

A COMPUTERIZED TEMPLATE-DRIVEN NEWS-LAYOUT SYSTEM FOR NEWSPAPERS

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ABSTRACT

In this thesis, an automated news layout system for newspapers, utilizing an on-line interactive computer, is presented. The news layout system accepts news stories, pictures, and ads-dummies as its primary inputs and automatically produces a page dummy outlining each story and picture location with only minimum guidance required from the user. A particular news layout scheme based on computer-stored page templates is developed. The template-driven layout concept allows the user to specify satisfactory page-layout structures a priori. Then, the computer positioning of individual stories and pictures is guided effectively, and the probability of achieving successful layouts is increased. The layout templates, representing the user-specified layout structures, are described symbolically utilizing a special news graphic language which describes the relative positions of news items on the page without any constraint on their sizes. Through use of the virtual-page-construction-and-assembly concept, a recursive layout algorithm places the assigned stories and pictures according to the structure specified by the symbolic layout template. The algorithm is also extended to lay out pages with display-ads as well. Experimental results of layouts taken from a typical newspaper show that the template-driven layout scheme is capable of producing layouts compatible with present manual layout standards, and indeed is a sound automated approach to the news layout problem.

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CHAPTER 1

INTRODUCTION

1.1 GENERAL DISCUSSION

The process of publishing newspapers may be divided into three functional parts: information collecting including news and advertising, page formatting, and the actual printing and distribution. The objective of page formatting is to accept the news and advertising information of an edition and to produce a layout (called a dummy) for each page which indicates in outline form the locations of display-ads, stories, and pictures. In general, the page-formatting process consists of three time-sequential phases: newspaper structuring, display-ads layout, and news layout. This report is concerned solely with news layout.

In the paper-structuring stage, the number of departments into which the paper is divided and the number of pages assigned to each department are determined according to the amount of display-ads available and certain established rules or policies pertaining to the news hole -- the remaining space on each page. These may include policies such as the department structure of the newspapers, section-size limitations, news-to-ads ratios, and so forth. Then, the display-ads are located on each page, and a display-ads dummy is produced. Finally, the stories and pictures gathered from the wire services or in-house reporters

are selected and fitted into the news-hole portions of pages.

Figure 1.1 shows a simplified block diagram of the newspaper process where the rectangular boxes represent the three major phases in page formatting. Typical results of executing the display-ads layout and news layout processes for an 8-column page, the ads dummy and the page dummy, are depicted in Figs. 1.2(a) and 1.2(b), respectively. In these figures, ads are identified by the advertisers' names or initials (such as "SEARS" and "GM") within the ad area, and stories are identified by a one-word descriptor (such as "OIL", "ECONOMY", and "HIJACKING") in the headline area. The one-word descriptor is called the story slug and serves to uniquely identify that story. Pictures are represented by cross-lined rectangular boxes in the dummy. Newspaper pictures can be classified into two types: those associated with a story, and those not associated with a story (called "independent" or "stand-alone" pictures). In Fig. 1.2(b) the picture "FORD" is associated with the story "ECONOMY", while "SPRING-WEATHER" is an independent picture uncorrelated to any story on the page.

It is important to note that only the outlines of ads, stories, and pictures are determined during the dummyming of the newspaper. The actual text and picture manipulations such as story cutting, hyphenation, justification, picture cropping, and ad composition are handled separately and are not considered part of the layout process.

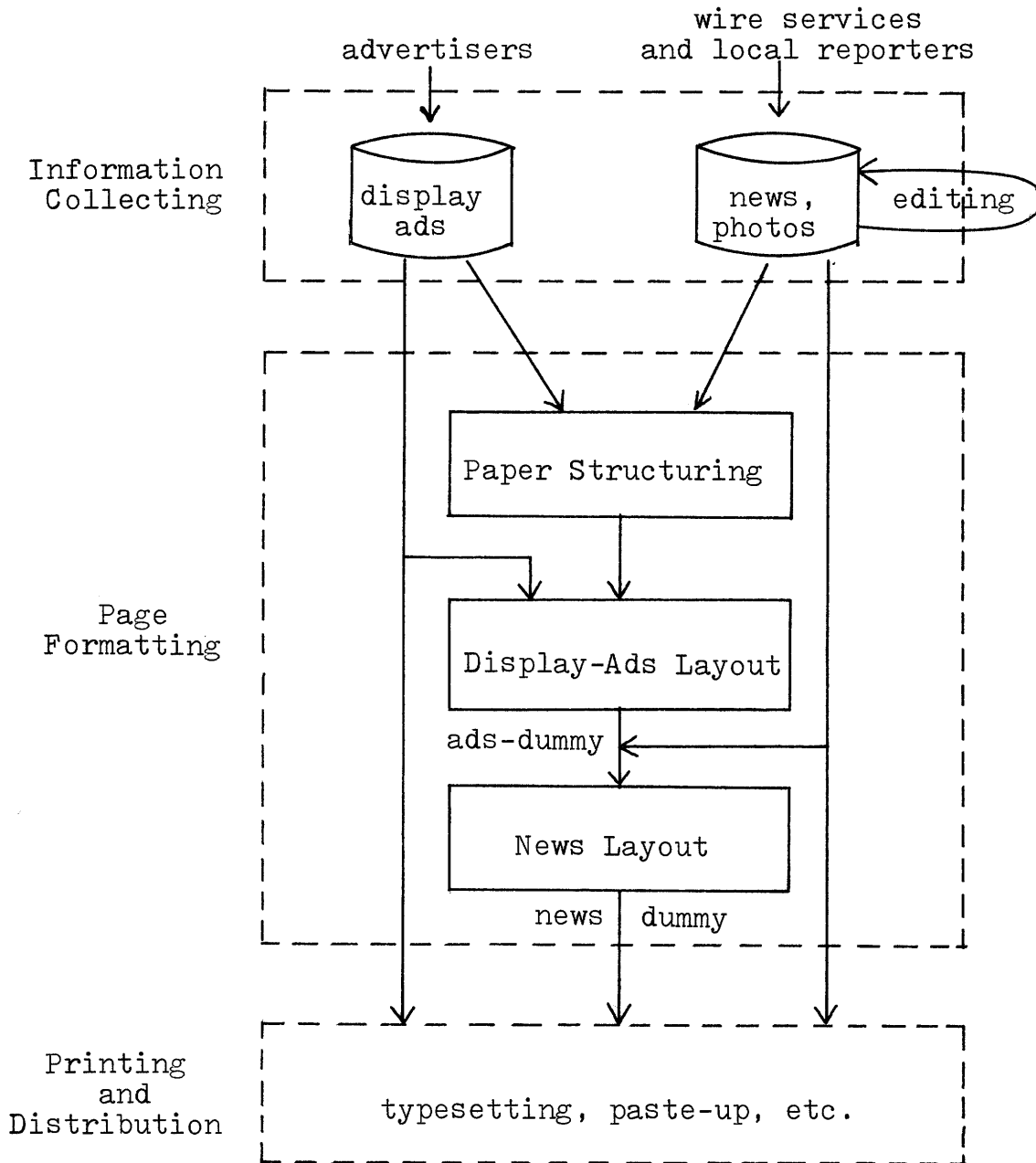
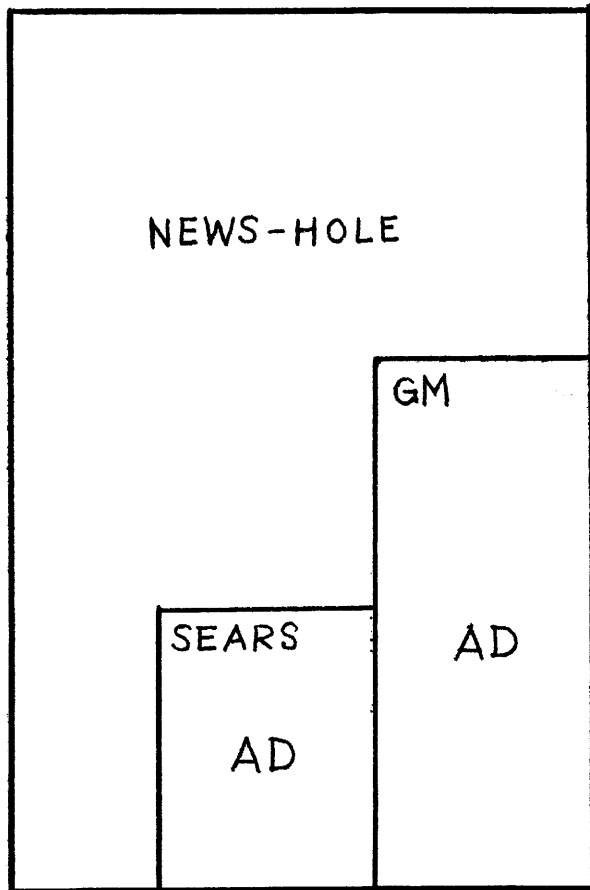
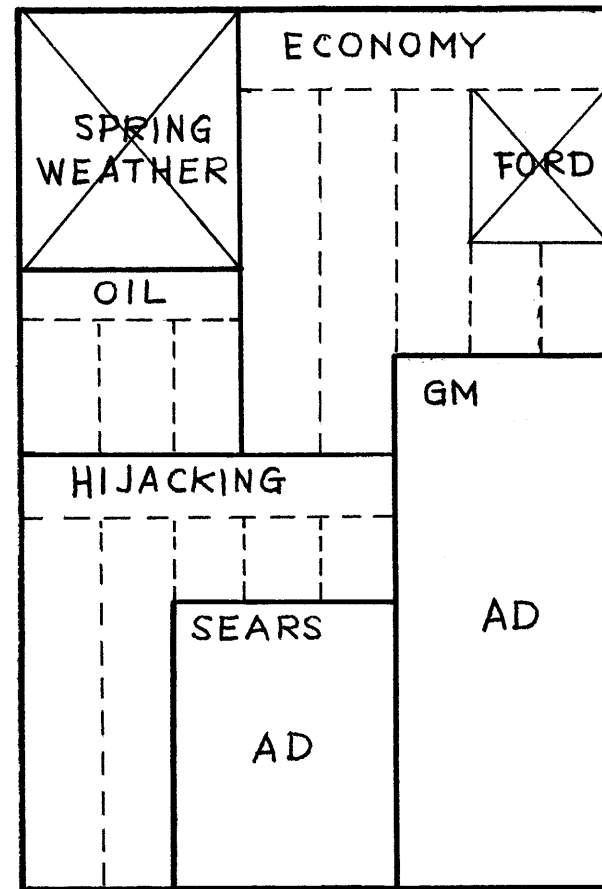


Fig. 1.1 Simplified Block Diagram for Newspaper Process



(a) Display-Ads Dummy



(b) News-Layout Dummy

Fig. 1.2 Page-Layout Dummies

1.2 THE NEWS-LAYOUT PROBLEM

In the general terms, the news-layout problem is that of choosing which of the available news materials to print, on which page it will be printed and where on the page it will be placed.

At a daily newspaper, news stories and photographs are collected throughout the day; there may be multiple versions of the same story and frequent updates. Generally, many more news items are collected than will fit into the available news-hole for that day. Therefore, the items must be sorted, reviewed, and, most importantly, a subset selected for publication. Since final story editing and picture cropping are usually accomplished after their selection, estimates of item sizes must be used to match the news budget to the available news hole. Current practice is to layout the pages based on the estimated sizes and then tailor the stories and pictures to fit their assigned spaces. In this way, current layout procedures influence not only the location of news items, but also their lengths and content.

News layout is complicated by several factors. First, printed news stories (unlike display ads) are not constrained to fixed rectangular shapes, but instead the story text can flow from one column to the next in a wide variety of configurations. This flexibility permits accommodation to various

news-hole shapes, but it also complicates layout decisions. For example, if a 16 column-inch story without picture is specified in an 8-column newspaper, the story can be shaped into a wide news block 8 columns wide and 2 inches high on one extreme, or into a tall block 1 column wide and 16 inches high on the other extreme. On the other hand, if the story has an associated picture of 2 columns by 4 inches within it, the story and picture block can only be constructed from the widest 4 columns by 4 inches to the tallest 2 columns by 8 inches.

A second factor involved in news layout relates to headlines. Headline sizes and shapes must be determined during layout and the rules governing this process are not well defined⁽¹⁾⁽²⁾. A third factor concerns story jumps. A story sometimes is continued on another page, and when this occurs, a decision is needed to determine how much of the story should appear on the initial page.

In addition to these fundamental problems, there are also a number of constraints dictated by accepted style conventions, some of which are well-founded while others appear to be a matter of personal taste. One of the basic news layout constraints is that story texts should flow continuously within the news blocks so that the reader is not confused when following the story from column to column. Furthermore,

besides the requirement of a monolithic news block for each story, the associated pictures within the news block must not isolate separate text areas from each other. As examples of layout violating these constraints, story D in Fig. 1.3 has two segments of text area (marked by horizontal shading) separated by a display ad, and the picture associated with story E isolates two separate-text areas of E (denoted by vertical shading), although the overall story-and-picture envelope is a monolithic block.

Another basic layout constraint concerns the placement of headlines. Headlines are intended to attract readers' attention and to summarize the story content. The basic constraint of the headline location within the news block is that it must be on the top of the news block. Furthermore, in order not to confuse the reader, two story headlines cannot be placed exactly adjacent to each other as illustrated by the headlines of stories A and B in Fig. 1.3. Also, the story text must start directly under the left edge of its headline. Story C in Fig. 1.3 is an example of a violation of the latter headline constraint. Here the beginning of the story text is separated from its headline by an associated picture.

A highly important constraint in news layout is the

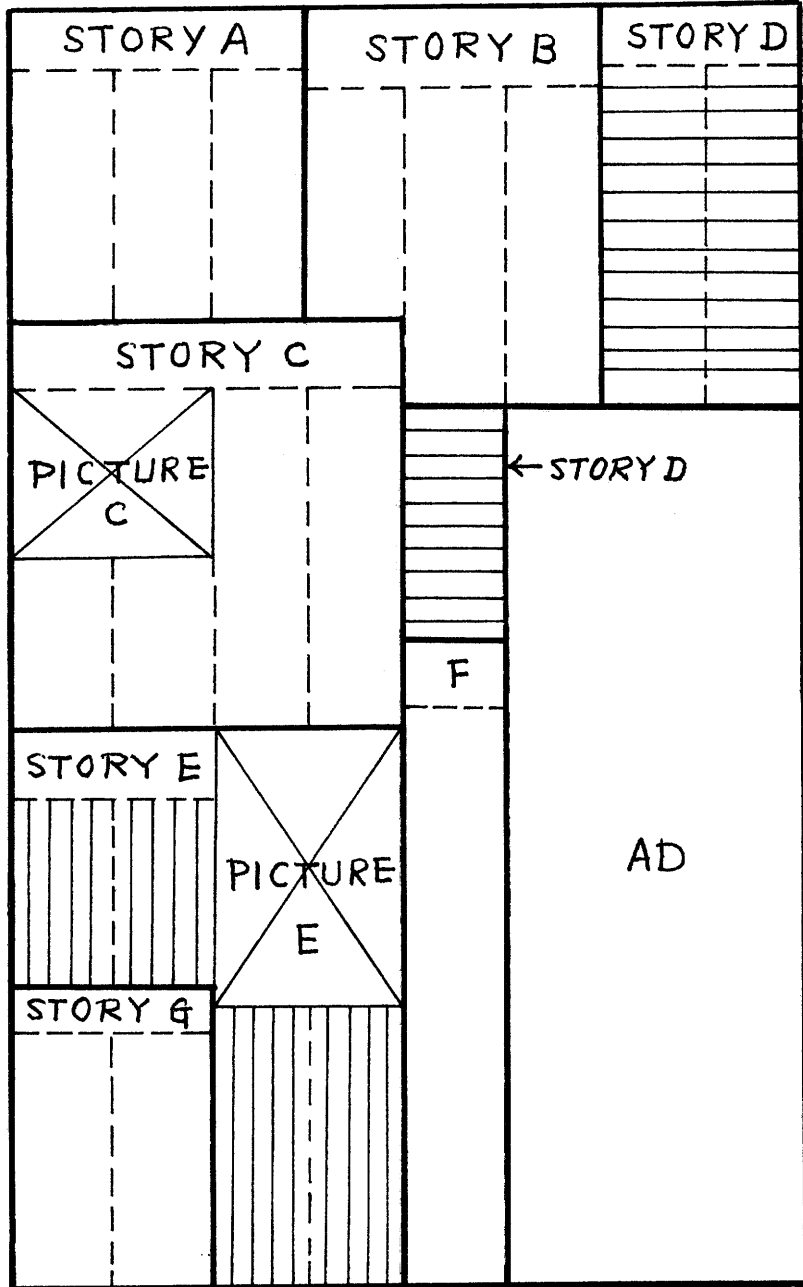


Fig. 1.3 Examples of Non-Acceptable Layouts

very short time available to produce the news dummies. Time is critical in the newspaper business. Presses must run on a tight schedule so that the newspapers can be delivered on time. Any modification of the finished news-layout dummies in response to late-breaking news has to be handled quickly in order not to delay the presses. A short reaction time to changes is often times difficult to achieve when layout is performed manually simply because of the numerous items of data, constraints and human judgements that must be dealt with. Thus, there is need for an automated approach in which layout dummies can be produced within a short time and late changes to the dummies can be accommodated quickly.

1.3 MOTIVATIONS AND OBJECTIVES OF COMPUTERIZED NEWS LAYOUT

Research in computerized news layout, like research in computerized display layout, is motivated by a desire to increase productivity in the news-layout process through use of modern technology. In other words, the major research objective is to reduce the man-hours spent in laying out the news by automating the process.

A second objective of the research is to speed up the layout process and provide as much flexibility as possible to alter layouts, particularly in response to the arrival of last-moment, late-breaking news stories.

In light of these objectives, our purpose is to make the layout process as automatic as possible and consistent with "aesthetically acceptable" formats. At the same time, we recognize the difficulty and probable cost of achieving a completely automated procedure, so that a third objective of the research is to contrive a system that includes some human decision-making at a level that makes efficient use of the decision-maker's time and that is consistent with his abilities.

Still another objective of a computer-based news-layout system is to allow newspapers to place more emphasis on providing useful news information to their readers. In their present manual layout system, stories and pictures are very often sized to fit areas designated by the layout man regardless of the actual story information value. In addition, 'fillers' of little or no information value are used frequently to 'fill in' fragmented news holes that remain on the pages after the important stories are placed. With the help of a computerized news-layout system, it is expected that newspapers will be able to lay out pages following their pre-determined story lengths more closely, and thus to provide readers more useful information for a fixed number of pages.

1.4 BASIC APPROACHES TO NEWS LAYOUT

News layout procedures may be divided into two broad categories: manual layout and computer-assisted layout. The latter method, in turn, may be further delineated in accordance with the amount of human effort that is involved in conjunction with the computer. These procedures are described in the following paragraphs.

1.4.1 Manual Layout

In manual layout, story selection and positioning are very much dependent on the personal judgement of editors and creativity of the layout man. For any edition, the editors have a supply of stories and pictures which could fill the newshole several time over. Conferring among themselves, they decide which stories are more important than others and rank the available news material in a rough order of importance.

Once it is decided which material will go on each page, the layout man begins his process of fitting and formatting the selected news items on the pages. Since the layout process generally starts well before the final copies of stories are edited and pictures are cropped, estimates of news-item sizes must be used in the layout to fit the news material into available news-hole. Using the estimated sizes, the layout man draws up his layout dummy which indicates the

location of each story and picture placed on the page. Then, the page is composed in accordance with the layout dummy.

1.4.2 Automatic News Layout

One major advantage of a computerized news layout system is its quick turnaround time in completing a layout. A basic design goal of the proposed system is to automate as many of the news layout tasks as possible. Given today's display-ads dummy, and a budget of news stories and pictures, the system automatically produces a complete layout and displays the results a page at a time on a cathode-ray-tube (CRT) terminal showing the exact locations of all items placed on the pages.

However, it is recognized that in some cases completely automatic layout results may not be satisfactory, especially for front pages which are judged more severely. Since the manual editing capability is provided to override the computer results when needed, the layout man always maintains control over the final layout; initial layout results generated by computers are expected to be at least used as the basis for editing, even for front pages. For interior pages requiring less elaborate layouts, automated algorithms can be expected to quickly lay out the news satisfactorily without any human assistance.

There exist some other less automated approaches to the news-layout problem, utilizing an on-line interactive computer. Professor Anderson at Brown University has investigated and developed a set of very sophisticated computer-oriented commands allowing a user to draw and edit his layout on a CRT terminal.

Brent Longtin in his thesis on news layout⁽⁶⁾ has proposed a layout scheme which needs user's assistance for the placement of most stories.

In a full-page composition system presently under development (such as the one by Newspaper System Development Group and its contractors), all the news information (stories, pictures, and artworks) is kept on-line for editing and typesetting, and both the display-ads makeup and page-layout are carried out interactively by editors on a full-page graphic terminal. At present, in contrast to automatic news layout, the news layout process in such a full-page composition system is still done manually on the composition terminal utilizing computer-oriented layout commands.

Although these are thought of as computer-based news-layout systems, the above systems are using a computer either as a sketchpad, or in a heavy user-assisted environment. Compared to the manual layout, the time saved in a sketchpad approach, which requires a very elaborate hardware configuration,

is very limited. Without any significant improvement of layout time, most newspapers cannot afford the 'luxury' of changing their sketchpad from pencils and paper to computers and CRT terminals. Therefore, the use of computer as a sketchpad for layout is clearly not the long-term solution to the problem. A news layout system using a computer should be designed to utilize the maximum power of a computer in producing a complete layout dummy, and at the same time provide the user with complete capability to monitor, edit, and override the computer-generated results as needed.

1.4.3 Interactive On-line Approach

An on-line interactive approach in which the layout man has an opportunity to check on progress of the computer and alter partial results as needed is the approach taken in this research. Although the basic design philosophy of the proposed layout system is to automate the layout process as much as possible, the problem is too complex and the input conditions are too varied to expect completely satisfactory computer-generated layouts at all times without human assistance. In a totally automated system, the user has no control of the layout, and may have trouble in identifying the causes of an unsatisfactory layout. Therefore, keeping the maximum degree of layout automation in mind, an on-line interactive operating mode between the computer and the user is adopted in news

layout. That is, several break-points are established after major steps in the layout so that the user can check intermediate results. If the user is not completely satisfied with the current results presented by the computer, he may stop the process and manually modify the results before continuing. Or, the user may wish to change his original data bases or policies and then direct the layout process to restart again. Because of the manual review and possible manual revision of the computer-generated result, the throughput time of an interactive layout system is greater than that achieved by a fully automated batch layout process. However, in a completely automatic news layout system, it is extremely difficult to design an algorithm that can produce satisfactory results for the large variety of input conditions encountered. If unsatisfactory layouts occur, the inputs must be altered and the program re-run. Several iterations may be needed before satisfactory layout are completed. By providing user review and interaction with the computer at the layout steps where manual checking of the intermediate results is most desirable, the automated interactive news layout system will achieve its maximum productivity with the shortest average processing time.

1.4.4 Computer-Oriented News Layout Environment

The objective of a computerized news-layout process is to devise procedures that are compatible with a computer-oriented newspaper environment. In light of this goal, manual procedures that have emerged over the years require critical examination for their relevancy in the new environment. In other words, in the research being reported upon here, no commitment is made to preserve traditional procedures by simply automating the manual process.

Besides the display-ads dummy showing the ads locations on pages and the layout policies concerning the story and picture placement, the basic inputs that are required for the computerized layout process are these:

- (1) Estimated story length (including area for headline) for each story.
- (2) Story length adjustment tolerance --- the longest or shortest length a story can be increased or reduced, respectively.
- (3) Relative story importance ranking in terms of numbers.
- (4) Fixed dimensions for pictures --- although more than one set of dimensions could be specified for each picture representing different cropping and/or size alternatives for that picture.
- (4) Relative picture importance ranking in terms of numbers.

It is the function of the news-layout computer program to assign stories to the various pages and to locate the story

on its assigned page in accordance with the algorithms described in the report.

The output is a dummy of each newspaper page showing outlines of story locations. A future research task is to merge the news-layout program with a display-ads-layout program that has already been developed, thus yielding a complete page dummy.

1.5 FORMAT OF THE REPORT

An overview of possibilities for a computerized news-layout process is presented in Chapter 2. Two layout schemes -- sequential story/picture placement and a template-driven method -- are discussed. The template-driven layout approach is considered superior to the sequential scheme and is the one chosen for extensive research. The operating environment of an automated template-driven news-layout system is described in Chapter 3 from a user's viewpoint.

Chapter 4 discusses how a full-page layout template can be represented symbolically. A special news graphic language that utilizes a set of symbolic operators is introduced and its syntax and semantics are explained. The operators are used to describe the relative positions of stories and pictures on a page template. The symbolic representation of the template based on the news graphic language then guides the

layout algorithm in positioning individual news items (stories or photos) assigned to the page.

The layout techniques used for the interpretation of such a symbolic template description is presented in Chapter 5. Layout examples utilizing the template-driven news-layout concept are reported and discussed in Chapter 6.

Fundamental to the template-driven layout scheme is a computer-stored template library. Chapter 7 includes an estimate of the size of such a library for a typical newspaper, and discusses the issues involved in designing and organizing templates. Finally, Chapter 8 summarizes the results of the research and suggests some related areas for further research.

CHAPTER 2

DEVELOPMENT OF A NEWS-LAYOUT ALGORITHM

Our investigation of computer-assisted news layout has provided insights into the capabilities and limitations of computer algorithms for positioning news stories and pictures on newspaper pages. As stated in section 1.3, in contrast to the page-composition systems being developed elsewhere, we have concentrated our efforts on a highly automated system in which the computer takes an active role in making layout decisions, although the system always provides the layout man an option to override and modify computer-generated results. Our goal is to maximize productivity by having the computer perform as much of the layout tasks as practical and to use human perception and judgement primarily to review and edit the computer results and to alter results as needed. Our previous success in applying this concept to display-ads layout supports this approach.

2.1 NEWS LAYOUT PROCESS

In order to break the problem into a manageable form, the news-layout process is separated into two phases, story and picture assignment and page layout. This approach was

proposed by Longtin⁽⁶⁾. The story and picture assignment software selects and assigns a subset of available news items for each page, and the page layout program actually positions the stories and pictures on the page which they are assigned.

2.1.1 Story and Picture Assignment

The function of story and picture assignment program is to select a subset of stories (or parts of jumped stories) and pictures for each page whose total area matches the page news hole before the news items are actually positioned on the page. Its purpose is to assure that important news items are assigned to appropriate pages and to implement other policy guidelines such as the number of stories contained on certain pages, picture distribution among the pages, desired jump-from and jump-to pages, collocating associated stories, and so forth.

The assignment process starts at the front page and works toward the last page. Stories and pictures with high user-specified importance ranking are assigned to pages near the front of the paper. Front-page stories are either pre-specified or are assigned the topmost priority rating. The assignment results consist of story and picture budgets for each page. The results are presented to the editor for review and modification, so that the editor has the opportunity to evaluate and modify the news selection by page before the actual layout process begins.

It is important to note that the process of breaking a story into two parts and assigning the parts to two different pages is handled in the story assignment phase. Thereafter the forepart of the story and its jumped portion are considered as two separate stories.

2.1.2 Page Layout

Upon completion of the story assignment phase the news layout process proceeds to position the assigned news items, one page at a time.

In an early version of a page-layout algorithm developed by Robert Polansky⁽⁷⁾ one story (or picture) was placed at a time on a page. A rectangular story envelope was constructed using a desired height-to-width ratio specified by policy inputs for that page, and the envelope was placed at a boundary of the remaining news hole. The algorithm would then shift the envelope and/or modify its shape in order to eliminate any overlap with ads or other items previously positioned on the page. Various constraints and rules were followed to avoid unsatisfactory layout conditions. The process was repeated for each story and picture until all items assigned to the page were placed.

Based on these techniques with minor modification, an experimental layout system was developed and implemented on

a general-purpose time-sharing computer. A more detailed description of the system including the story assignment and story/picture placement algorithm is included in Appendix A.

The experimental sequential layout system was tested by inputting a set of news stories and pictures taken from a local newspaper. The data used in the test and the detailed layout test results are presented in Appendix B. In general, the test results of the story-assignment phase were acceptable, but the layout results indicated some fundamental problems in the one-item-at-time layout approach.

2.2 THE SEQUENTIAL STORY-PLACEMENT PROBLEM

The experimental evaluation of the sequential layout algorithm showed that good layout results were usually achieved on pages with no more than two or three stories and limited news holes, such as commonly found on many interior pages, but unsatisfactory layouts occurred too frequently on pages with large news holes and/or several news items. The major difficulty in the sequential layout process arises near the end of the sequence, often times, an irregularly shaped news hole is created in which the last one or two news items cannot be placed satisfactorily.

For example, in the layout depicted in Fig. 2.1, the algorithm places story S1, picture P1, and stories S2, S3, S4,

in that order, but the remaining news hole (indicated by the shaded area) is unsuitable for the last story. The news-hole area matches that of the remaining story, but its shape precludes an acceptable layout.

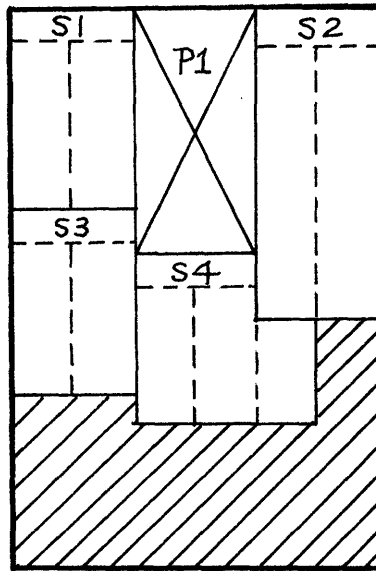


Fig. 2.1 Examples of Sequential Layout

Another major problem with the sequential story-placement algorithm is fragmentation of the news-hole. Since there is no special effort made to keep all unoccupied news areas contiguous, placement of a story or picture often creates two or more isolated segments in the remaining news-hole. A more detailed discussion of these deficiencies and others can be found in Appendix C.

To solve these problems, an adaptive layout algorithm was considered which would look ahead at the remaining news hole as each story was placed and alter the layout rules in an attempt to avoid unusable news-hole shapes. However, because the design of such an algorithm prove to be very difficult, as discussed in Appendix C, still another approach was sought.

2.3. TEMPLATE-DRIVEN NEWS LAYOUT

The results from these initial attempts to achieve automated news layout indicated that the computer needed more information about the desired overall page layout in order to position individual items satisfactorily. With such information available the overall page structure can be used as a guide to the construction and positioning of individual story and picture envelopes. Techniques based on this concept of using pre-determined page templates have been investigated. Page templates were used in the initial sequential layout algorithm, but only on pages containing pictures, as described in Appendix A. There the templates were used as part of a tentative layout process designed to provide a balanced distribution of pictures on the page. However, the tentative layout only affected the sequence in which items were placed on the page, and in practice, had a relatively minor influence

on the final layout results. In the template-driven system proposed here, the final layout is controlled more rigorously by the selected template.

2.3.1 All-Inclusive Template Library

Two methods for using templates to control news layout have been investigated. One method is to define full-page templates in such a way that all the news items (stories and pictures) and ads, are precast on the template. That is, each template represents an acceptable page layout for a given set of news stories, pictures, and ads, and the template description includes the exact location for each story, picture, and ad. The template library would represent various combinations of different numbers of stories and pictures, different story areas and picture dimensions, various ads dummies, and perhaps several layout styles for each of the previous combinations.

Fig. 2.2 depicts three examples of such precast templates, each with four stories (S1 to S4) and one stand-alone picture P. Note that the only differences between the template in Fig. 2.2(a) and Fig. 2.2(b) are the sizes of stories S3 and S4. Although everything else is the same, Fig. 2.2(a) and (b) are treated as two different templates.

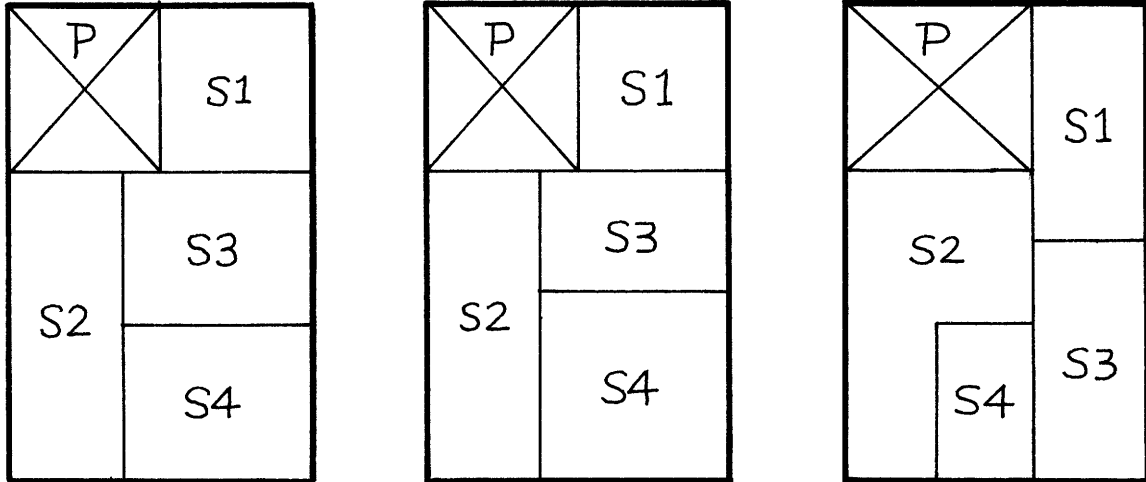


Fig. 2.2 Examples of Precast Layout Templates

If the existence of a very large computer-stored library of precast templates describing all acceptable layouts for all combinations of stories, pictures, and ads that are likely to be encountered is assumed, the page-layout process is reduced to the selection of a proper template from the library. The selection is based on matching the stories and pictures assigned to the page, regarding their number and size, to the corresponding items on the templates. A certain tolerance on the size difference (for example, 10 percent) is allowed because an exact match of each story size is very unlikely

and in fact unnecessary. If the difference is small, leading* can be used to adjust the story size to the layout space, and an actual story size change can be avoided.

Thus, the layout algorithm using a precast template is basically a template selection or matching process. The success of such a layout scheme relies heavily on the pre-formatting of an appropriate template library. The template library must be sufficiently large to include all possible combinations of different numbers of stories and pictures, story and picture sizes, ads dummies, and layout patterns. In other words, the library must contain templates with various numbers of stories and pictures, and for each number of stories and number of pictures there must be an assortment of templates with various sets of item sizes. Obviously, this leads to a very large template library.

The total number of templates required for news layout utilizing a preformatted template library is estimated to be in the order of 10^5 to 10^6 . This estimate is derived from the product of the numbers of different possibilities for typical layout styles, ads dummies, story and picture sizes, and story and picture counts. It is estimated that the average

* This is a term carried over from hot-type printing press where extra pieces of metal are inserted to control the spacing between lines or characters.

computer-storage space needed per template is seventy-two words (eight stories or pictures with eight words for recording coordinates of each item and one word for its size); thus, a precast library with 10^5 templates can be stored on a medium size disk unit such as the IBM 2314 disk drive which has storage capacity of 58×10^6 words on an 8-pack unit. The analysis suggests that with current technology digital storage of an all-inclusive template library is feasible.

However, the main obstacle of such a simple layout scheme is the process needed to generate 10^5 templates. It is very unlikely that a general algorithm could be designed to create acceptable templates automatically for all newspapers because of the significant differences in their overall layout policies and styles. Therefore, the template library is not sharable generally among newspapers, and most newspapers would have to generate and maintain its own template library.

To generate 10^5 templates manually is a formidable task. One solution is to build up the library gradually for the daily newspaper over a period of time as entries in the template library. However, a calculation shows that it takes approximately seven years to accumulate 10^5 templates from an average daily forty-page newspaper, assuming no duplication of layouts on any pages throughout that time span.

The size of the required template library is a serious drawback to the feasibility of this approach for a template-driven layout system. Hence, an alternative scheme is needed which requires only a small library of a few hundred or so templates.

2.3.2 Symbolic Representation of Page Templates

The second technique for representing full-page templates which has been investigated in depth is based on a symbolic news graphics language. With this language, templates are described symbolically by the relative positions between news items rather than their fixed coordinates on the page, and each template can be applied to the news-layout process without matching story and picture sizes. For example, the layout templates depicted in Fig. 2.2(a), (b), and others with the same basic layout "structure" are represented by a single template utilizing the symbolic template description.

This greatly reduces the total number of templates needed in the library while still retaining the needed layout guidance in the template structure, and makes the implementation of a template-driven system attractive. A complete discussion of the news graphic language and its application to symbolic-template description is presented in Chapter 4.

CHAPTER 3

OPERATING ENVIRONMENT FOR A TEMPLATE-DRIVEN NEWS-LAYOUT SYSTEM

The operating environment for a computerized news layout system is different from that of present manual systems. This chapter presents an overview of the proposed template-driven layout system from a user's point of view. The emphasis here is on how he employs the system to lay out newspaper pages.

In section 3.1 we present an external view of the system and describe what a user does when he makes a layout with the proposed template-driven techniques. Then, in section 3.2 there is a discussion of an overall internal structure of the layout system in terms of various data bases that the system is composed of and their relationship with the layout process. The details and specific techniques used to carry out the layout task are presented in subsequent chapters.

3.1 USER'S OVERVIEW OF THE NEWS LAYOUT PROCEDURES

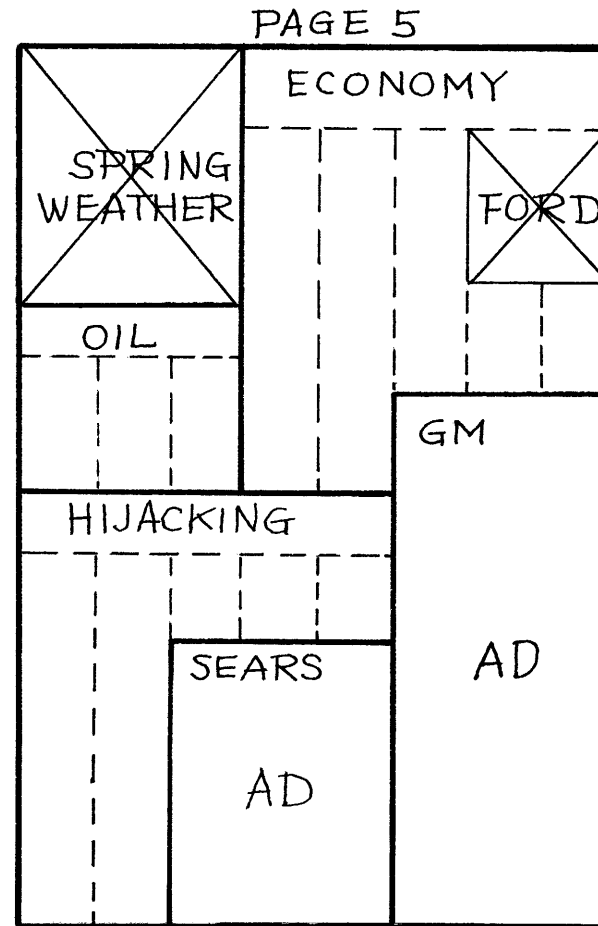
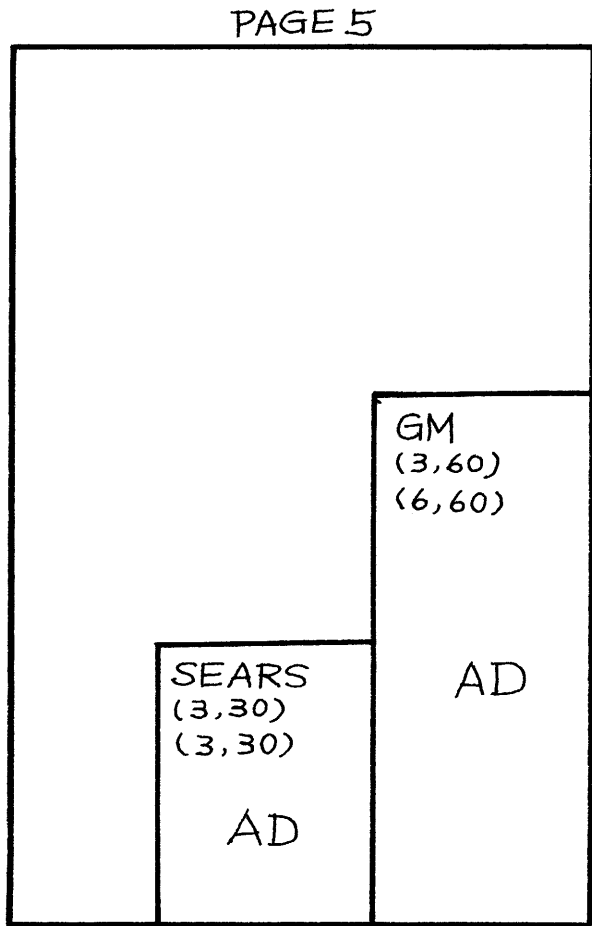
Assuming the existence of an operational news-layout system utilizing the proposed computerized template-driven layout concepts, a user performs the layout task through a sequence of interactive dialogues with the system via a Cathode-Ray-Tube (CRT) terminal. The sequence of events is described in the next several paragraphs.

3.1.1 Data Review and Inputs

The user initiates the layout task for a newspaper edition by first reviewing the data that have been already entered into the system such as the previously prepared ads-dummy and the news data for that edition. Fig. 3.1 (a) illustrates a typical ads-dummy for a page, as displayed on the CRT terminal. The dummy outlines the position for each display-ad located on the page, and for each ad there is shown in the upper left corner the advertiser's name, ad dimensions, and the coordinates of the ad.

At this point, the news data that have been stored in the system can be called up for review; the data include the slug and the estimated size for each story, and the caption and the dimensions for each picture.

The major purpose of the news-data review is to allow the news editor to rank the stories and pictures according to their importance. Upon completion of his review, an integer representing importance ranking is assigned to those more important stories and pictures; and the number is entered into the system by the editor. Note that it is not necessary to assign an importance to every news item in the data base. Those not ranked would be considered to have a default value of low ranking. The numbering scheme we have chosen is this:



-45-

Fig. 3.1 Typical Layout Dummies on a CRT Terminal

the larger the number, the less important is the news item. In other words, the highest ranking stored is labelled 1.

Another operation a user can carry out at this time is the pre-assignment of stories and pictures. Stories and pictures can be pre-assigned to a specified page by entering their desired page numbers from the layout terminal. This facilitates a partial manual story and picture assignment on pages where tighter editorial control is desirable, such as the front pages of various departments. Furthermore, those pictures associated with news stories and those stories associated with each other are also tagged during the news review phase. After the data review and inputs are completed, the story and picture assignment process can be initiated.

3.1.2 Story and Picture Assignment

The assignment process accepts news data as inputs and automatically assigns stories and pictures to each page of the edition. The computer-generated results, consisting of a news budget which matches the available news-hole for each page of the paper, is presented to the news editor in tabular form for his review. The results are presented in a page-by-page format, and for each news item assigned to the page results typically consist of the story slug or picture caption, actual size being assigned to the page,

jump-to or jump-from page number, and story-picture association.

If the editor is not completely satisfied with the computer-generated assignment results, he may either manually modify the results from the terminal, or change his original news data (such as the importance ranking and size specification for certain stories and pictures) and direct the assignment process to restart. After the story and picture assignment results are considered satisfactory, the page-layout process is initiated.

3.1.3 Page Layout

In the page-layout process, the stories and pictures assigned to pages are placed in the positions they will occupy on the page. The layout task is done page-by-page. For each page the layout editor can either manually pick a layout template from the template library or he may wish to let the system automatically select a template according to some pre-determined template-selection algorithm. After the template is specified, the layout process for the page is carried out automatically and if performed successfully, a news dummy whose structure conforms to that of the selected template is produced. Figure 3.1 (b) depicts a sample news-layout dummy for a page where the location and identifier of each story and picture are outlined.

If an acceptable layout can not be achieved with that template, an attempt is made by the layout system using another template, either manually picked or automatically selected, and so forth, until an acceptable layout is obtained. Should none of the templates stored in the library produce an acceptable result, the layout process stops; the layout editor must then re-direct the layout of the page by either entering a new template from the terminal console or changing the stories and/or pictures assigned to the page in order to eliminate the layout bottleneck. If the computer achieves a layout acceptable within the algorithm constraints but the results are not completely satisfactory, the layout editor may use the computer-generated layout as basis for further manual editing on the CRT. After a satisfactory layout is achieved for that page, the layout editor directs the layout process to the next page until all the pages are laid out.

Since the complete layout procedure outlined above has been presented primarily from a user's point of view, no effort has been made at this point to describe the actual algorithms used by the system to perform the various layout tasks. In order to provide insight into how such a system is organized, there is presented in next section an internal overall structure of the template-driven layout system which shows the required data bases and their contents.

It is evident from the preceding discription that the template-driven news-layout system is a highly automated system. It allows, however, for page-by-page approval of layout results and the possibility for manual intervention should the layout editor wish to override the system.

3.2 OVERALL STRUCTURE OF THE LAYOUT SYSTEM

Figure 3.2 shows the overall system structure and data bases for a computer-based template-driven news-layout system. Three data files, Display-Ads Dummy, News Data, and Story Assignment Policy, are required for the story- and picture-assignment process. The Display-Ads Dummy File contains the outlines of all ad locations on the pages, as well as the structural information of the paper such as the number of departments in the edition and the pages assigned to each department. The information about stories and pictures for the day, from both wire services and local editors is stored in the News Data File. For each story, this information includes the slug, the relative-importance ranking of the story as specified by the editor, the estimated story length with maximum allowable tolerance for reduction or expansion, and the associated picture(s) if any. For stand-alone pictures, the information contains the picture slug, the relative-importance ranking, and the fixed dimensions of the pictures (more than one set of dimensions can be specified).

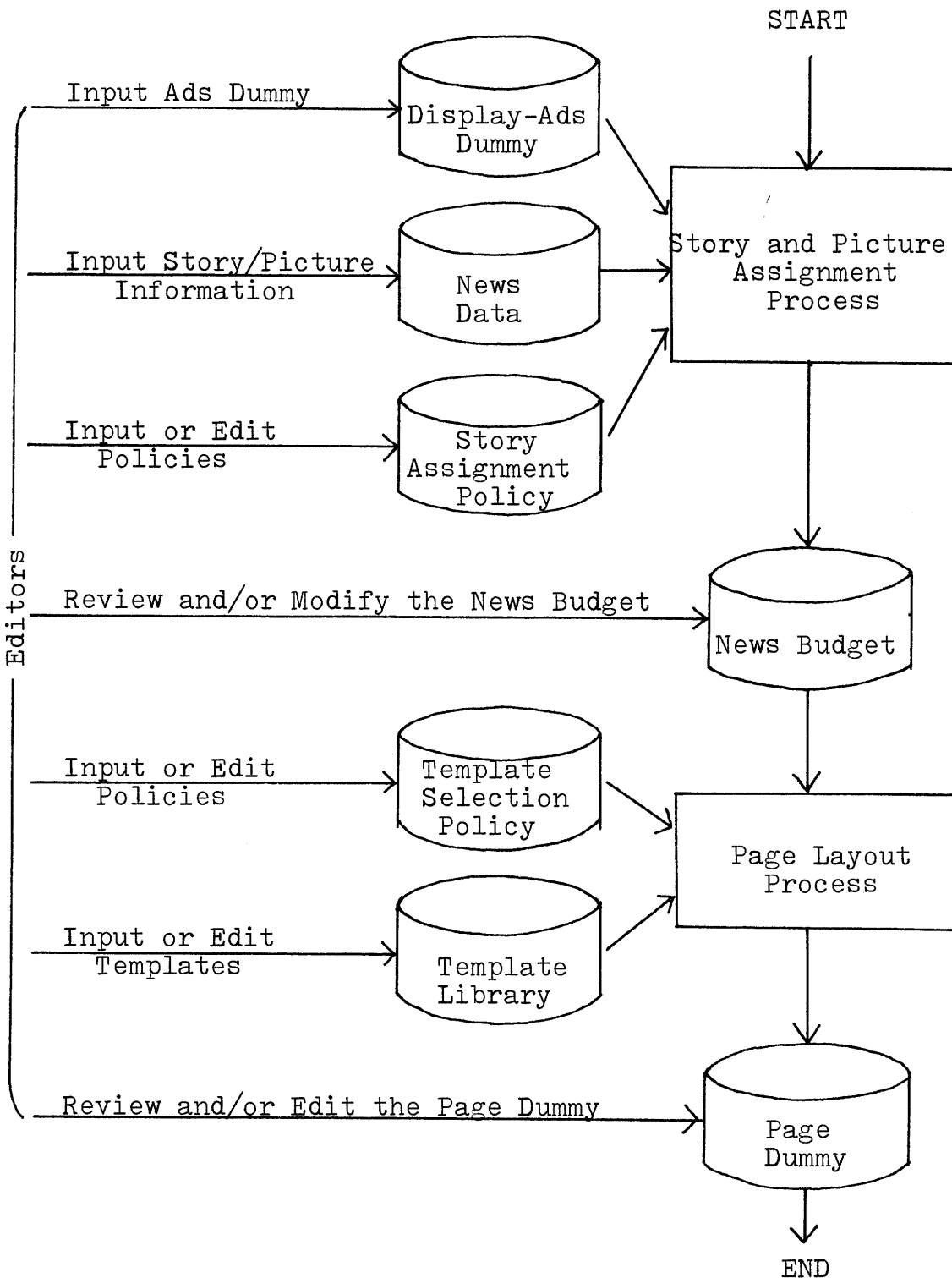


Fig. 3.2 Overall Structure of the Automatic News Layout System

An important system-design feature is the separation of the news-layout policies or rules from the layout process. The story assignment and template-selection rules which influence the story/picture selection and the placement of stories and pictures are not buried in the news-layout algorithm. Instead, as shown in Fig. 3.2 these policies are treated as files which can be designed by the editors to suit their own style; as such, they may be modified at any time without requiring any modification of the news layout programs.

The story-assignment policies guide the determination of how many and which stories and pictures are assigned to each page without regard to their locations on the page. Examples of story-assignment policies are these: the desired ranges of the number of stories and of the picture percentage on certain pages, the leading percentage, and the rules concerning the jumping of stories such as the specification of non-jump-from or non-jump-to pages, and the desirable jump-to pages.

The story-and-picture assignment algorithm accepts as inputs the Display-Ads Dummy, News Data, and Story Assignment Policies; and automatically produces a News-Budget File which contains, for each page, a list of stories and pictures whose total area matches the available news-hole for the page. As shown in Fig. 3.2, the News Budget File together with the

Template Library and Template Selection Policy serve as inputs to the page-layout process where the assigned stories and pictures are actually placed.

The Template Library File contains full-page layout templates designed by a particular newspaper to reflect its own layout style and preference. The templates describing the desired layout structure of news items on the page are represented symbolically, utilizing a set of operators. As a result, the layout templates can be entered or edited very easily from a terminal console with special user-designated functional keys. When selected for layout of a given page, a template is used as a structural guide for the placement of the assigned stories and pictures.

In general, several templates are defined in the Template Library representing different possible layout structures with the same number of stories and pictures on the page. The template-selection rules establish the priority among this subset of templates when automatically selecting a template for layout. The template with the highest priority assigned to it is tried first as a structural guide in the story and picture placement process. If a satisfactory layout result can not be achieved with that template, an attempt is made with the next priority template, and so forth until a satisfactory layout is obtained or no more templates are

available with the appropriate combination of stories and pictures. Allowing the layout editor to specify template priority provides the editor with control over the sequence of selected templates to be tried in the page-layout process.

It is important to note that the Story-Assignment-Policy File and Template-Selection-Policy File, as well as the Template Library, are considered as permanent data files. In general, they are always on hand and available when the actual news-layout process begins. Since they represent a particular newspaper's style and policy, no major modifications are made to these files from day to day. On the other hand, Display-Ads Dummy and News Data Files are temporary in nature and change from one edition to another.

Fundamental to the proposed template-driven layout system is the capability of describing layout templates symbolically. With symbolic-template representations, the number of templates required for a template library can be reduced dramatically. In the next chapter, there is presented a symbolic news graphic language based on a set of relational operators. Utilizing such operators, one is able to represent a desired layout template symbolically by describing the relative positions of news items on the page.

CHAPTER 4

SYMBOLIC NEWS GRAPHIC LANGUAGE

In this chapter a news-graphics language is described which is utilized to define page templates in a template-driven news-layout system. In contrast to a precast-template approach (described in section 2.2) where absolute locations and sizes of all news items are specified, this language permits templates to be specified by the relative positions of news items on the page. Its major advantage is that the number of templates can be reduced several orders of magnitude compared to the number required in precast-template system.

Following a discussion of the motivation for a symbolic representation of templates in section 4.1, the symbolic operators on which the news graphic language is based are introduced in section 4.2 as the basis of the language. A formal discussion of the language syntax, including its grammar, is presented in section 4.3. Initially, the discussion is restricted to pages with full-page news holes, but the concepts are extended for application to pages with display-ads in section 4.4.

4.1 MOTIVATION FOR SYMBOLIC REPRESENTATION OF LAYOUT TEMPLATES

Figure 4.1 illustrates three of the many possible templates with the same basic structure, number of stories S, and number of pictures P, but with different combinations of story and picture sizes. Notice that by merely changing two story sizes in the template in Fig. 4.1(a) (increasing story size S1 and reducing story size S2) a new template shown in Fig. 4.1(b) is created although everything else remains the same. Similarly, a third template is required to define the layout in Fig. 4.1(c), since alternations in the sizes of the stories have been made. Note, however, that

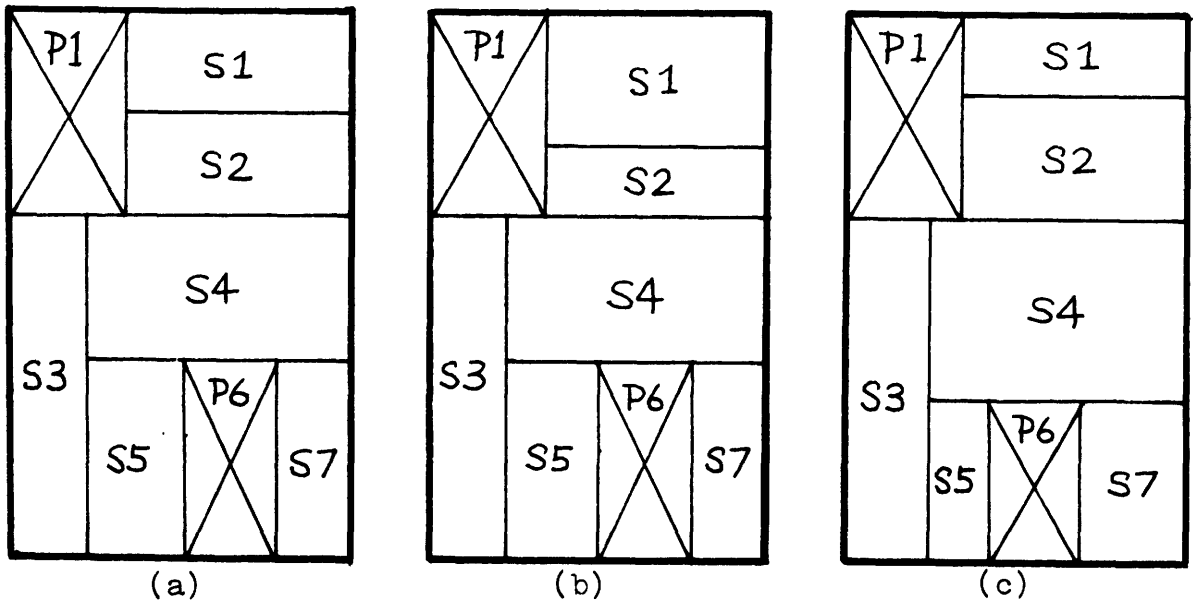


Fig. 4.1 Templates with the Same Basic Layout Structure

the relative positions of the stories have not been altered. Obviously, the template library could be reduced greatly if all the layouts in Fig. 4.1 plus others with the same basic layout "structure" could be represented by a single layout template.

Therefore, the object is to use only structural information on the template to guide the layout so that a relatively small number of templates can be used*, but still provide effective control of the layout of individual news items on the page. Through use of this type of template representation the story-placement algorithm receives adequate guidance, but it is not constrained by the areas of items on the template.

However, in absence of the story and picture areas, a template can no longer be described by specifying the coordinates of corners for each item on the page. Thus, the problem is how to represent the two-dimensional geometric information of news items on a layout template; that is, a formal mechanism is needed to describe the relative geometric

* In section 7.2, it is estimated that the template library needed for news layout can be reduced from the order of 10^6 templates to a few hundred templates for a typical medium-size newspaper by using symbolic template definitions rather than exact precast templates.

information of a template, such as the one in Fig. 4.1. Here the layout calls for a picture (P1) at the upper left corner with two stories (S1 and S2) to its right, and one narrower (with respect to the horizontal dimension of the picture) story (S3) beneath it, and so forth.

In order to represent formally the structural information of a layout template, a set of basic operators expressing the geometric relationship among items on the template is developed. The explanation of these relational operators along with their usage is presented in the next section.

4.2 RELATIONAL OPERATORS AND THEIR USAGE

In this section, a set of binary symbolic operators are developed which are used to describe the relative positions of two adjacent news items (stories or pictures) on layout templates.

Through utilization of the proposed relational operators, a wide range of commonly encountered newspaper layouts can then be represented symbolically. This section defines each relational operator introduced and illustrates their usage in composing a symbolic description for templates with more than two news items. The news items connected by a relational operator are called "operands", and an infix notation is adopted in which the operator appears between its two operands.

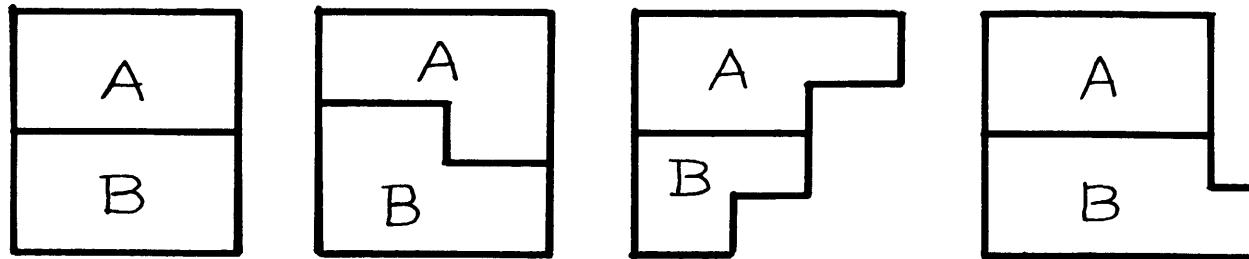
In accordance with their usage, binary relational operators can be classified into three groups: basic, embedded, and extended.

4.2.1 Basic Operators

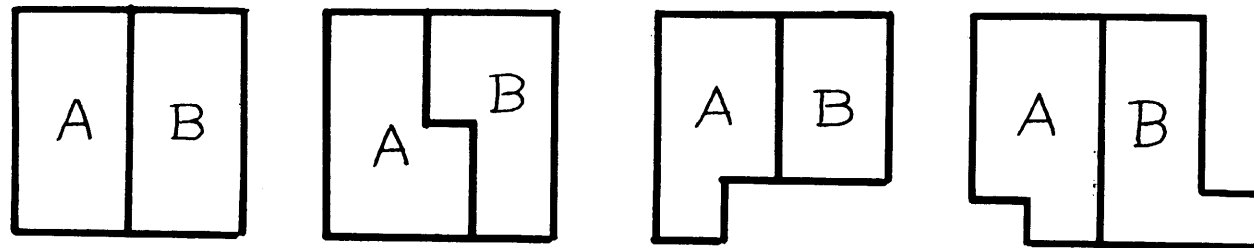
Operators used to indicate the adjacency, either vertical or horizontal, of two news items with the same dimension at their common edge are designated as basic operators. There are two basic operators denoted by the symbols = and || . The interpretation of these operators is as follows:

- = This is a vertical-construction operator; it indicates that one operand is positioned above the other. A = B means that news item A is on top of news item B, and A and B are of the same width at their common edge. Examples of this vertical construction are depicted in Fig. 4.2(a).
- || This is a horizontal-construction operator; it indicates that its operands are beside each other. A || B means the news item A and B are next to each other, and A and B have the same height at their common boundary. Examples of this horizontal construction are depicted in Fig. 4.2(b).

The symbols = and || have been chosen because they provide an easily recognized portrayal of the relative positions of the operands in each case.




(a) $A = B$



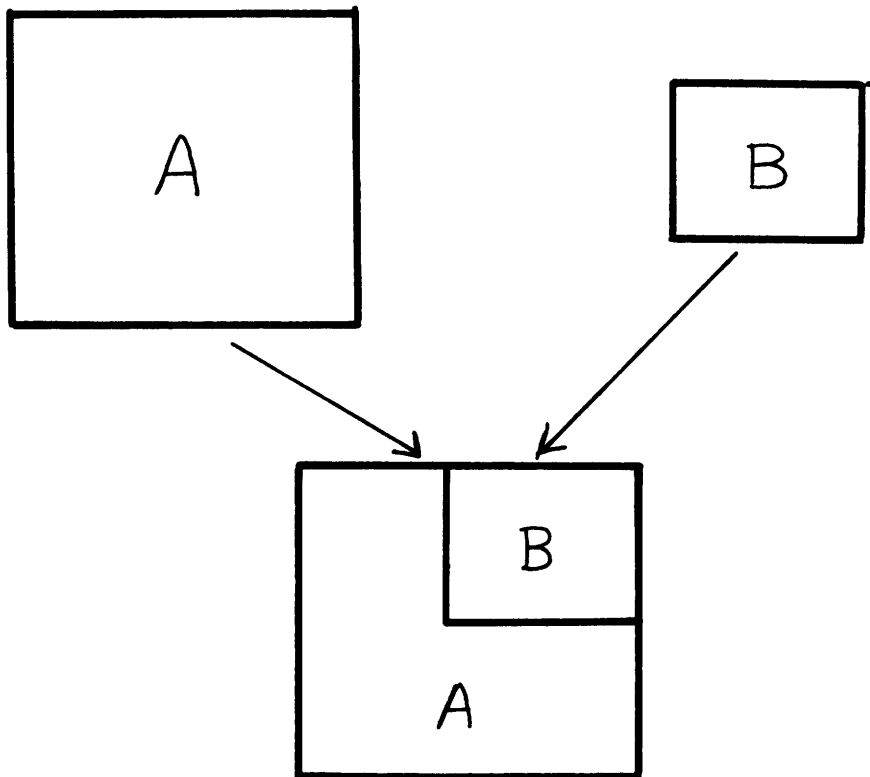
(b) $A \parallel B$

Fig. 4.2 Configurations of Basic-Operator Constructions

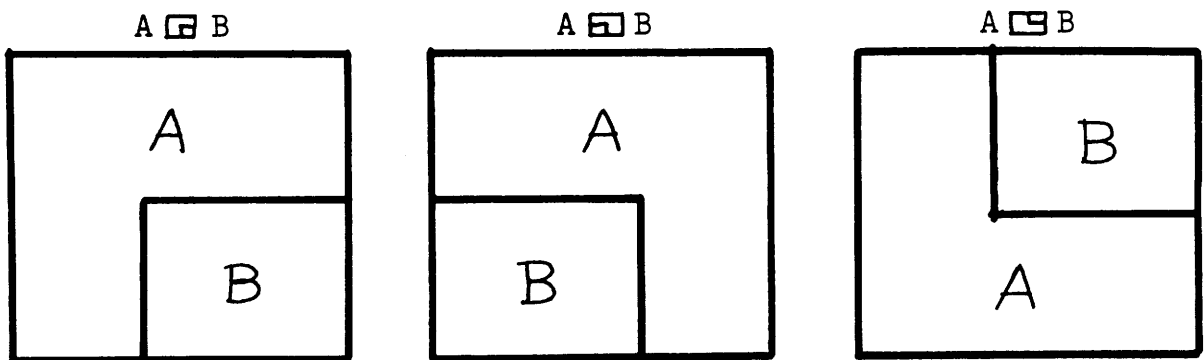
4.2.2 Embedded Operators

Operators used to indicate that one news item is nested at the corner of another item are classified as embedded operators. Figure 4.3(a) depicts such a construction where one operand (item B) is embedded in the upper right corner of the other operand (item A). Note that the areas of both operands are required to be rectangular in shape. Three operators of this type are defined in Fig. 4.3(b). The fourth possibility, with B in the upper left corner, represents an unacceptable layout for story A, since the headline can not cover the left portion of the story area. As indicated in Fig. 4.3(b), the symbols used to represent the three acceptable templates are .

The five operators comprising the basic and embedded classifications can be used together to describe templates with more than two items with the help of parentheses indicating the precedence of the operators. Thus, $P1 \parallel (S1 = S2)$ means that story S1 is directly above story S2, and the combination is adjacent to picture P1. Figure 4.4 illustrates how a complete page template such as that in Fig. 4.1 can be defined by combining expressions representing page sectors. Figure 4.4(c) is the full page structure to be described. The upper portion of the page template is shown in Fig. 4.4(a) and is defined, already illustrated,



(a) Construction of $A \sqcup B$



(b) Definitions of Embedded Operators

Fig. 4.3 Embedded Set of Operators

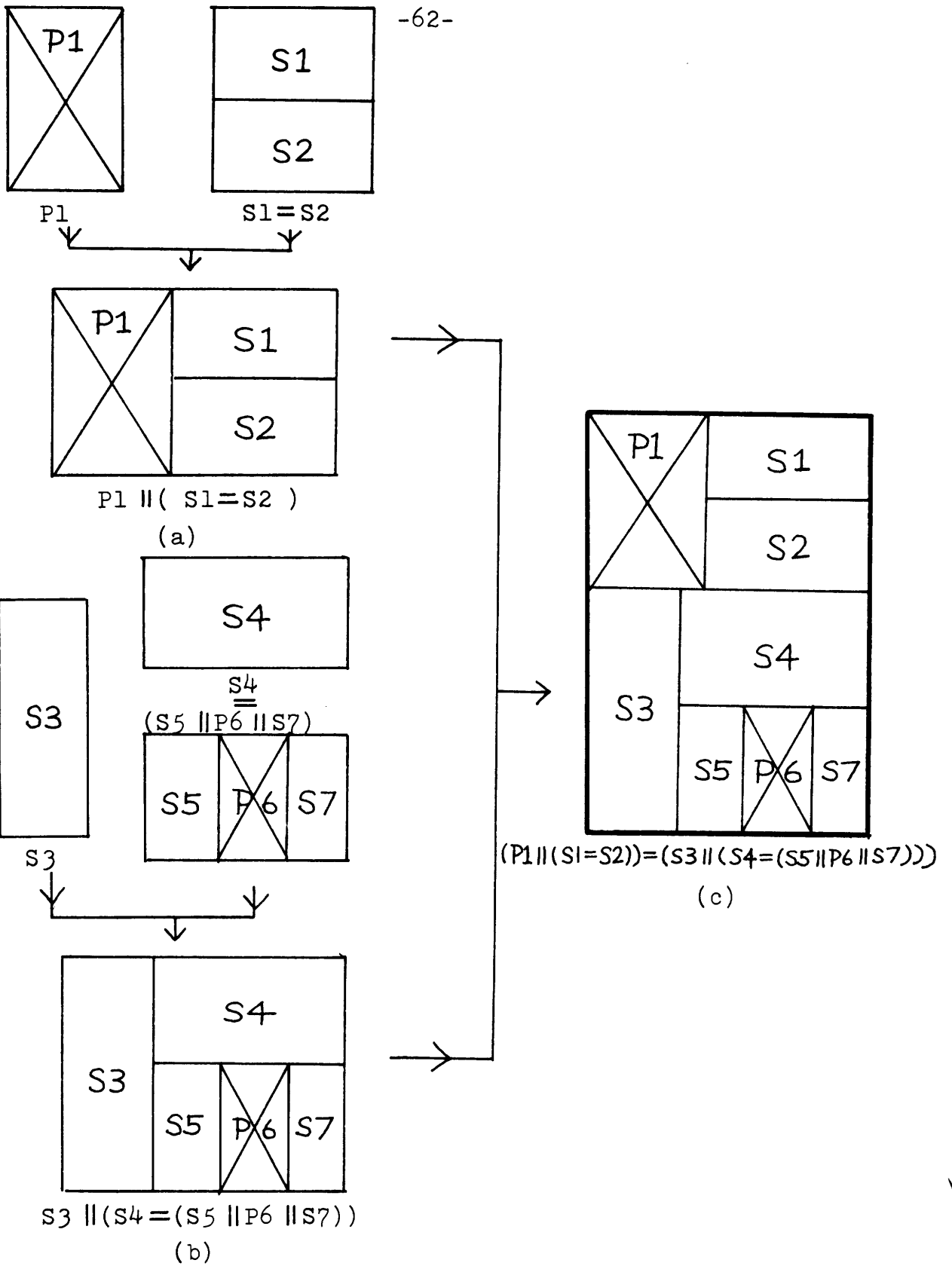


Fig. 4.4 Formation of a Template Description

by the expression:

$$P1 \parallel (S1 = S2) \quad (1)$$

The lower portion of the page is shown in Fig. 4.3(b) and is defined by

$$S3 \parallel (S4 = (S5 \parallel P6 \parallel S7)) \quad (2)$$

Through combination of the expressions (1) and (2), the symbolic representation of the complete page structure is thus derived as :

$$(P1 \parallel (S1 = S2)) = (S3 \parallel (S4 = (S5 \parallel P6 \parallel S7))) \quad (3)$$

The kind of template that can be described with the five basic and embedded relational operators is limited because, in order to be able to apply these operators, adjacent news items must have the same dimension along their line of contiguity. Hence, it is not possible to represent the commonly encountered news structure such as the one depicted in Fig. 4.5 where two news items A and B are of different heights. Therefore, the operator set must be expanded to accommodate this case.

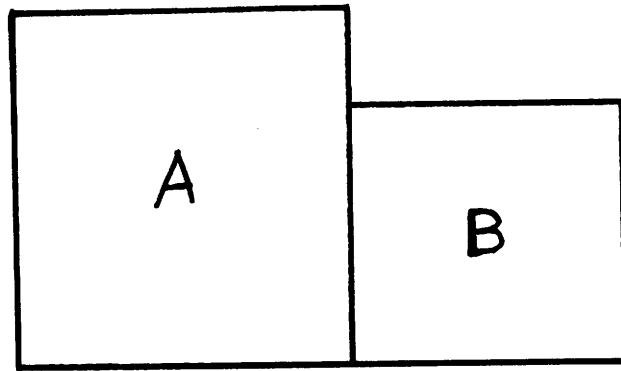


Fig. 4.5 News Items with Different Heights

4.2.3 Extended Operators

The extended set of operators are used to describe the layout structure of two news items with different dimensions along their line of commonality. There are eight possible extended operators and their definitions are as follows:

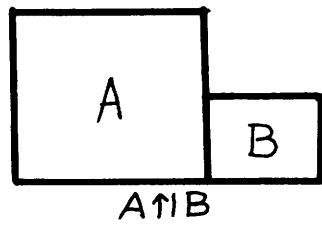
$\uparrow\parallel$ and $\downarrow\parallel$ These have the same meaning as the basic horizontal construction operator, \parallel , except that the left-hand item is taller than the right-hand item at their common edge. The arrows indicate the directions in which the left-hand item is elongated, as illustrated in Fig. 4.6(a).

$\uparrow\downarrow$ and $\downarrow\uparrow$ These have the same meaning as the above two operators except that the right-hand item is taller than the left-hand item, as shown in Fig. 4.6(b).

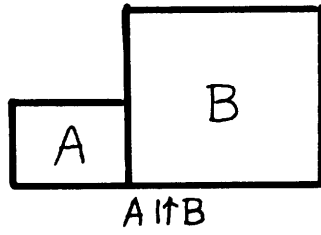
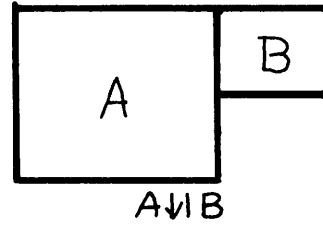
\Rightarrow and \Leftarrow These have the same meaning as the basic vertical-construction operator, $=$, except that the left-hand item is wider than the right-hand item at their common edge. The arrows indicate the directions in which the left-hand item is widened as illustrated in Fig. 4.6(c).

$\Rightarrow\Leftarrow$ and $\Leftarrow\Rightarrow$ These have the same meaning as preceding two operators except that the right-hand item is wider than the left-hand item, as shown in Fig. 4.6(d).

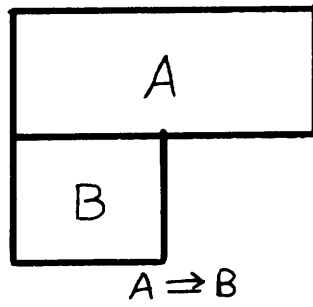
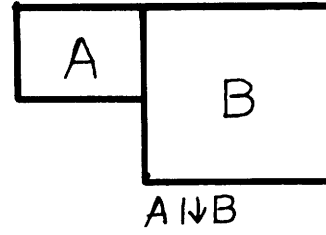
With the availability of these additional eight operators, we can now describe symbolically a wide range of commonly used layouts. For example, the templates in Fig. 4.7(a) and (b) can be expressed as



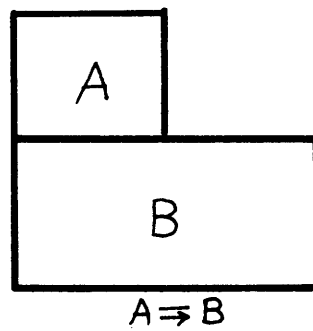
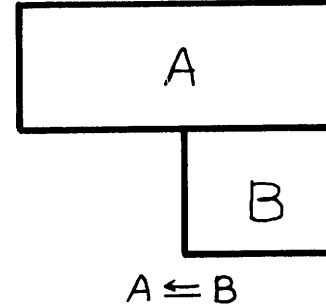
(a)



(b)



(c)



(d)

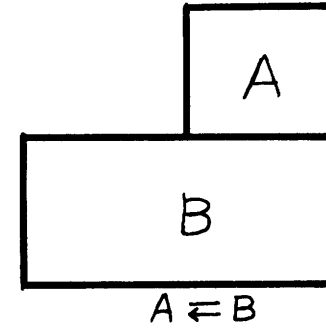


Fig. 4.6 Extended Set of Operators

$$A = A' \tag{4}$$

and

$$B \uparrow C \tag{5}$$

respectively. By substituting the items in (5) for item A' in (4), we obtain the symbolic expression for the template in Fig. 4.7(c) as

$$A = (B \uparrow C).$$

Similarly, the template of Fig. 4.7(d) is represented by

$$(A \Rightarrow B) \parallel C.$$

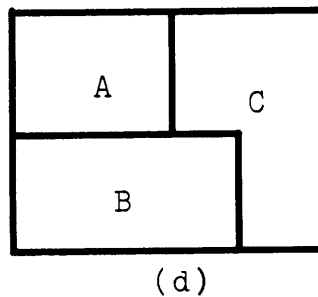
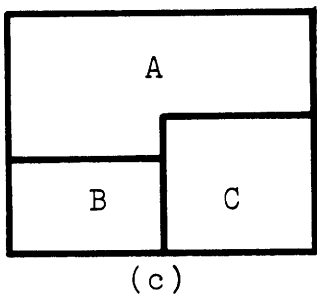
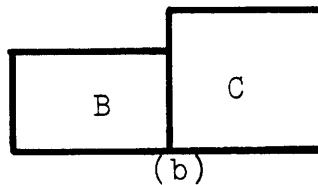
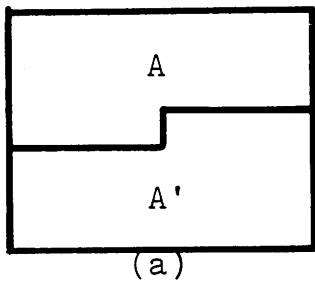


Fig. 4.7 Applications of Extended Set of Operators

Fig. 4.8 depicts the step-by-step derivation of the expression for the full-page template illustrated in Fig. 4.8.(c). Figure 4.9 shows several additional examples of layout templates, along with their corresponding symbolic representations. These examples indicate that the set of thirteen relational operators are capable of describing a wide spectrum of complicated layout template structure, and are relatively simple to use.

4.2.4 Relational-Operator Types

The thirteen relational operators may also be classified by the types of constructions the operators represent. The three types of construction are: vertical construction where one news item is on top of another, horizontal construction where one item is next to another, and embedded construction where one item is embedded into the other.

According to these classifications, operators

$$=, \Rightarrow, \Leftarrow, \Leftrightarrow, \Leftarrow,$$

are classified as vertical-construction operators. Similary

$$\parallel, \uparrow, \downarrow, \updownarrow, \downarrow,$$

are classified as horizontal operators, and $\square, \square, \square$, are embedded construction type.

In a template expression containing the same type of operators, it is not necessary to use the parentheses to indicate the precedence of constructions.

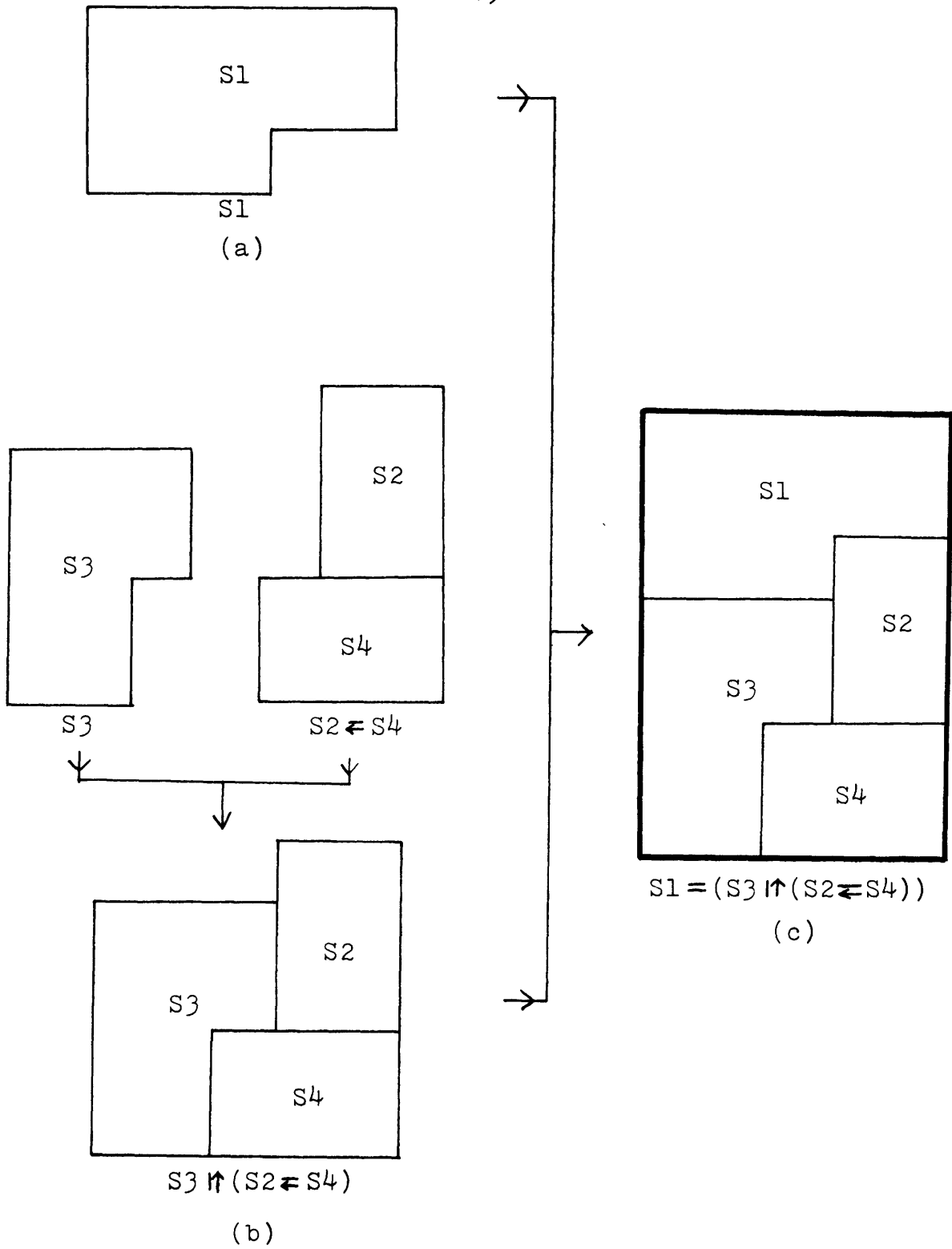
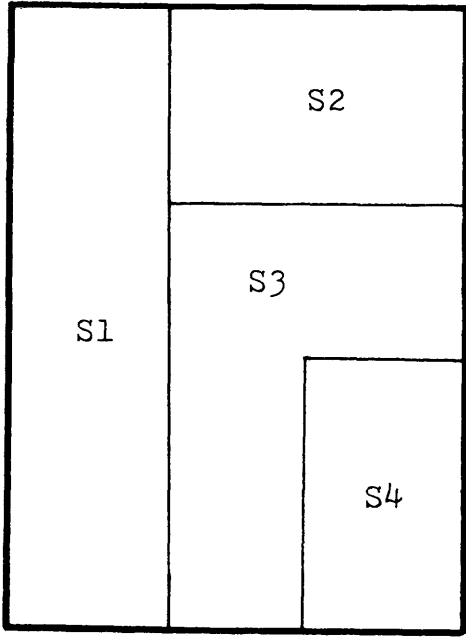
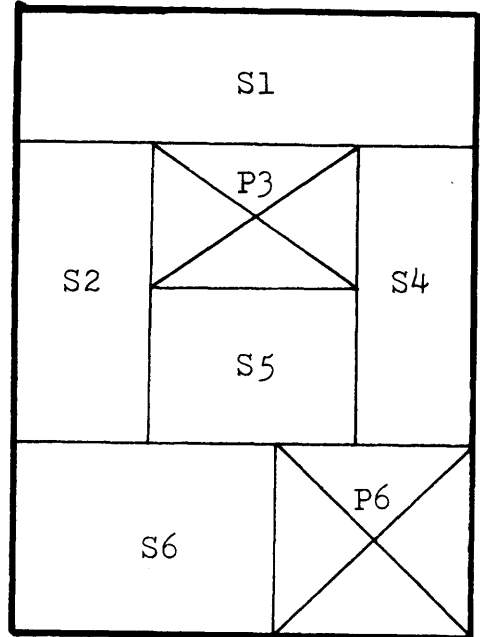


Fig. 4.8 Formation of Template Description Using Extended Operators



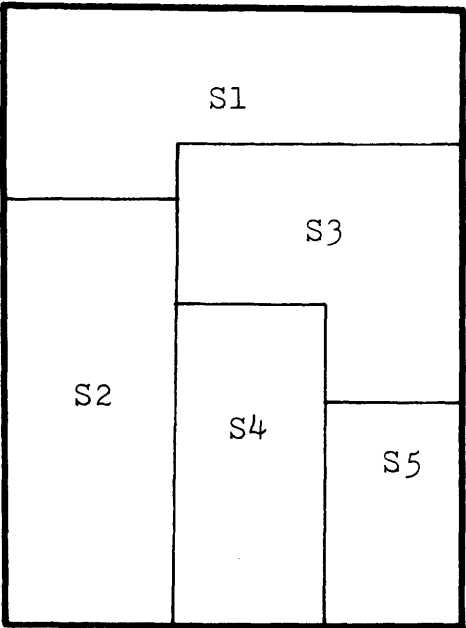
$$S1 \parallel (S2 = (S3 \boxminus S4))$$

(a)



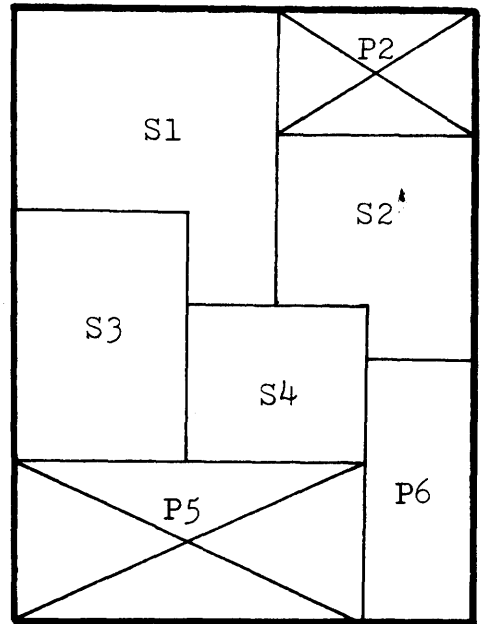
$$S1 = (S2 \parallel (P3 = S5) \parallel S4) = (S6 \parallel P6)$$

(b)



$$S1 = (S2 \uparrow (S3 = (S4 \uparrow S5)))$$

(c)



$$(S1 \parallel (P2 = S2)) = (((S3 \uparrow S4) = P5) \uparrow S6)$$

(d)

Fig. 4.9 Examples of Templates and Their Symbolic Descriptions

That is, template expression

$$A \Rightarrow (B \Rightarrow C)$$

and

$$(A \Rightarrow B) \Rightarrow C$$

have the same interpretation and can be expressed as

$$A \Rightarrow B \Rightarrow C$$

without the parentheses.

However, for template expressions with operators of different types, parentheses are required to be used to indicate the desired precedence. In other words, template expression

$$A \parallel B = C$$

is ambiguous, and has to be expressed explicitly as either

$$(A \parallel B) = C$$

or

$$A \parallel (B = C).$$

4.3 SYNTAX OF NEWS GRAPHIC LANGUAGE

Having defined the set of relational operators and discussed informally their usage in composing symbolic template description for templates with more than two news items, we now discuss the syntax of the news graphic language in a formal manner.

In general, an artificial language* is a subset of the set of all possible strings constructed by concatenating symbols from the specified language alphabet. In other words, a language does not include all possible strings on its alphabet. The elements belonging to the subset of strings are called "sentences" or "legal strings" of the language.

In the case of the proposed news graphic language, all the symbolic template descriptions presented in the previous section are considered as "legal templates", although we have not rigorously defined the language syntax. We have illustrated the generation of such template descriptions primarily through examples and informal explanations of the language syntax. This informal approach is adequate if we are only concerned with the generative aspect of the symbolic representation for

* An artificial languages is a language which is designed according to certain user-specified rules for communicating ideas or expressing notions.

a desired layout template. However, the purpose of developing the news language is not only to express the layout structure of news items symbolically but also to use the symbolic template expression as a structural guide in the placement of stories and pictures on pages. As the result, a formal syntax specification of the news-graphic-language syntax is necessary in order to enable the layout process to recognize the validity of a given symbolic-template representation and then to interpret it properly. With such a formal syntax specification, which rigorously defines the syntactical relationship among the basic language constructs, one can then parse the template description into a proper syntactical equivalent form suitable for interpretation later in the layout process.

Therefore, a formal language syntax description of each basic language-construct is presented in detail in this section. A particular notation, namely Backus-Normal-Form, is adopted as a grammatical tool to specify the language syntax; and an introduction to such notation is included in Appendix D.

4.3.1 Relational Operators

We begin the discussion of our language syntax with the simplest and previously well-defined language construct, the relational operators. In our case, there are thirteen relational operators, and their syntax, as well as semantics, is

defined in section 4.2. The operators are listed below according to their construction types:

vertical construction : = , \Rightarrow , \Leftarrow , \Rightarrow , \Leftarrow ;
horizontal construction : || , \Uparrow , \Downarrow , \Uparrow , \Downarrow ; and
embedded construction : $\boxed{}$, $\boxed{}$, $\boxed{}$.

Hence, in terms of Backus-Normal-Form (BNF), the grammar for the language construct "relational operator" can be expressed by the following production rule:

$$\langle \text{Relational Operator} \rangle ::= = | \Rightarrow | \Leftarrow | \Rightarrow | \Leftarrow | \boxed{} | \boxed{} | \boxed{} | \\ || | \Uparrow | \Downarrow | \Uparrow | \Downarrow \quad (\text{rule 1})$$

4.3.2 News Items

Thus far, news items (stories or pictures) have been represented by user-designated arbitrarily distinctive symbols. But, in order to allow the symbolic template description to convey more information about the layout templates, some restrictions on the symbols representing news items have to be imposed.

Besides representing the desired layout structure, a symbolic description has to be able to distinguish stories from pictures and furthermore to identify any story-picture associations. Moreover, the relative importance ranking of various news items on the template is also desirable for

inclusion in the template description.

As the result, "news items" are restricted to be two-part symbols. The first part of the news-item symbols is constrained to be either "S" denoting a story item, or "P" denoting a picture item. The second part of the news-item symbol is restricted to be positive integer numbers denoting the relative importance ranking of the described news items. The importance of items is assigned by users, and the smaller the integer numbers, the more important the news item. Furthermore, a story and its associated picture is denoted by assigning the same number in the second part of the symbol for both story and its associated picture.

As an example, the symbolic representation of the template shown in Fig. 4.4(c)

$$(P1 \parallel (S1 = S2)) = (S3 \parallel (S4 = (S5 \parallel P6 \parallel S7)))$$

not only describes the layout structure of the template as depicted in the figure, but also indicates that:

- (a) News items S1, S2, S3, S4, S5, and S7 are story items with S1 being the most important story item, S2 next, etc;
- (b) News items P1, and P6 are picture items while P1 is associated with story item S1, and P6 is a stand-alone picture less important than P1.

In BNF notation, the syntax of the language construct "news item" can be expressed by the following production rules:

<News Item> ::= S <Number> | P <Number> (rule 2)

<Number> ::= <Digit> | <Digit> <Number> (rule 3)

<Digit> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 (rule 4)

Note that rule (3) can be recursive; this enables users to generate integer numbers consisting of more than one digit. For example, news item "S16" can be generated by the application of rule (2) first, then the recursive option of rule (3), the non-recursive option of rule (3), and finally rule (4).

The syntax tree* for the language construct "S16" is shown in Fig. 4.10 where the numbers at the upper right corners of each intermediate node indicating the production rule being applied to generate its subnodes.

The definition of "news items" can be further extended to include those symbolic-template expressions enclosed by a pair of parentheses. For example, the top part of the page

* Syntax tree is a tree diagram which describes the syntax, or structure of a language construct showing how the construct can be generated from the production rules. At each application of production rules, the left-hand side of the rule is designated as a root node in a subtree (or tree) and the different elements in the right-hand side as its subnodes. If a string can be derived by constructing a syntax tree according to the specified language grammar, then the string is considered as a legal string of the language.

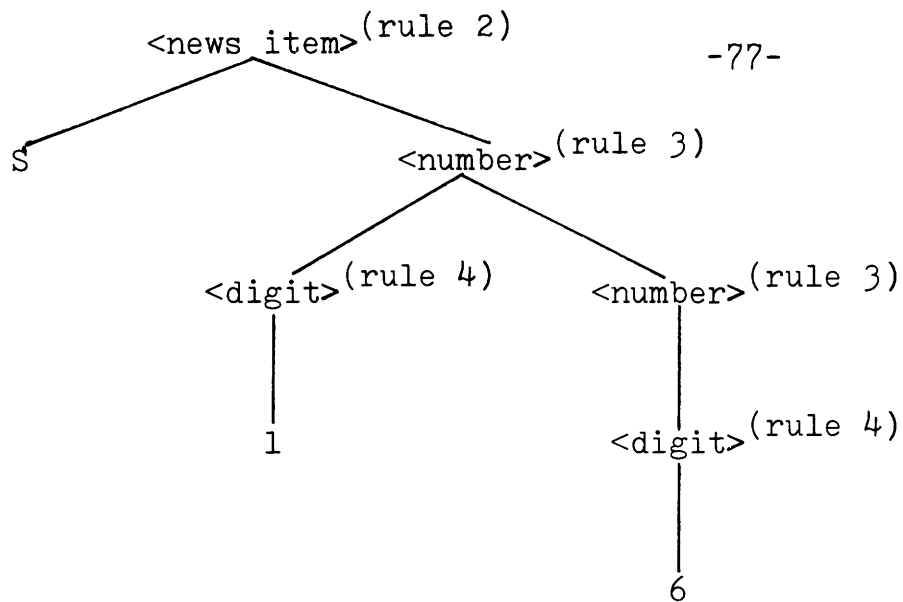


Fig. 4.10 Syntax Tree for News Item Construct "S16"

template shown in Fig. 4.4(a) is expressed by

$$P1 \parallel (S1 = S2)$$

which means that the picture item P1 is in parallel with another news element, namely (S1 = S2). In this expression, news element (S1 = S2) is treated as a more elaborate news item serving as the second operand of the horizontal operator \parallel . The symbolic expression within the parentheses which describes a sub-template structure is generally called a "news expression".

Therefore, the production rule (2) for the "news item" construct is extended to be as follows:

$$\langle \text{News Item} \rangle ::= S \langle \text{number} \rangle \mid P \langle \text{number} \rangle \mid (\langle \text{News Expression} \rangle)$$

The new construct "news expression" is formally defined in the following sub-section.

4.3.3 News Expressions

A "news expression" is a sequence of "news items" and "relational operators" in the following form:

(news item) (relational operator) (news item) (relational operator) (news item) (news item)

where all the relational operators are required to be the same type as defined in section 4.2.4 and all news items in the expression must be distinctive. According to the above definition, S1 || S2, S1 = P1 = S2, and S1 || S2 ↑ S3 are examples of news expressions; while S1 || S1, and S1 || S2 = S3 are not because the former has two identical news items and the latter contains operators of different types.

Again, the syntax of news expression can be defined in BNF notation as follows:

$$\langle \text{News Expression} \rangle ::= \langle \text{News Item} \rangle \langle \text{Relational Operator} \rangle \langle \text{News Item} \rangle \mid \langle \text{News Item} \rangle \langle \text{Relational Operator} \rangle \langle \text{News Expression} \rangle$$

(rule 5) (rule 6)

As an example of news-expression generation using rule (1) through (6), consider Fig. 4.11. It depicts a complete syntax tree for the news expression S1 = S2. Note that production rules (2) and (5) for the constructs "news item"

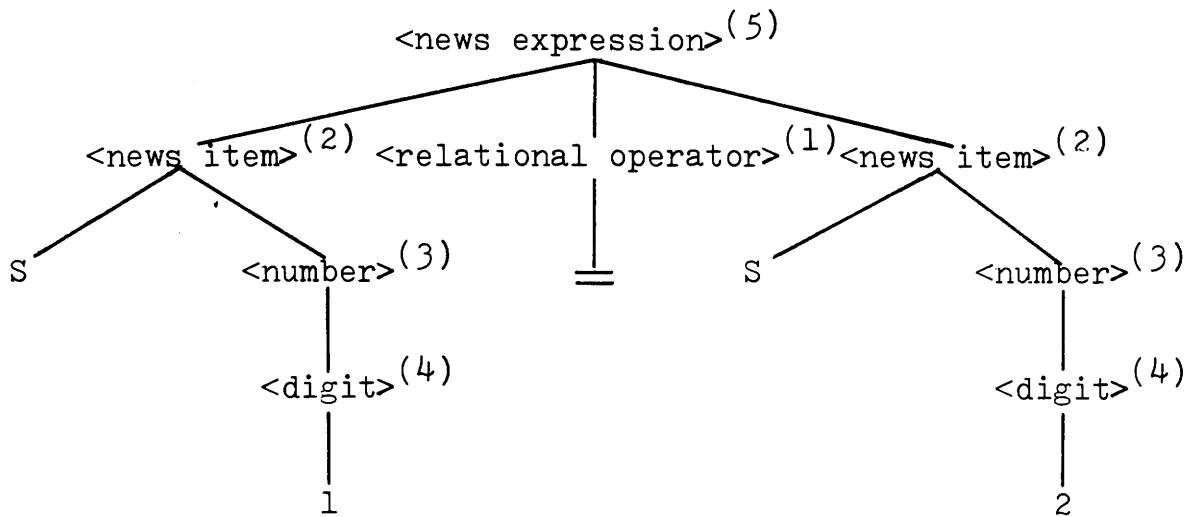
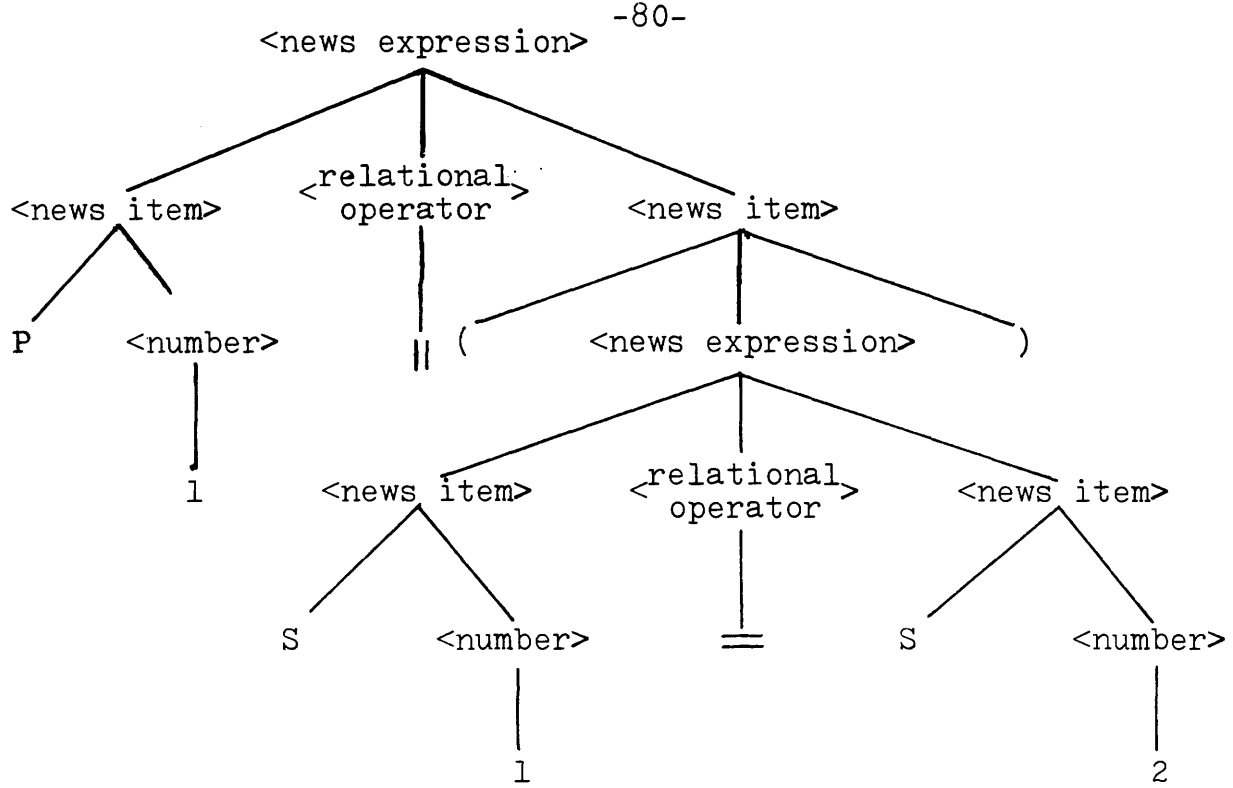


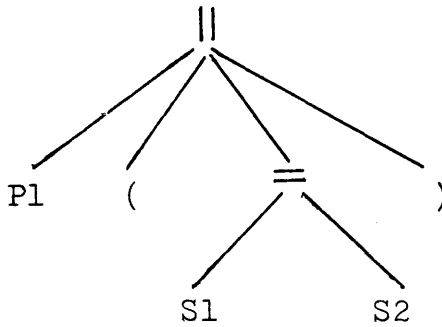
Fig. 4.11 Syntax Tree for News Expression "S1=S2"

and "news expression", respectively, are recursive. A news expression enclosed by a pair of parentheses can also be regarded as a compound news item by production rule (2) and used to construct another more complex news expression. For example, $S1 = S2$ is a news expression by definition; adding parentheses on both sides of it forms a compound news item $(S1 = S2)$, which can be used as the second operand of another operator $||$ to form the news expression $P1 || (S1 = S2)$.

Figure 4.12(a) depicts a complete syntax tree for the above expression which proves that $P1 || (S1 = S2)$ is indeed a legal news expression. An equivalent compact version of the syntax tree is depicted in Fig. 4.12(b); here, all the



(a) Complete Syntax Tree



(b) Compact Syntax Tree

Fig. 4.12 Syntax Tree for News Expression "P1 || (S1 = S2)"

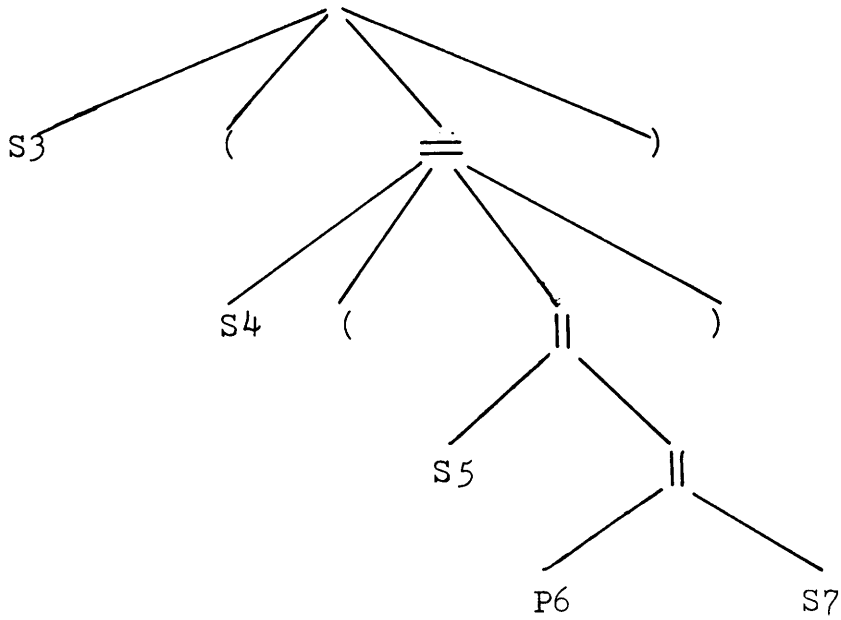
intermediate language constructs (enclosed by brackets "< >") have been eliminated. Since the compact syntax tree is much simpler in form but still preserves the syntax structure it represents, in later discussions only the compact tree is used to depict language-construct generation.

As an example of more complicated news-expression generation, Fig. 4.13(a) depicts the compact syntax tree for the layout template expression given in Eq. (2) of section 4.2.2 :

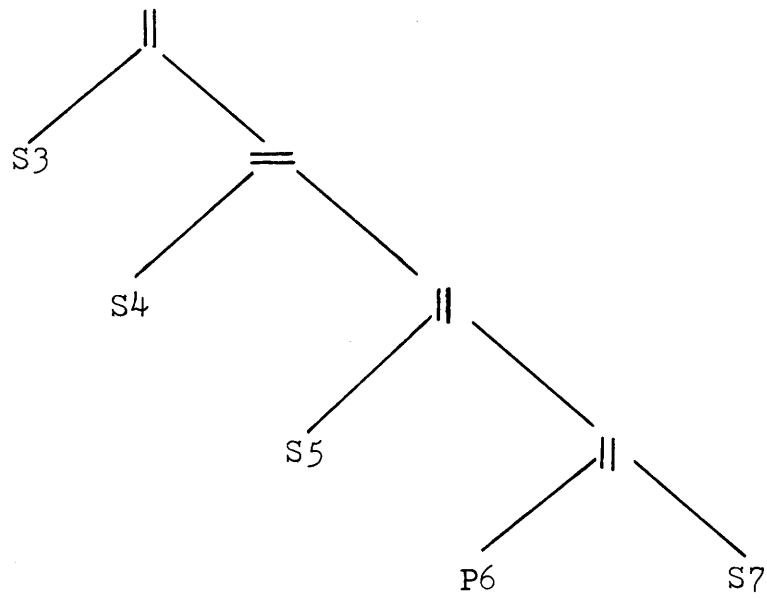
$$S3 \parallel (S4 = (S5 \parallel P6 \parallel S7))$$

Through construction of syntax trees for basic expressions, it is obvious that the precedence of different type operators in an expression is implied in the tree structure; a higher tree level* implies a lower precedence. As the result, the parentheses indicating the desired operator precedence can be eliminated from the syntax trees without losing any syntax information. Figure 4.13(b) depicts an equivalent syntax tree without showing the parentheses. The simplified syntax tree in Fig. 4.13(b) contains essentially all the syntax (or structure) information about the above expression.

* The tree level is defined by saying that the root has level 1, and other subnodes have a level that is one higher than their ancestors.



(a)



(b)

Fig. 4.13 Syntax Tree for News Expression "S3 || (S4 = (S5 || P6 || S7))"

4.3.4 Layout Templates and Complete Language Specification

We can now formally define the syntax of symbolic layout representations and the legitimacy of news layout templates. By the syntax definition, a "layout template" is a "news expression" just defined. In other words, layout templates can be defined by the following BNF production rule:

$\langle \text{Layout Template} \rangle ::= \langle \text{News Expression} \rangle$ (rule 7)

Therefore, the expressions

$P1 \parallel (S1 = S2)$

and

$S3 \parallel (S4 = (S5 \parallel P6 \parallel S7))$

in the previous section can also be considered as templates by themselves. The combined expression

$(P1 \parallel (S1 = S2)) = (S3 \parallel (S4 = (S5 \parallel P6 \parallel S7)))$

which describes the layout structure depicted in Fig. 4.4(c) is also a news expression by the syntax definitions and thus is regarded as a layout template. A complete simplified syntax tree for the above expression is depicted in Fig. 4.14. Success achieved in constructing such a syntax tree according to the specified production rules further proves that the expression is indeed a legitimate layout-template representation. As additional examples of the legitimacy of the templates illustrated in section 4.2, Fig. 4.15 shows the corresponding

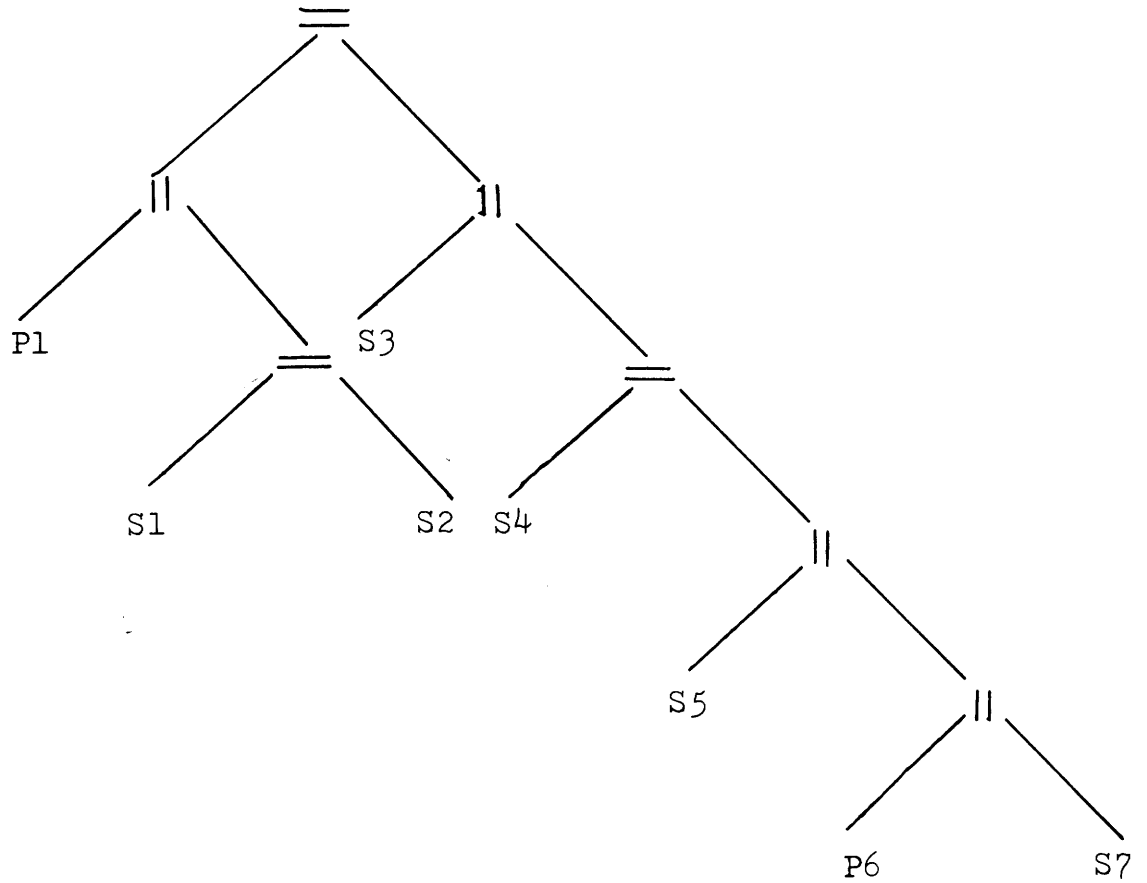
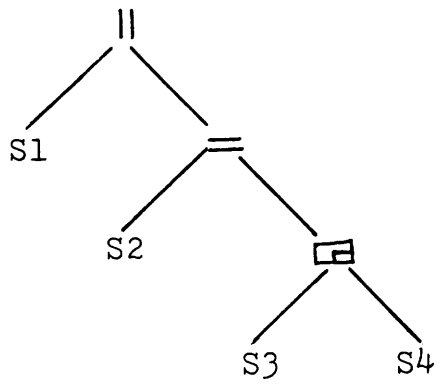
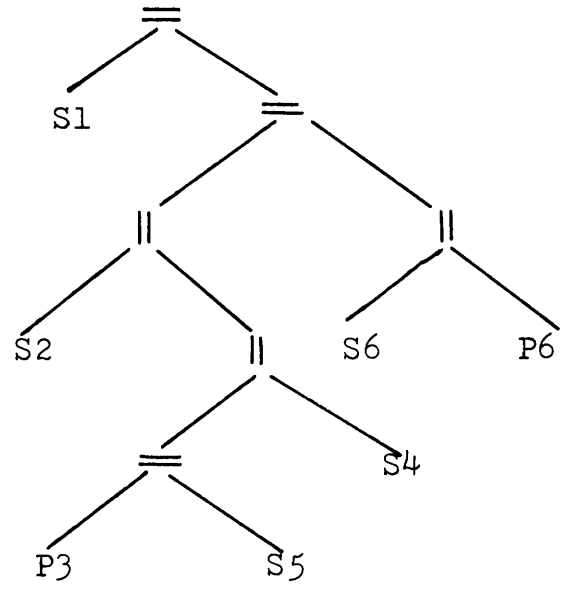


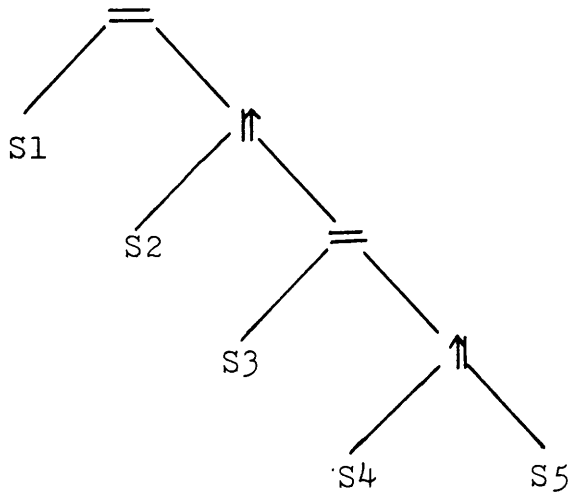
Fig. 4.14 Syntax Tree for Layout Template in Fig. 4.4(c)



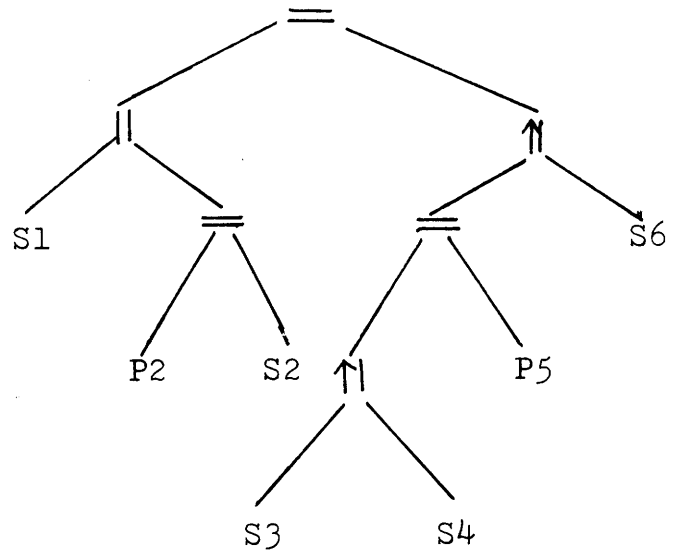
(a)



(b)



(c)



(d)

Fig. 4.15 Syntax Trees for Layout Templates in Fig. 4.9

syntax trees for each of the layout templates depicted in Fig. 4.9. The constructed syntax trees not only prove the validity of template descriptions but also are used later in the layout process as structural guides for the actual placement of stories and pictures assigned to the pages.

In summary, we have completed the task of defining the syntax rules for the proposed news language. The alphabet being used in the language consists the following set of symbols:

$$\left\{ \begin{array}{l} S, P, (,), 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 \\ =, \geq, \leq, \Rightarrow, \Leftarrow, ||, \Uparrow, \Downarrow, \Updownarrow, \square, \boxplus, \boxminus \end{array} \right\}$$

and the intermediate language-constructs introduced for the purpose of constructing production rules are the following set of symbols:

$$\left\{ \begin{array}{l} \langle \text{layout template} \rangle, \langle \text{news expression} \rangle, \langle \text{news item} \rangle, \\ \langle \text{relational operators} \rangle, \langle \text{number} \rangle, \langle \text{digit} \rangle \end{array} \right\}$$

Table 4.1 summaries the formal syntactical specifications of the news graphic language, including a collection of all the BNF production rules introduced in this section.

Table 4.1 Formal Syntax Specifications of News Graphic Language

Language Alphabet :

{ S, P, (,), 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 }
{ =, ≥, ≤, ⇒, ⇐, ||, ↑, ↓, ↗, ↘, ☐, ◻, ◻ }

Production Rules :

< Layout Template > ::= < News Expression >

< News Expression > ::= < News Item > < Relational Operator > < News Item > |
< News Item > < Relational Operator > < News Expression >

< News Item > ::= S <Number> | P <Number> | (< News Expression >)

< Number > ::= < Digit > | < Digit > < Number >

< Digit > ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

< Relational Operator > ::= = | ≥ | ≤ | ⇒ | ⇐ | || | ↑ | ↓ | ↗ | ↘ |
☐ | ◻ | ◻

4.4 APPLICATION TO PAGES WITH DISPLAY-ADS

So far we have restricted the application of full-page templates for news layout to pages without display-ads. Since the proposed symbolic description of a page template serves only as guidance for story/picture placement in the layout process, it is conceivable that the same non-ads templates can be used for positioning stories on pages with ads as well. Of course, the layout process has to be modified slightly for this application to be able to adjust the story envelopes properly to eliminate overlaps between stories and ads.

As an illustration, an ads dummy and a four-story page template are depicted in Fig. 4.16(a) and (b) respectively, and a possible layout result following the template pattern is shown in Fig. 4.16(c). The layout results are duplicated in (d) where the heavy-lined boxes show that the layout dummy indeed resembles the template, assuming the story areas are extended to the ads areas. Note that a symbolic layout-template specifies the desired "structure" of the news items on the page. The only concern is the relative positions of the items to be placed rather than their shapes or areas. As the result, the news layout in Fig. 4.16(c) can still be represented by the template in (b), although stories S1,

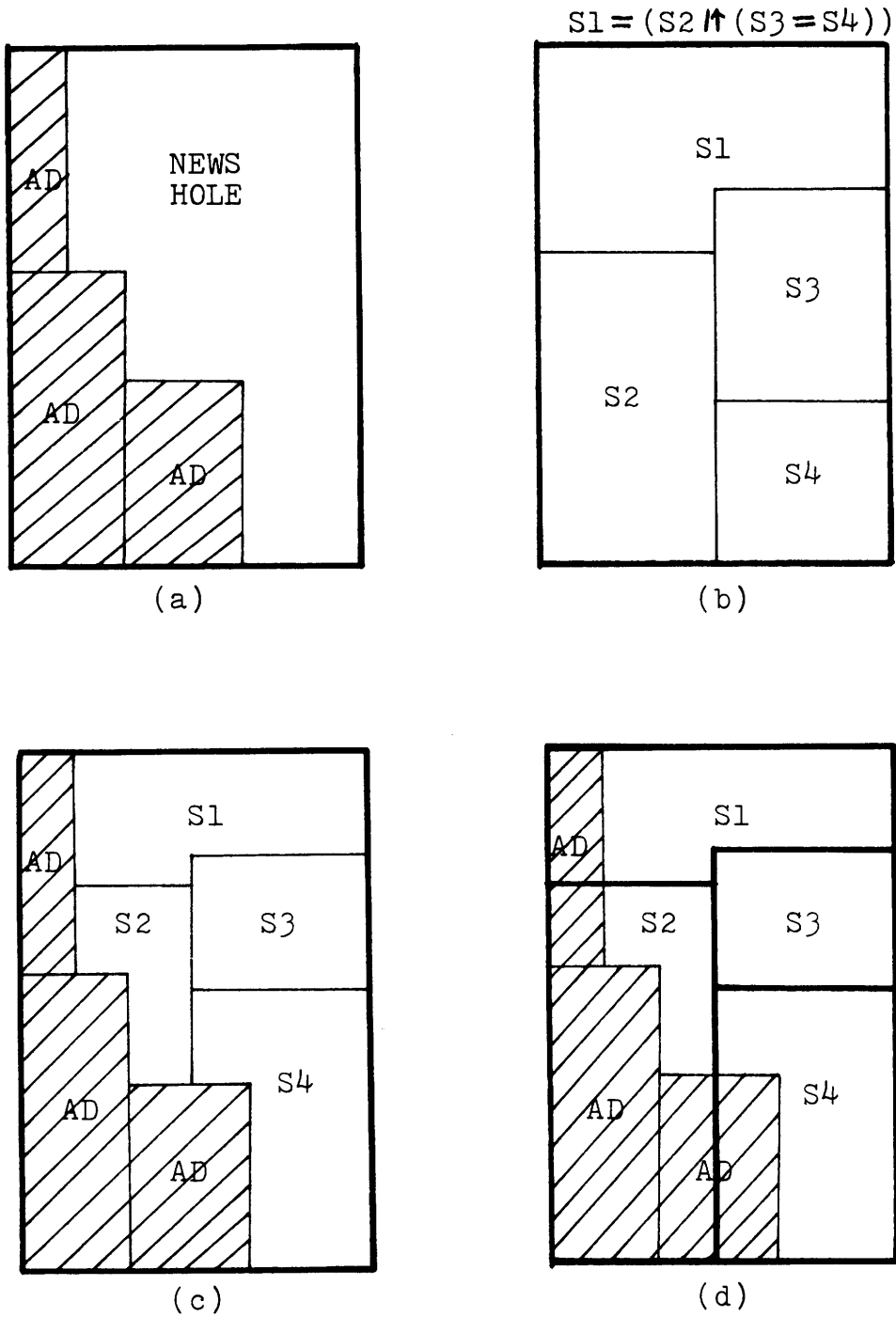


Fig. 4.16 News Layout with Display-Ads

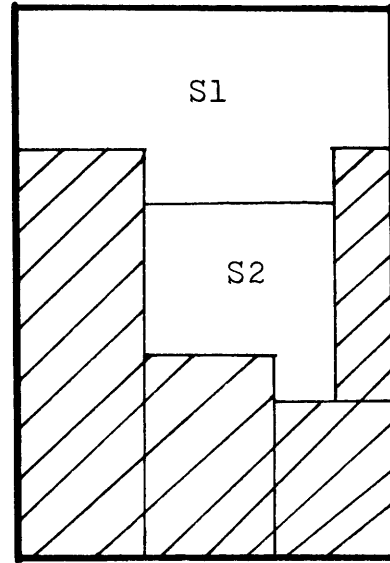
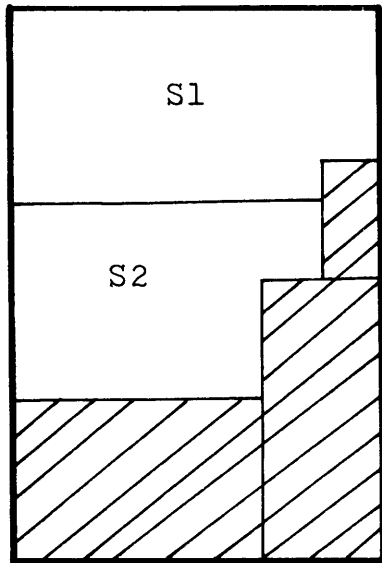
S2, and S4 do not occupy rectangular areas due to the existence of ads on the page.

Figure 4.17 depicts two more examples of how the news layout of pages with various news-hole shapes can be described by a single full-page template. Figure 4.17(a) depicts two page layouts (of different ads-dummies) whose news layout structure is represented by a single expression $S1 = S2$, and Fig. 4.17(b) shows the same two pages whose news portion layout is described by another template $S1 \boxplus S2$.

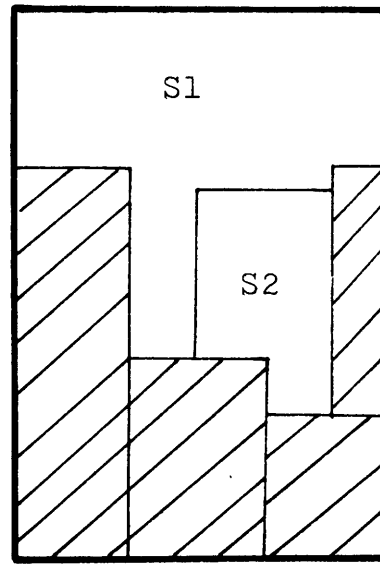
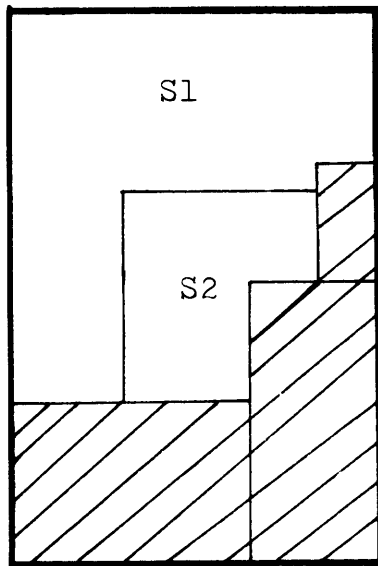
Although it is possible to use a non-ads template in laying out pages with display-ads, special care has to be taken in designing templates for such purpose. For example, a template intended for pages with ads laid out in left-pyramid style (Fig. 4.16(a)), should have more items located on the right-hand side than the left-hand side because the left of the page is mostly occupied by ads. Layout template design and organization is discussed further in Chapter 7.

4.5 SUMMARY

A symbolic news graphic language based on a set of relational operators which represent the desired layout structure for news items on pages has been presented in this Chapter. The definition of each operator was introduced and the formal syntax specification of the news language was



(a) News Layout Structure $S1 = S2$



(b) News Layout Structure $S1 > S2$

Fig. 4.17 Examples of Display-Ads Page Layout

explained. The language-syntax rules rigorously define the validity of a layout template, and the syntax tree constructed by a sequence of applications of these rules provides an appropriate structure suitable for interpretation later in the story- and picture-placement process.

The major advantage of this symbolic language for representing layout template is that many different layouts with the same layout structure (such as those shown in Fig. 4.1) can be described by a simple, unique symbolic expression utilizing a small set of well-defined relational operators. The symbolic approach not only greatly reduces the total number of templates required in a news-layout system but also gives a formal mechanism to describe all the structural information contained in a two-dimensional page template. The symbolic representation of templates can thus be used to guide the actual layout process without need for a close match between a precast template and the sizes of news items assigned to the page. Whenever a story or picture is to be placed, the selected symbolic template describes how the item should be shaped and where it should be placed in relation to previously placed items on the page. As a result, the layout process provides a page layout whose structure conforms to acceptable layout practices. If the template is not realizable with the given set of stories and pictures, another template may be selected and the layout can

be tried again.

The next Chapter explains how the selected symbolic-template representation is used as a structure guide for actual placement of stories and pictures assigned to a page.

CHAPTER 5

TEMPLATE-DRIVEN PAGE LAYOUT TECHNIQUES

5.1 PARSING OF SYMBOLIC LAYOUT TEMPLATES

5.1.1 Overview

Before layout templates written in news graphic language can be used as a structural guide for story and picture placement on pages, the symbolic template expressions must be parsed. Parsing of an artificial language serves two purposes. First, from parsing the validity of the symbolic-template expression can be determined; that is, a template expression which does not conform to the prescribed language syntax is recognized and rejected. Second, as a result of the parsing process, a syntax tree is produced which represents the syntactical-structure relationship among the language constructs of the template expression.

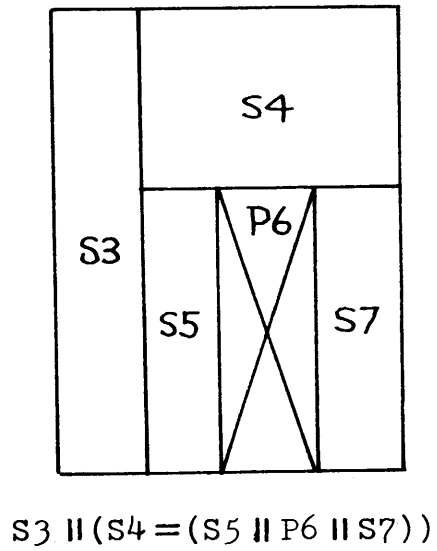
The syntax tree of a layout template such as the one shown in Fig. 4.13(b) is an equivalent two-dimensional representation of the template expression, in which the syntax of the template can be more easily visualized and understood. The syntax-tree form of the template is actually used later in the layout process as a structure guide for story and picture placement. In addition, by successful construction of the

syntax tree of a given template also proves the validity of the template expression syntax.

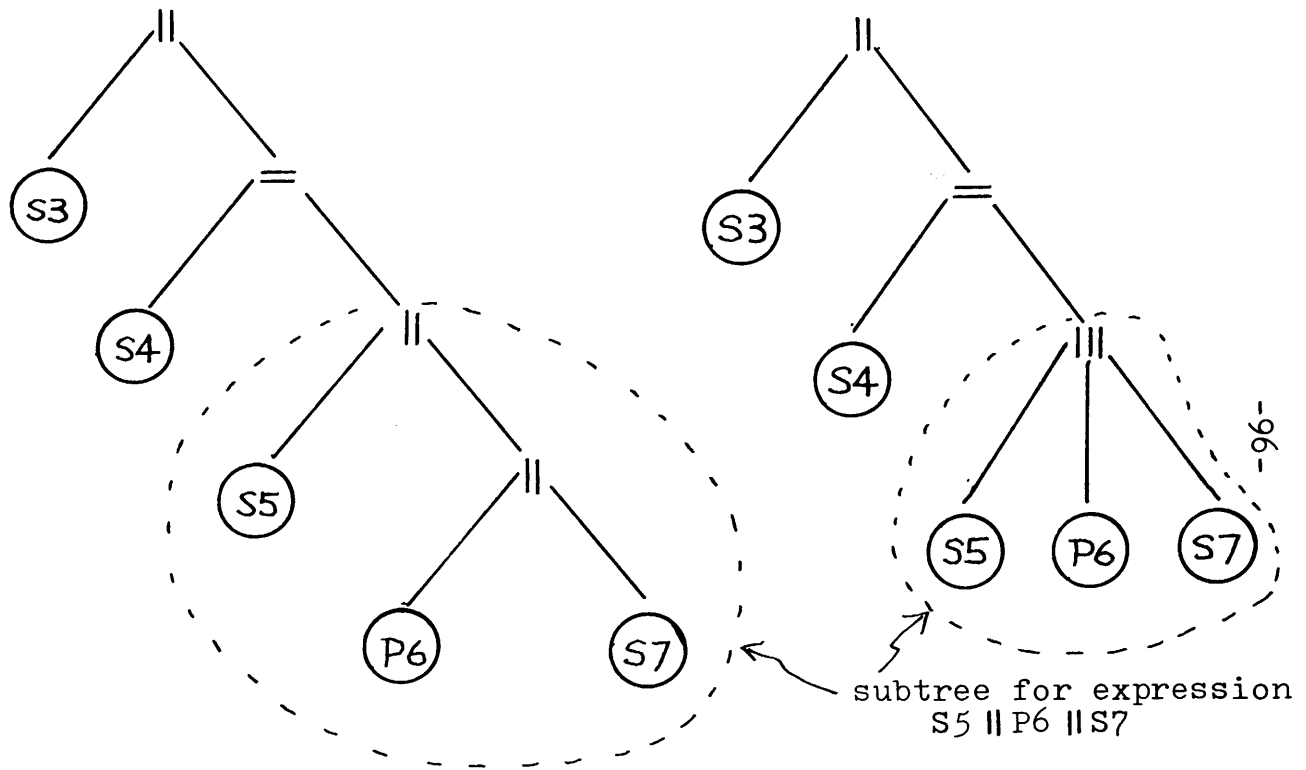
Therefore, the main function of the parsing process is to construct an equivalent syntax tree for a layout template following a prescribed parsing algorithm. If a syntax tree can not be constructed in accordance with the rules, the template is considered to be an illegal expression. Otherwise, a syntax tree is generated and used as the basis for layout interpretation. Hence, the purpose of this section is to present a parsing algorithm for layout templates written in the symbolic news graphic language.

5.1.2 Syntax Tree and Its Most Simplified Form

For simplicity and compactness it is desirable to design syntax tree structures that portray templates as concisely as possible, we attempt to do this here. Figure 5.1(a) and (b) depict an example of a layout template structure and its corresponding syntax tree, respectively, as introduced in section 4.3. In the syntax tree of Fig. 5.1(b), the top-most node is called the root node of the tree. All the leaf nodes such as S3, S4, S5, P6, and S7, are called terminal nodes, while the intermediate nodes are referred to as non-terminal nodes. Since the non-terminal nodes in the syntax trees of layout templates are always relational operators, they are also often called operator nodes.



(a)



(b)

(c)

Fig. 5.1 Example of Syntax Tree Representations

Subnodes of a non-terminal node are those nodes on the ends of branches extended from the non-terminal node. Subtrees as well as terminal nodes can be subnodes. As an example, terminal node S4 in Fig. 5.1(b) is the first (left-most) subnode of the operator node = at level 2, and the subtree circled by the dashed lines is its second subnode. A non-terminal node is called a parent node with respect to its subnodes. Subnodes connected to a non-terminal node through one or more branches are called descendants of the node. Therefore, the parent node of S5 in Fig. 5.1(b) is the operator node || at level 3, and nodes S5, P6, and S7 are the terminal descendants of the operator node || at level 3.

A news expression with a single operator of the form of that shown in Fig. 5.2(a), can be represented by the syntax tree shown in Fig. 5.2(b), where the root node is the operator in the expression and the subnodes are the news item operands.

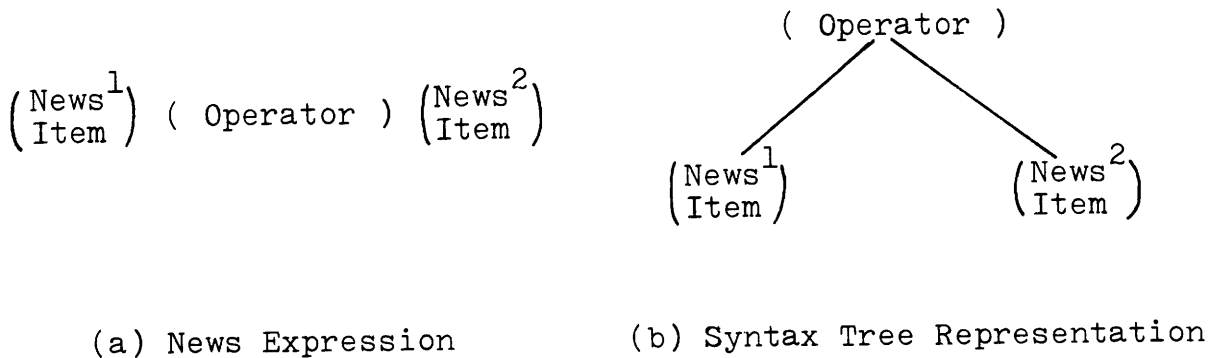


Fig. 5.2 Single-Operator News Expression and Its Syntax Tree Representation

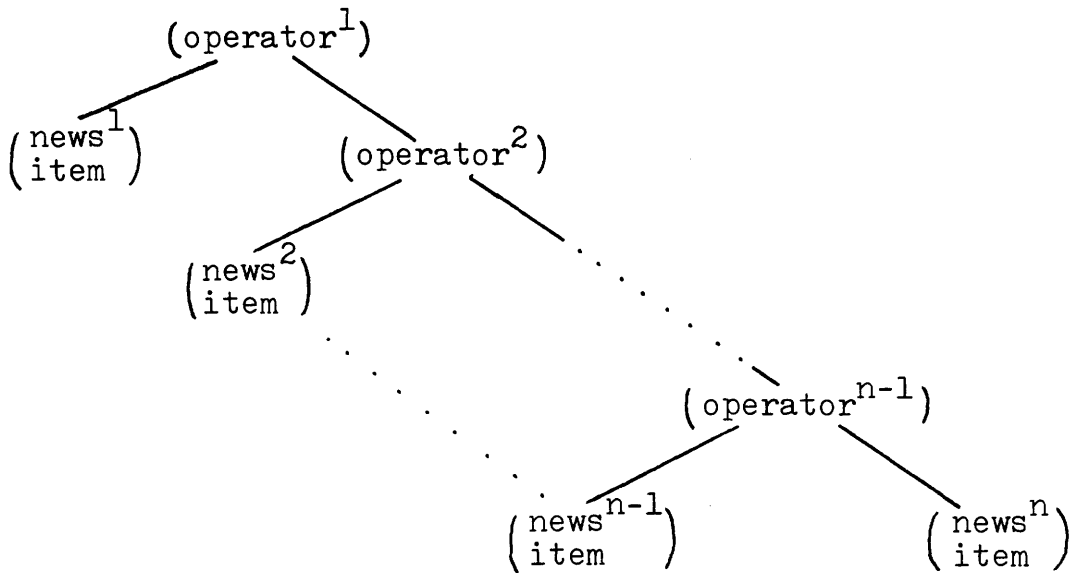
Similarly, a multiple-operator news expression, such as illustrated in Fig. 5.3(a), can be represented by the syntax tree shown in Fig. 5.3(b). However, since all the operators in a multiple-operator news expression are required to be of the same type, the syntax tree representation can be simplified further. Figure 5.3(c) depicts the simplified syntax tree in which the only operator, denoted as a "multiple-operand operator", represents all the operators appearing in the original expression.

Therefore, the simplified syntax-tree representation requires the introduction of additional operator symbols with more than two operands. For vertical-construction-type operators, multiple vertical lines, $\left| \cdots \right|$, are used as a multiple-operand operator symbol, where the number of lines indicates the number of operands in the news expression. Similarly, multiple horizontal lines, $\underline{\underline{\quad}}$, are used to represent horizontal-construction-type operators in the simplified syntax tree. For the extended vertical or horizontal operators, lines with arrows such as $\left| \downarrow \cdots \right|$ or $\overleftarrow{\underline{\underline{\quad}}}$ are used in the same way as in the notation for two-operand operators.

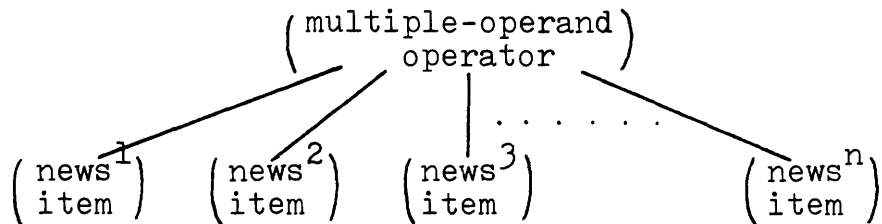
As examples, the syntax trees of news expression $S1 \parallel S2 \parallel S3$, and $S1 = S2 \Rightarrow S3 \Rightarrow S4$ are depicted in Fig. 5.4(a) and (b), respectively. In the latter syntax tree, the arrow of the third horizontal line means that story $S3$,

(news^1) (operator^1) (news^2) (operator^2) (news^n)
 (item) (item) (item) (item) (item)

(a) News Expression



(b) Syntax Tree Representation



(c) Simplified Syntax Tree Representation

Fig. 5.3 Multiple-Operator News Expression and its Syntax Tree Representations

5.1.3 Basic News Expression

"Basic news expressions" are those news expressions whose operands are all simple news items. In other words, the operands in a basic news expression do not include parenthesized news expressions. As a result, expression

$$S5 \parallel P6 \parallel S7$$

is an example of a basic news expression, while expression

$$S4 = (S5 \parallel P6 \parallel S7)$$

is not because one of its operands is a parenthesized news expression.

The syntax tree of a basic news expression is a tree whose root node is the multiple-operand operator in the expression and the subnodes are the operands. In the next sub-section a layout-template parsing algorithm is presented in which an attempt is first made to find a left-most basic news expression in the template expression, then to construct a corresponding syntax tree for it. The constructed syntax tree becomes a "building block" for the complete syntax tree construction.

5.1.4 Parsing Algorithm

Before a symbolic layout template expression is parsed, two symbols \lrcorner and \llcorner , indicating the beginning and ending of the template respectively, are added to each end of the expression. To parse a layout template, the algorithm first searches the

template expression for a left-most basic news expression whose operands are all simple news items. This is achieved by reading the template expression from left to right starting from the beginning symbol \downarrow until a right parenthesis $)$ or an ending symbol \uparrow is encountered. Then, starting from the right parenthesis just found, the template expression is read backwards until a left parenthesis $($ or a beginning symbol \downarrow is encountered. The expression within the pair of parentheses, or within the beginning and ending symbols, is the desired left-most basic news expression.

A syntax tree representing the encountered basic news expression can be constructed in such a way that the root node of the syntax tree is the multiple-operand operator in the basic news expression and the subnodes are the operands. If the syntax tree of the basic news expression cannot be constructed because either the operators in the basic expression are of different types or a mistaken syntax for news-item symbols is found, the parsing process stops and the given template is considered an illegal syntax expression.

After the syntax tree for the basic news expression is constructed successfully, the tree is designated by its first subnode, and the template expression is reduced by substituting the first subnode-news-item for the basic news expression and its enclosing parentheses. After the replacement of a complicated

news item by a simple news-item symbol, a new basic news expression may exist in the reduced template expression. Thus, the process of searching for a basic news expression is repeated; a corresponding syntax tree for the new basic expression is constructed, and the process continues iteratively. In the second iteration and after, some of the subnodes in the syntax tree might be those news items whose syntax trees have already been constructed previously. These subnodes are substituted by the corresponding existing syntax trees. As a result, separate syntax subtrees are combined together. The construction of a syntax tree for a layout template is completed when the template expression is reduced to a single news item.

As an example, Fig. 5.5 shows step-by-step how a syntax tree can be constructed from a layout template expression using the parsing algorithm just presented. Figure 5.5(a) is the complete symbolic expression of the template structure depicted in Fig. 5.1(a), and the corresponding syntax tree to be generated from the parsing process is shown in Fig. 5.2(c). In Fig. 5.5(a), beginning and ending symbols are added to the template expression, and an arrow is used to indicate the starting point of the expression being read. By reading the template expression from left to right, the first right-closure parenthesis is located to the right of S6 as indicated by an

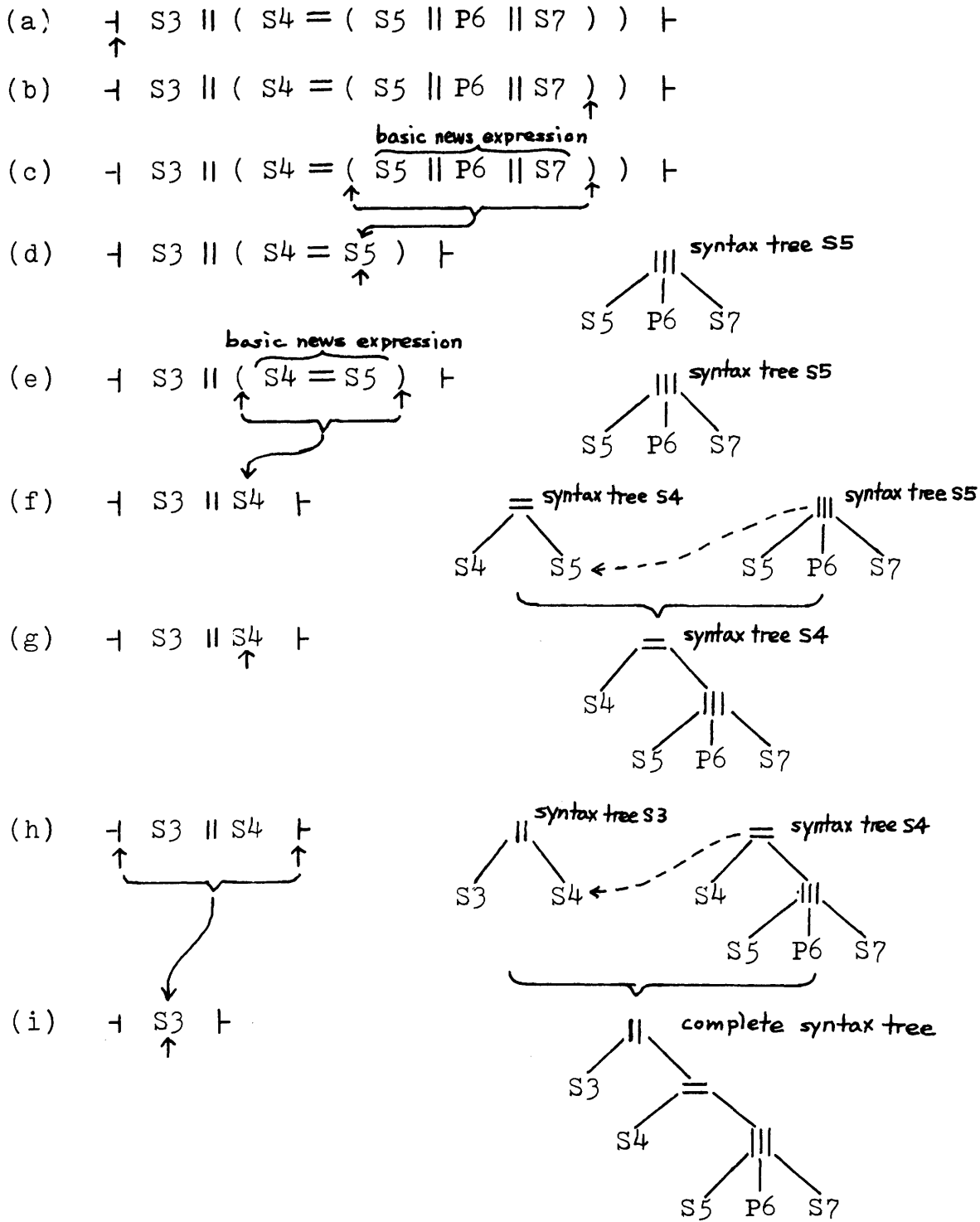


Fig. 5.5 Parsing of Layout Template Expression

arrow in Fig. 5.5(b). Reading backwards (right to left) from the above right parenthesis locates its corresponding left parenthesis. Then, the expression enclosed by this pair of parentheses is a left-most basic news expression, illustrated in Fig. 5.5(c) by two arrows.

Next, a syntax tree is constructed for the basic news expression, $S5 \parallel P6 \parallel S7$, and the tree is named after its first subnode $S5$. Then, the basic news expression is replaced in the template along with its enclosing parentheses by $S5$. Figure 5.5(d) depicts the intermediate parsing results showing the current reduced template expression and the syntax tree constructed for the basic news expression denoted by $S5$. The arrow in the figure denotes the location where the reading process should resume. Now, with a new reduced template expression $S3 \parallel (S4 = S5)$, the process of searching for a basic news expression is repeated. Figure 5.5(e) shows that another pair of parentheses is found which enclose a new basic news expression, $S4 = S5$. Figure 5.5(f) shows the reduced template expression after substituting $S4$ for the second basic news expression, and also shows the constructed syntax trees $S4$ and $S5$. These two syntax trees $S4$ and $S5$ are combined together by substituting the syntax tree $S5$ for the subnode $S5$ in syntax tree $S4$. That is, the syntax tree $S5$ becomes a subtree of the syntax tree $S4$. The combined syntax tree $S4$ together with the new reduced template is

shown in Fig. 5.5(g).

As the next iteration, the reduced template expression in (g) is read first forward and then backward, and a new basic news expression enclosed by the beginning and ending symbols is detected. Following the same procedure, a syntax tree S3 is constructed as shown in Fig. 5.5(h) and then merged with the previously constructed syntax tree S4. Figure 5.5(i) depicts the resulting tree. The syntax tree construction is now completed because the reduced template expression contains only one news item. The success of the syntax tree construction verifies the validity of the original template expression.

After this presentation of a parsing algorithm for constructing syntax trees, the next section describes the basic techniques through which the layout syntax tree are used as a structural guide for the placement of stories and pictures on a page.

5.2 BASIC TECHNIQUES OF PAGE-LAYOUT

A layout template describes symbolically the desired structure of news items assigned to a page. This is achieved by utilizing a set of relational operators which describes the relative news-item positions on the template. Then, in the parsing process, the symbolic-layout-template expression is transformed into a syntax-tree representation suitable for layout interpretation.

This section presents the basic page-layout techniques that have been developed to actually place the stories and pictures assigned to a page through use of the syntax tree representation as a layout structure guide. The layout process, if successful, produces a page dummy showing the outlines of every story and picture location on the page. Moreover, the structure of the news item locations conforms to that described by the layout template.

In order to simplify the presentation, we first restrict our attention to the layout of pages without display-ads and templates without any of the extended operators. The extension of the basic techniques to include the extended set of operators and to accommodate pages with display-ads are presented in sections 5.3 and 5.4, respectively.

5.2.1 Traversing of Layout Syntax Tree

The page-layout algorithm developed in this chapter for actual story and picture placement is based on the notion of traversing or "walking through" the layout syntax tree. In this method, the nodes of the syntax tree are examined systematically, starting from the root node, so that each node is visited exactly once. During the visit to each node, certain layout actions are taken; the visit is complete when all required layout actions for that node have been performed. Hence, the visit to a tree node is also referred to as the layout of that node.

One of the layout actions performed at the visit of an operator node is the set of visits to all its subnodes in a prescribed order. Therefore, the visiting process of an operator node is complete only if the visits to all its subnodes have been completed. Thus, the layout traversing algorithm is recursive and can be described by indicating the sequence in which the subnodes of a particular operator node are traversed.

Unlike most tree-traversing schemes in which the order of subnodes to be visited is determined by their relative positions in the tree (such as the left-precedence or right-precedence methods), this layout-traversing sequence of subnodes in the layout-syntax tree depends on the types of the parent operator node as well as its subnodes.

For a vertical-construction-type operator node, an operator type subnode in general has higher precedence than does a terminal type subnode. On the other hand, operator subnodes of an horizontal-construction-type operator node have lower precedence than do the terminal subnodes. Among subnodes of the same type, the left subnode takes precedence over right subnode. The primary concern here is to assign higher traversing precedence to subnodes which are considered to involve more difficulty in achieving a satisfactory layout. A more detailed reasoning of the traversing sequence is discussed later in section 5.2.5.

As an example of traversing a syntax tree, consider Fig. 5.6 which depicts the syntax tree of the layout template

$$((P1 = S2) \parallel S1) = S3$$

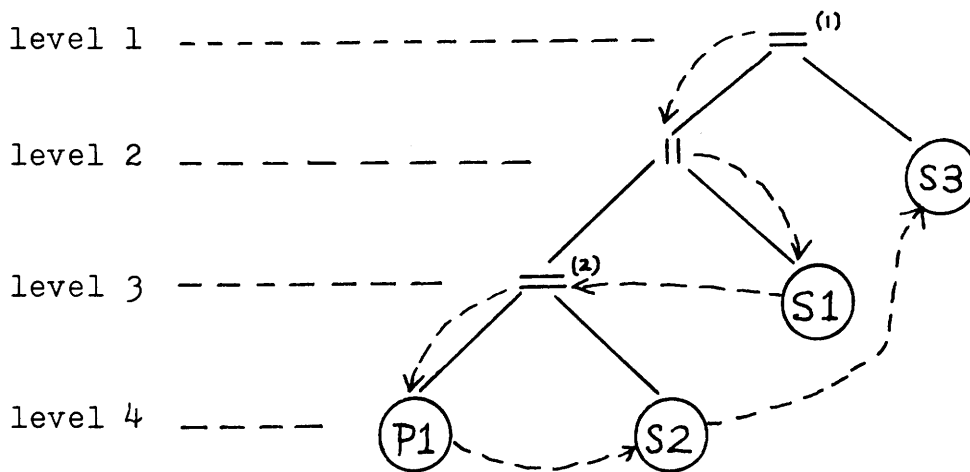


Fig. 5.6 Traversing a Layout-Syntax Tree

In the figure, terminal nodes are circled in order to distinguish them from the operator nodes, and the occurrences of operator node $=$ at two different levels are denoted by the number at the upper-right corner of the operator symbol. As stated previously, the traversing process begins at the root node $=^{(1)}$ and proceeds downward. For the two subnodes of the root node, operator node \parallel has a higher priority than does the terminal node S_3 because the nodes \parallel and S_3 are the subnodes of a vertical construction type operator node. Therefore, operator node \parallel is the second node to be visited. Because of the recursive property of the traversing algorithm, the subnodes at level 3 are traversed next. In accordance with the traversing rule for a horizontal-construction-type operator node, terminal node S_1 has precedence over the operator node $=^{(2)}$. Therefore, S_1 and $=^{(2)}$ are the third and fourth node to be visited, respectively. During the visit of $=^{(2)}$, terminal subnode P_1 is traversed before terminal subnode S_2 because P_1 is a left terminal node and hence has precedence over right terminal node S_2 . Upon completion of traversing all the subnodes of the operator \parallel , only terminal node S_3 remains to be visited. The dashed lines in Fig. 5.6 indicate the complete layout-traversing sequence as follows:

$=^{(1)}$, \parallel , S_1 , $=^{(2)}$, P_1 , S_2 , S_3 .

Besides a determination of the traversing sequence for the subnodes, additional layout actions are performed during the visit to each operator node. Two items of information are passed to the node from its parent node. These serve as inputs for the layout actions taken during the visit. The information items are:

- (1) a set of stories and pictures, which matches the number as well as the type of the terminal descendants attached to the node, and
- (2) the width and height of a rectangular news area which matches the total area of the story and picture set specified in (1).

With the above information as inputs, the main layout functions during the visit to an operator node is to provide the same information as in (1) and (2) to each of its subnodes. Recursively, the information generated for the subnode serves as the inputs for its layout actions.

For a root node, results from the story- and picture-assignment process (a news budget for the page) and the dimensions of the full news page being laid out are used as the inputs for the layout actions performed at the root node. The basic concepts used in selecting a set of stories and pictures, and constructing a news block for each subnode are presented in the following two sub-sections.

5.2.2 Story and Picture Selection for Subnodes

During the visit to an operator node, the story-and-picture-selection function chooses, for each subnode, a subset of stories and pictures from the given set of news items for the operator node. The number, as well as the type of the stories and pictures selected for a subnode, matches the number and type of the terminal descendants of the subnode. There are four types of news items and hence four terminal nodes types, as listed below;

- (1) S type: a story (or a story terminal node) not associated with any picture (or picture node), respectively,
- (2) SP type: a story (or a story terminal node) associated with a picture (or picture node), respectively,
- (3) P type: an independent picture (or picture terminal node), and
- (4) PS type: a picture (or a picture terminal node) associated with a story (or a story node), respectively.

Therefore, in each type category, the number of stories or pictures selected for a subnode from those news items assigned to the parent node should equal the number of terminal descendants of that subnode. That is, all the news items passed to the parent node are distributed to its subnodes in accordance with the number and type of each subnode's terminal descendants. Often, more than one possible distribution satisfies the number and type requirements. In that

case, priority among the different possibilities is determined from a comparison of the relative importance rankings of the terminal descendants with the importance rankings of the selected news items. The distribution possibility that is assigned first is the one that yields the closest match among the importance rankings of news items and terminal descendants.

As an example, consider the syntax tree depicted in Fig. 5.6. Assume that three stories A, B, and C, and one picture P associated with story A are assigned to a full news page as the result of the story and picture assignment process carried out prior to the page layout. This information is passed to the root node $\equiv^{(1)}$ of the syntax tree and is regarded as the input to the story- and picture-selection process during the visit to the root node. Thus, the root node $\equiv^{(1)}$ has two news items of the S-type (stories B and C), one SP-type (story A tied to picture P), one PS-type (picture P tied to story A), and no P-type; which matches the number of terminal descendants in each type category (S2, S3 of S-type, S1 of SP-type, and P1 of PS-type).

During the visit to the root node $\equiv^{(1)}$, the news items selected for the node are distributed to its two subnodes, namely, operator node \parallel and terminal node S3. The operator subnode \parallel has terminal descendants of 1 S-type (S2), 1 SP-type (S1), and 1 PS-type (P1); while the terminal subnode S3 is of

S-type. Due to the fact that the parent node has two S-type news items (B and C) and either can be selected for the subnode S3, there are two possible distributions:

Selection 1:

operator subnode || --- stories A and B, and picture P
terminal subnode S3 --- story C

Selection 2:

operator subnode || --- stories A and C, and picture P
terminal subnode S3 --- story B

Should story C have a lower importance ranking than story B, Selection 1 is assigned a higher priority than Selection 2 because the terminal node S3 is less important, by the definition of news graphic language, than the terminal descendant S2 of the operator node || .

Similarly, for operator node || , the selected news items (A, B, and P) of selection 1 are distributed to its two subnodes with story B (S-type) and picture P (PS-type) for operator subnode $\equiv^{(2)}$ (1 S-type, and 1 PS-type terminals), and story A (SP-type) for terminal subnode S1 (1 SP-type terminal). Working downward, the distribution algorithm selects story B and picture P for the story node S2 and picture node P1, respectively. Note that this selection process ensures that the associated story and picture terminal node, S1 and P1, are assigned a pair of associated news items, story A and

picture P. Figure 5.7 depicts the two possible story and picture selections for the syntax tree, where the news items selected for each node are denoted in parentheses, and the association of story and picture is indicated by dashed lines.

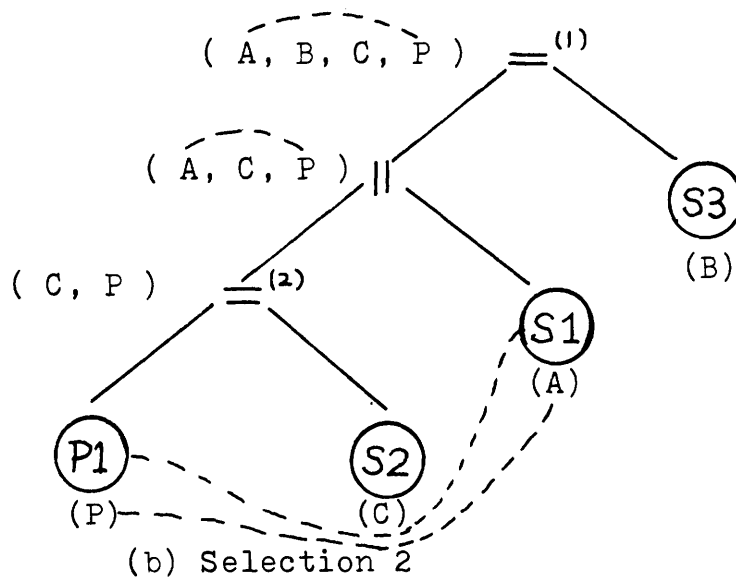
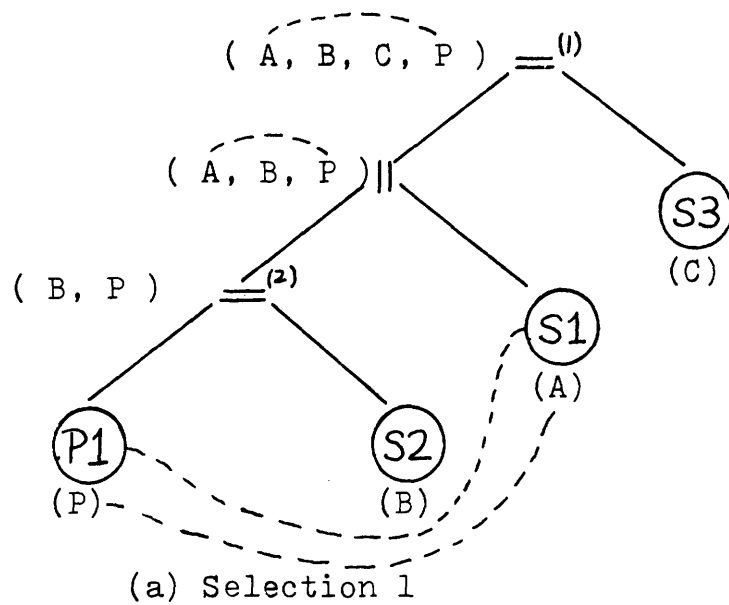


Fig. 5.7 Story and Picture Selections

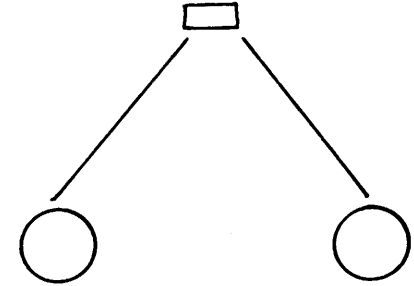
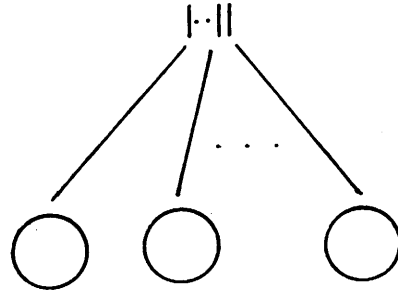
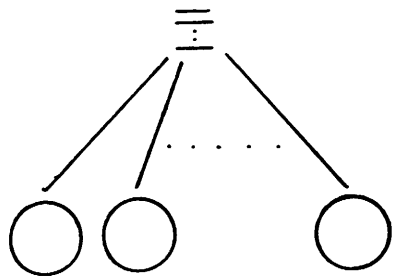
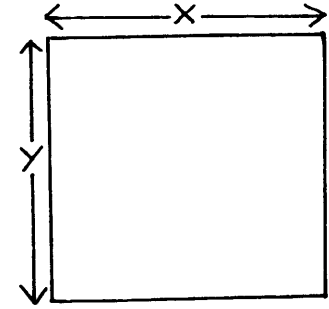
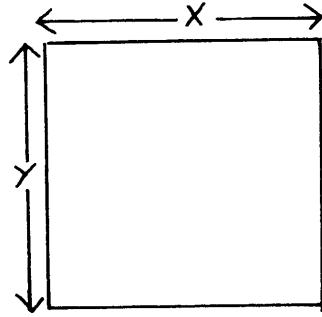
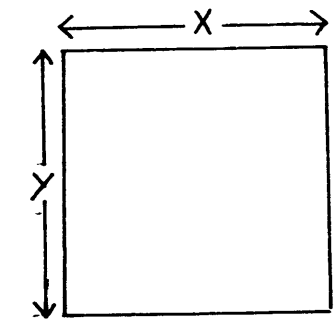
5.2.3 Virtual-Page Construction

Besides the story and picture selection, another major layout function performed during the visit to each node is the construction of a news block for each subnode. The constructed news-block area for each subnode matches the total area of the selected stories and pictures for the subnode. Furthermore, the width and height of the news block are determined by both the news-block dimensions and the operator type of the parent node as described below.

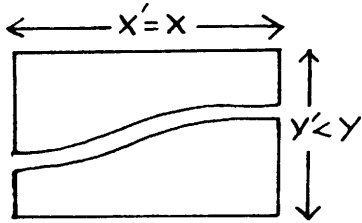
Since the set of stories and pictures selected for a subnode is a subset of available news items for the parent node, the subnode news block area is always smaller or equal to the news block area of the parent node. Therefore, by traversing down the syntax tree from the root node, the size of the news block is reduced from its original full-page size at the root node. However, during the visit to each node other than the root, the reduced news block and the selected news-item set for that node can be thought of as a smaller news page to be laid out. The only difference between nodes are the page sizes and the news-item sets. Hereafter, this is called the virtual-page concept of layout, and the reduced news block at each node is referred to as the virtual page of the node.

During the formation of virtual pages for subnodes, the height of a virtual page for a basic vertical-construction-operator is shortened and the width is retained. Similarly, only the width of a virtual page for a basic horizontal-construction-operator node is reduced to form its subnode virtual page. Figures 5.8(a) and (b) illustrate these two construction methods where the news blocks on the top represent the parent virtual page, and the ones at the bottom are the subnode virtual pages. The actual values of the height of subnode virtual page Y' in Fig. 5.8(a), and the width of subnode virtual page X' in Fig. 5.8(b), are determined by the virtual-page-area requirement, which is equal to the total area of the selected news items for the particular subnode. For an embedded-type operator node, the virtual page remains unchanged, as shown in Fig. 5.8(c), for the left subnode, and shrinks proportionally in both vertical and horizontal dimensions for the right subnode.

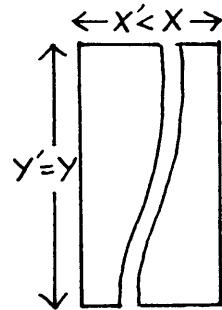
Since all news items selected for a basic operator node are distributed among its subnodes in a prescribed fashion and the virtual-page area of each subnode is determined by the total area of the news items distributed to the subnode, the summation of all the subnode virtual pages should be equal to the virtual page area of the basic operator node. Therefore, the construction of subnode virtual pages for a basic operator



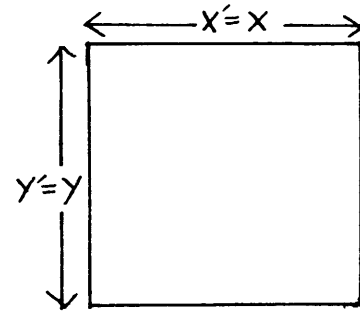
-118-



(a)



(b)



(c)

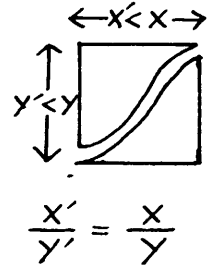
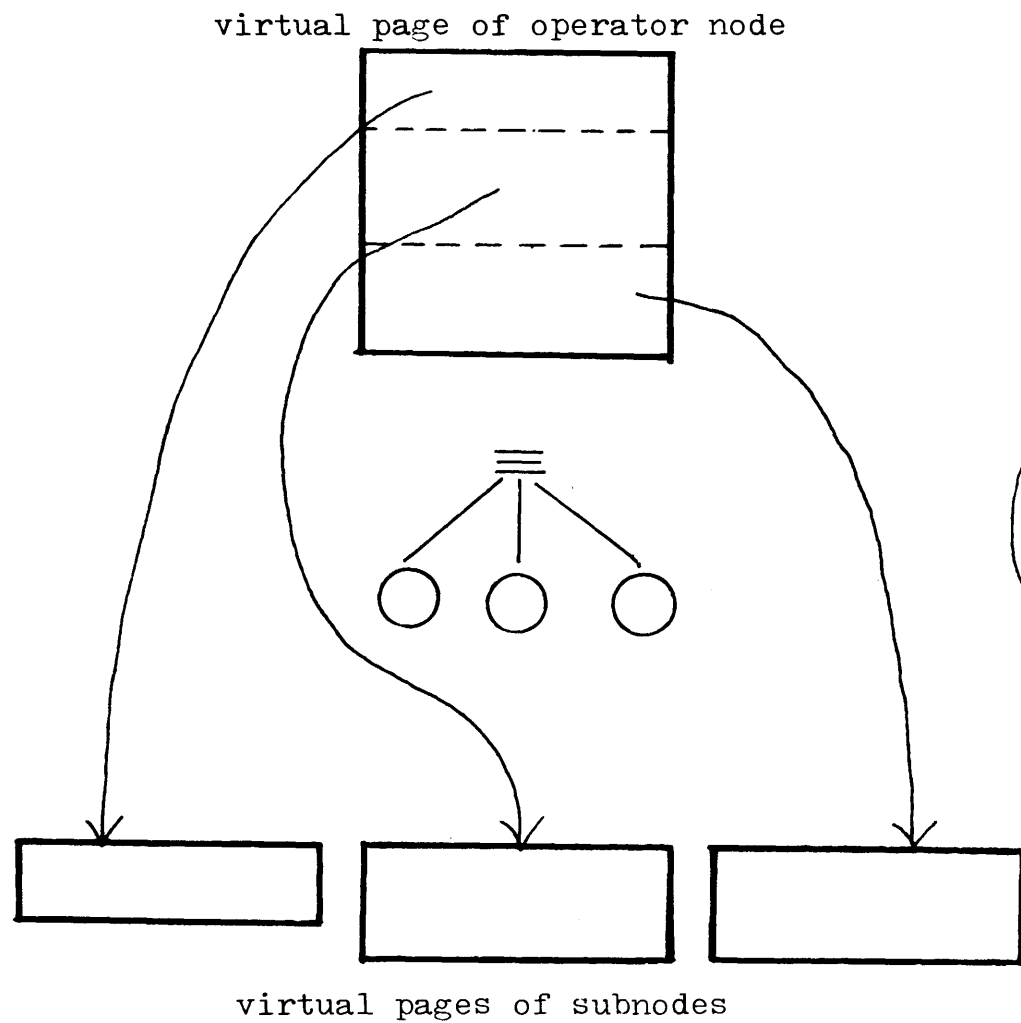


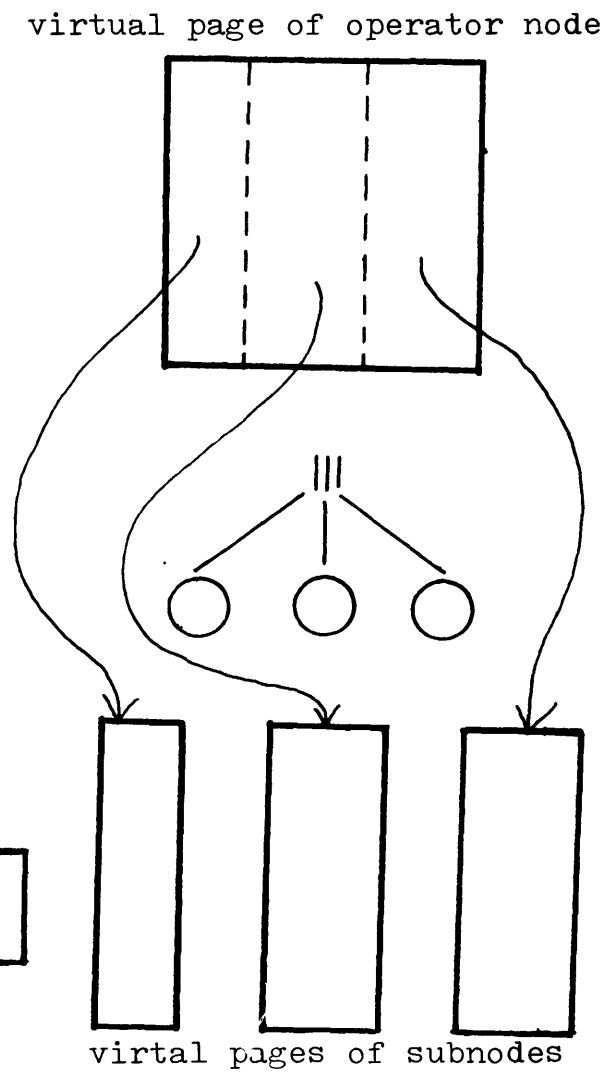
Fig. 5.8 Virtual Pages of Subnodes

node can be interpreted in the following alternate way: By traversing down the syntax tree from the root node, the given full news page is "cut" into sub-pages horizontally or vertically. Each sub-page is then assigned to a corresponding subnode as its virtual page. Therefore, the information distributed from the parent node to its subnodes includes the virtual page as well as the set of news items. Figure 5.9 depicts the virtual pages of vertical- and horizontal-operator nodes with three subnodes. The "cutting" and "distribution" are illustrated by the dashed and solid lines, respectively.

As an illustration of virtual page layout, consider the story and picture assignment results of the example presented in the previous section. Figure 5.10(a) duplicates Fig. 5.7(a), and Fig. 5.10(b) depicts all the virtual pages constructed during the node visits. At the root node \equiv , the virtual page represents a full news page whose area is the total area of news items A, B, C, and P assigned to the root node. The page is cut horizontally into two virtual sub-pages; one is assigned to the operator node \parallel , and the other to terminal node S3. The size of the constructed virtual pages matches that of the news items selected for the subnode. Following the traversing sequence, the virtual page of operator node \parallel is further cut vertically into two sub-pages, and they are assigned to its two subnodes, $\equiv^{(2)}$ and S1, accordingly. No

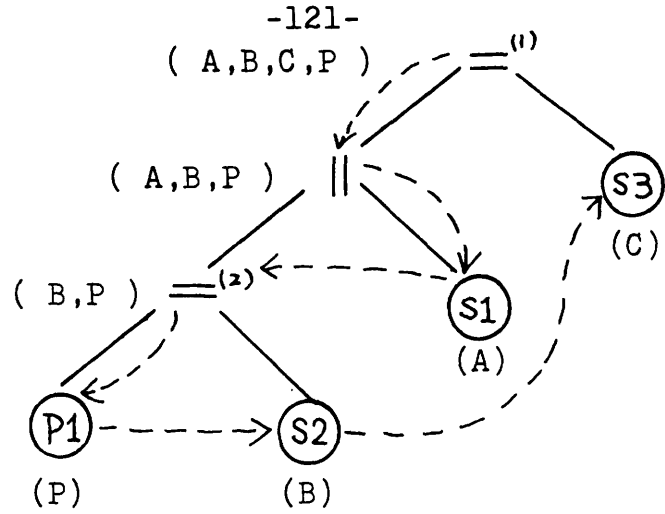


(a) Vertical Construction

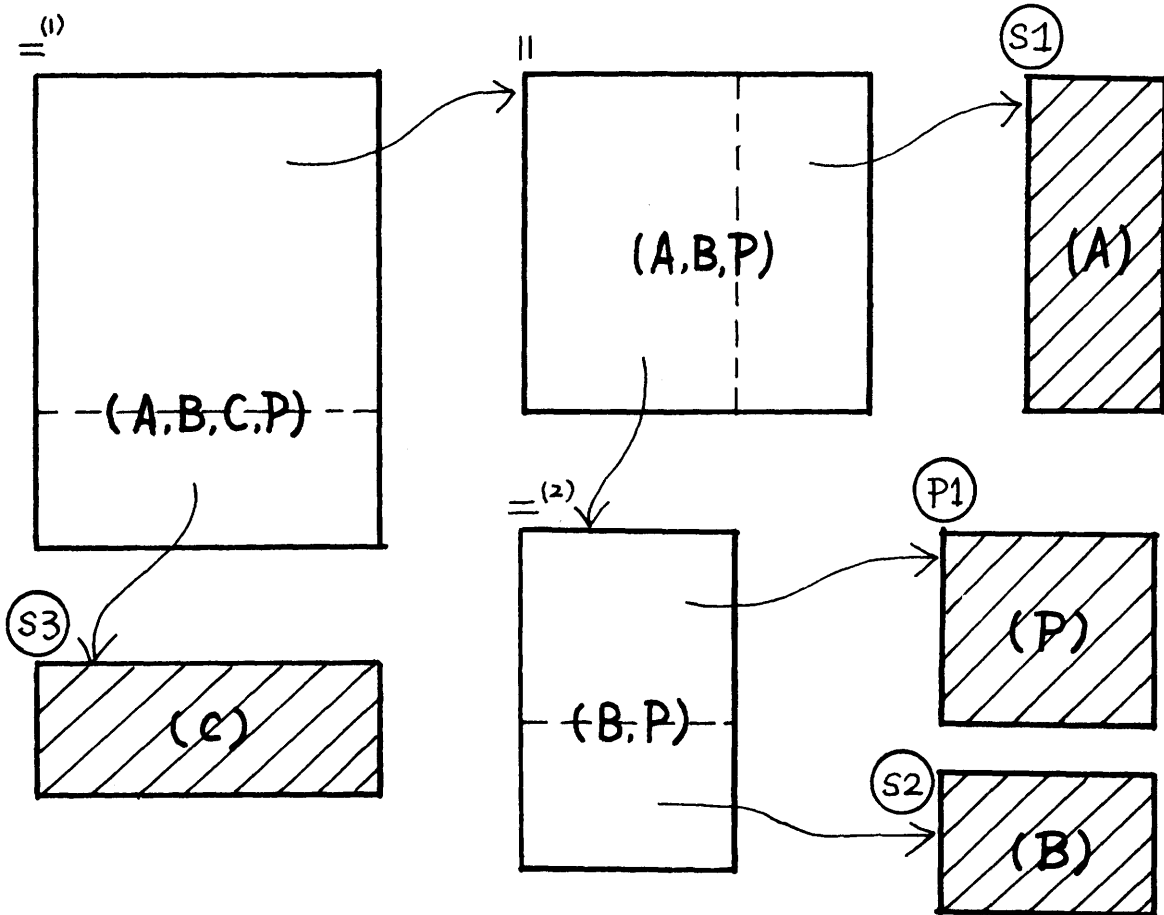


(b) Horizontal Construction

Fig. 5.9 Cutting and Distribution of Virtual Page for Basic Operator Node



(a) Syntax Tree and News Item Assignment



(b) Virtual Pages of Nodes

Fig. 5.10 Example of Virtual-Page Construction

cutting is made during the visit to the next node S1 because it is a terminal node and cannot be reduced further. Finally, at operator node $\equiv^{(2)}$, its virtual page is cut vertically into two sub-pages and distributed to its corresponding terminal subnodes, P1 and S2. Since the remaining nodes to be traversed, P1, S2, and S3, are all terminal node, the construction of virtual pages for the syntax tree is complete. Upon completion of the virtual page construction, each news item assigned to the news page has a fixed-dimension news block (shown as shaded areas of Fig. 5.10(b)) representing the virtual page for that terminal node, and the news block area matches the area of the assigned news item. A page layout dummy can be produced by assembling these virtual-page blocks together, as described in the next section.

Thus far, the columnar structure of the newspaper has been ignored. In a real case, the news page is measured in terms of vertical and horizontal units which restricts the places where a virtual page can be cut. A virtual page is required to be cut in such a way that all its sub-pages have an integral number of units in both dimensions. For example, if the virtual page of the operator node in Fig. 5.9 is 6 columns wide and 10 lines high, there are only 5 and 9 possible vertical and horizontal "cutting lines", respectively. In other words, an exact match between the area of the virtual

sub-page and that of the news items assigned to the subnode is very unlikely. However, if the area difference is small, leading can be used to make up the difference.

5.2.4 Virtual-Page Assembling

In the construction of virtual page, the news block of a parent node is "broken" into sub-blocks in a prescribed way, and each sub-block is the virtual page of its corresponding subnode. The assembling process of the virtual pages is just the reverse process. That is, given a set of constructed virtual pages of the subnodes, the virtual page of the parent node is constructed by assembling the subnode virtual pages together.

For a vertical type operator node, the subnode virtual pages are "stacked up" one on top of the other to form the assembled virtual page of the node. Similarly, for a horizontal type operator node, the virtual pages are sided next to each other horizontally. For an embedded type operator node, the virtual page of the second subnode is embedded into one of the three allowable corners of the virtual page of the first subnode. Figure 5.11(a) and (b) illustrate the assembling process in the case of three subnodes for a vertical and a horizontal operator node, respectively. Figure 5.11(c) depicts the assembling of a lower-right-corner-embedded-operator node.

Assembled Virtual Pages of Operator Nodes

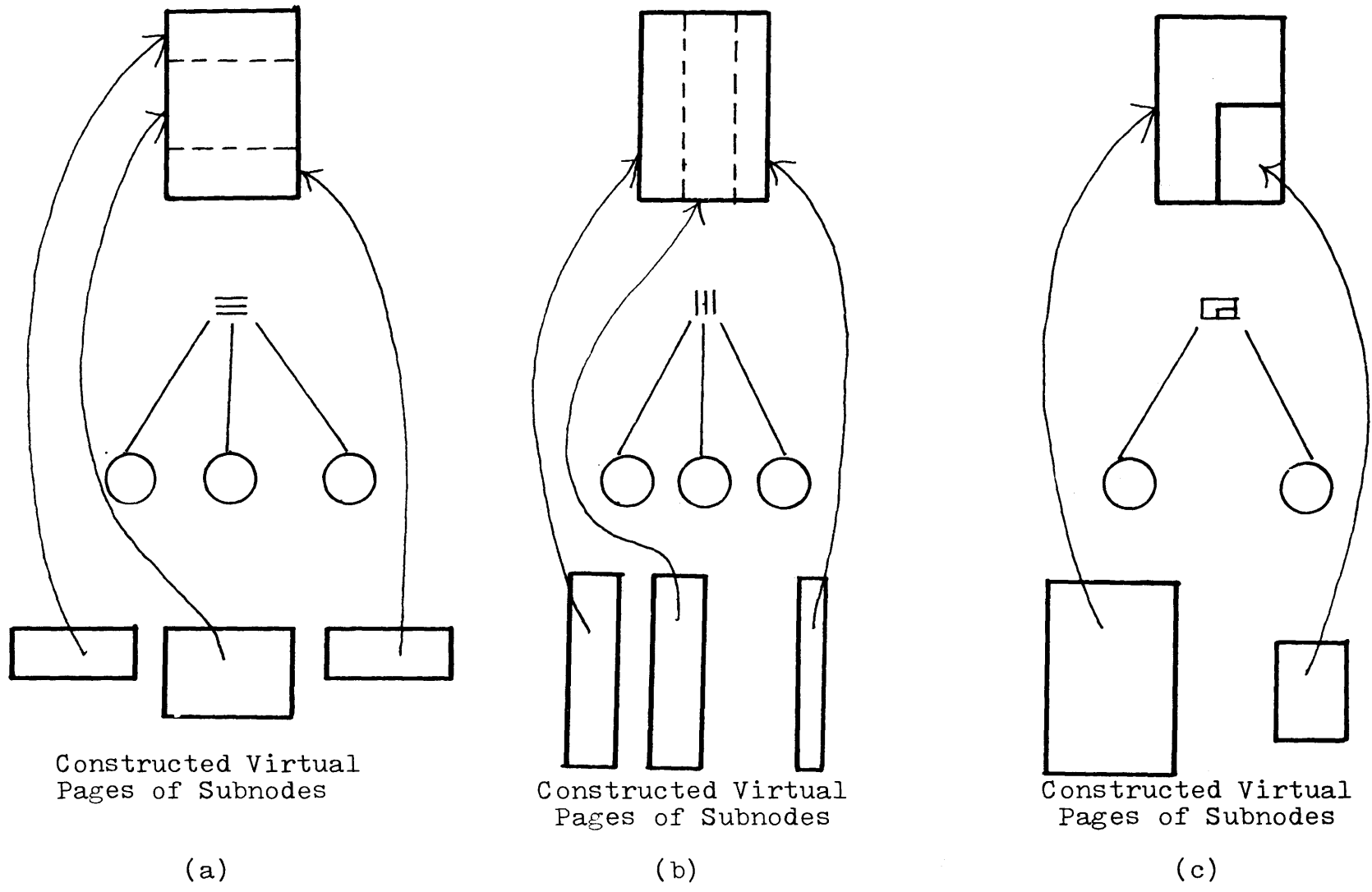


Fig. 5.11 Assembly of Virtual Pages

Note that Fig. 5.11 is essentially the same as Fig. 5.9 except that the arrows which indicate the directions of the virtual-page construction are reversed.

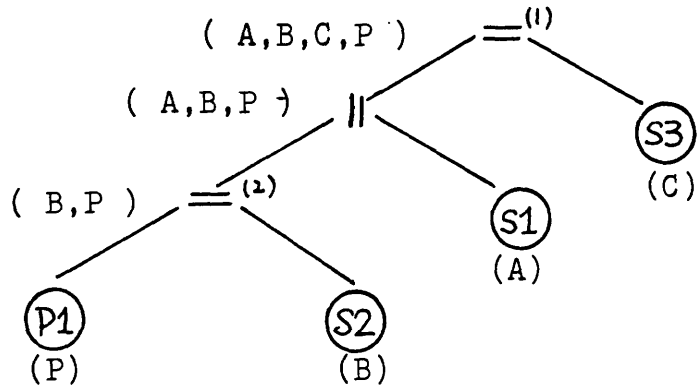
The assembling process for an operator node starts after all the virtual pages of its terminal descendants are constructed. That is, virtual pages of terminal nodes are used as "building blocks" in the assembling process. The virtual page constructed for a terminal node is also regarded as the assembled virtual page, even though no actual assembling process is taken due to the lack of subnodes for a terminal node. For operator nodes, the assembling process is performed when all its subnodes have an assembled virtual page. In contrast to the top-down virtual-page construction process, the assembling of virtual pages starts at the terminal node level of the syntax tree and works upward until the root node is reached.

After the virtual page of a node is assembled, the layout actions, (or the visit) of the node are completed. When the layout of the root node is completed, the page-layout process for that news page is terminated. Since the assembling as well as the constructing of virtual pages are performed according to the type of operator nodes in the syntax tree, the final news structure of the assembled news page at the root node conforms to the structure requirement specified in the layout syntax tree.

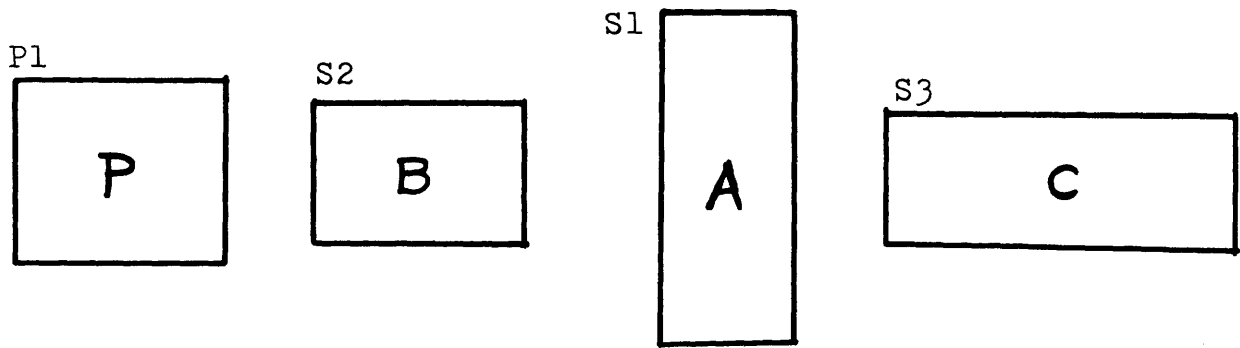
As an example, consider the virtual-page construction results in Fig. 5.10. Figure 5.12(a) re-depicts the syntax tree of Fig. 5.10(a), and Fig. 5.12(b) shows the constructed virtual pages of all terminal nodes from Fig. 5.10(b).

After the virtual pages of terminal nodes S1, P1, and S2 are constructed, the assembling process begins at operator node $\equiv^{(2)}$. This is the first operator node encountered in the traversing sequence which has all its subnode virtual pages assembled. Recall that for terminal node, a constructed virtual page is also the assembled virtual page. Therefore, as shown in Fig. 5.12(c), the virtual page of terminal node P1 (the news block for picture P) is placed on top of the virtual page of S2 (the news block for story B) to form an assembled virtual page for the operator node $\equiv^{(2)}$. Note that as the result of virtual-page construction, the news blocks of picture P and story B must have the same width and thus the assemble virtual page in (c) also must form a rectangular news block.

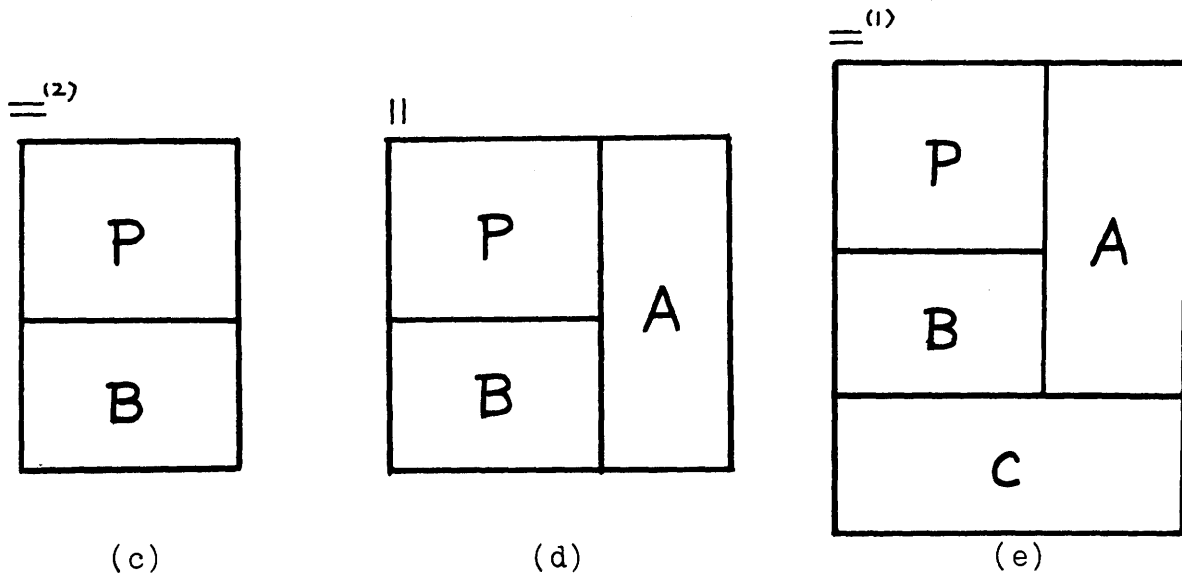
Then, as shown in (d), the assembled virtual page of the node $\equiv^{(2)}$ (Fig. 5.11(c)) is placed next to the assembled virtual page of terminal node S1 (news block A) to form an assembled virtual page for operator node \parallel . This completes the layout of the operator node \parallel and next terminal node S3



(a) Syntax Tree



(b) Virtual Page Construction for Terminal Nodes



(c)

(d)

(e)

Fig. 5.12 Example of Virtual-Page Assembly

is visited. Its virtual page is constructed and placed beneath the assembled virtual page of (d) to form an assembled virtual page for the root node $\equiv^{(1)}$, depicted in (e). This is the final page layout dummy, and the layout structure conforms to that specified by the syntax tree.

5.2.5 Layout Failures

Thus far in our discussion of layout actions, we have ignored the possibilities of layout failures. In real case, the layout of a node can fail in the following three instances:

- (1) in the construction of virtual pages,
- (2) in the assembly of virtual pages, and
- (3) in the layout of its subnodes.

Each of these possible layout failures are discussed below.

In the construction of virtual pages for the subnodes, an exact match between the total area of the selected news items and that of the virtual page is very unlikely. This is because one dimension of the constructed virtual page is required to remain the same as that of its parent virtual page, and the other dimension can only be set in one of the integral dimension units. However, for story terminal nodes, if the area difference is small, leading can be used to make up this area difference.

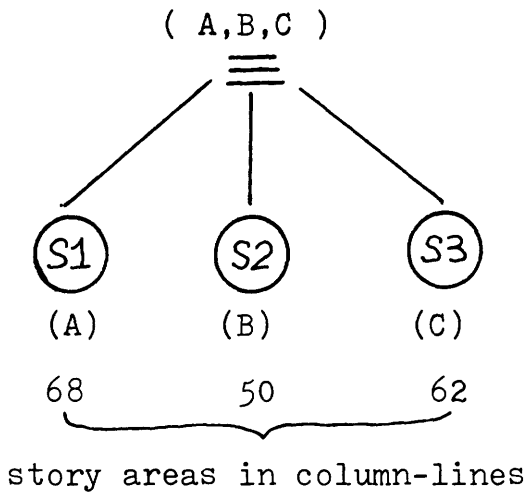
For example, assume a horizontal operator node $||$ has a virtual page of 3 columns wide and 10 lines high. Now assume

a story with an area of 11 column-lines is assigned to one of its story-type terminal nodes. Since the terminal node is a subnode of a horizontal operator, the height of the subnode virtual page remains the same as its parent node (10 lines). Then the virtual page of the subnode can only be constructed as either 1 column by 10 lines (10 column-lines) or 2 columns by 10 lines (20 column-lines). That is, the story has a mismatch of size by 1 column-line in the former case, and 9 column-lines in the latter. However, if a $\pm 10\%$ tolerance in story area is allowed through the use of leading, the virtual page of 1 column by 10 lines meets the leading tolerance, and can be constructed successfully.

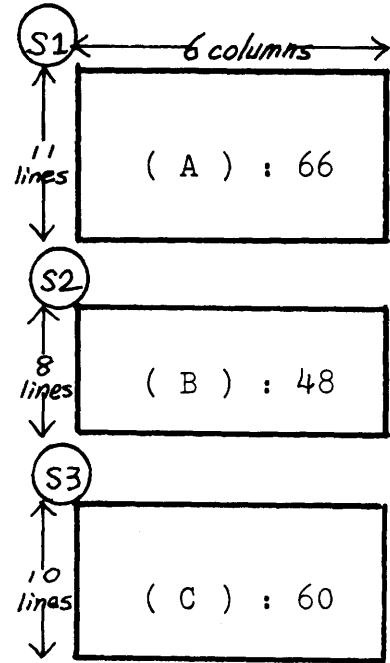
In the case where the subnode has an immediate picture descendant, the construction of the virtual page is further constrained. In addition to the requirement that one dimension of the virtual page must equal the corresponding dimension of its parent virtual page, the other dimension is also bound since it must be the same as the corresponding dimension of the assigned picture. The operator node || in Fig. 5.10(a) is an example of this case since one of its subnodes, $\equiv^{(2)}$, has an immediate picture descendant P1. Therefore, in addition to the equal-height requirement set by the parent operator ||, the width of the virtual page constructed for the subnode $\equiv^{(2)}$ must equal the width of the

picture P assigned to the node P1. Should the resultant virtual page area not match the total area of picture P and story B after taking the leading tolerance for story B into account, then the virtual page construction for subnode is considered a failure.

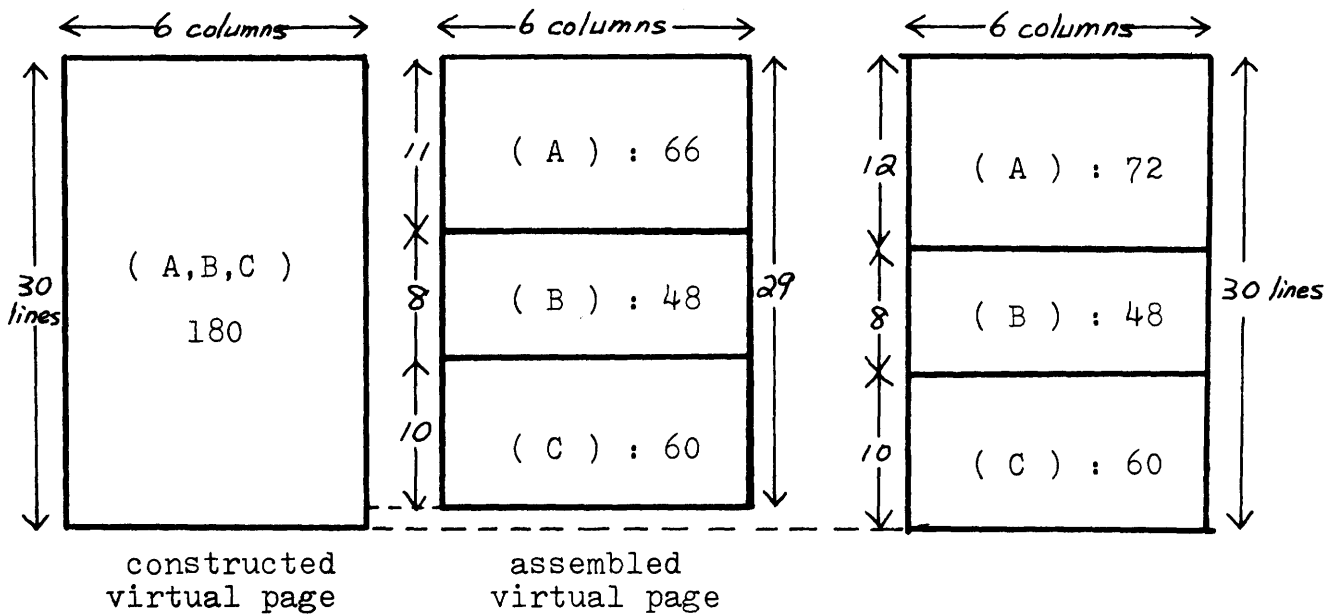
Since the sizes of the subnode virtual pages have to be adjusted slightly to meet the integral dimension unit requirement, the page assembly does not always yield an exact match between the assembled page and the previously constructed virtual page of the node. If this happens, an attempt is made to adjust some of the constructed virtual pages to make up the difference. For example, Fig. 5.13(a) depicts a vertical operator node with three story-type terminal subnodes. Assume that the areas of the three assigned stories A, B, and C are 68, 50, and 62 column-lines, respectively. Therefore, a virtual page of area 180 column-lines (6 columns by 30 lines) is constructed for the operator node in order to match the total area of the three assigned stories. In the layout of the operator node, further assume that stories A, B, and C are assigned to subnodes S1, S2, and S3 respectively. A virtual page for each subnode is constructed according to the size of the assigned story with an assumed leading tolerance of $\pm 10\%$. As shown in Fig. 5.13(b), the dimensions of the virtual page are 6 columns by 11 lines (66 column-lines) for



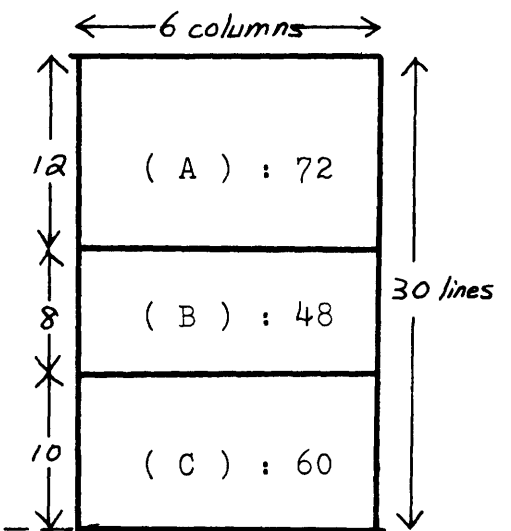
(a)



(b)



(c)



(d)

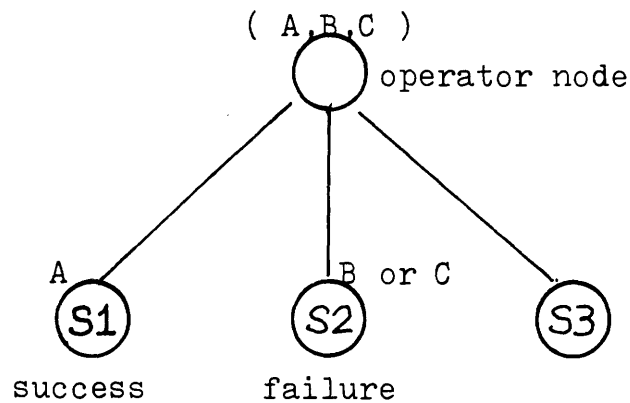
Fig. 5.13 Re-Adjust of Assembled Virtual Pages

S1, 6 column by 8 lines (48 column-lines) for S2, and 6 columns by 10 lines (60 column-lines) for S3. The assembly of these three virtual pages results in a news block of 6 columns by 29 lines; one line shorter than the originally constructed virtual page. Figure 5.13(c) depicts the constructed as well as the assembled virtual pages for the operator node with the dotted lines indicating the size difference. However, the difference can be eliminated as the result of lengthening the virtual page of subnode S1 by one unit. A new virtual page of 6 columns wide and 12 lines high is thus constructed for S1 which still retains its area (72 column-lines) within the $\pm 10\%$ leading tolerance of the original area of story A (68 column-lines). Figure 5.13(d) depicts the new assembled virtual page. Now, an exact match between the constructed and new assembled virtual page is achieved, and the assembling process for the operator node is accomplished successfully. Should the re-adjustment of an assembled virtual page create an area difference which can not be offset through use of leading, the assembly process fails.

The last type of layout failure concerns the layouts of the subnodes. Layout at a node fails if all possible story-and-picture selection combination for a subnode are tried and fail. However, in order to keep the layout algorithm deterministic, no special rescue attempt is made to re-try a

failed subnode by re-selecting the news items for the subnodes which have been previously laid out successfully.

As an example, in Fig. 5.14, assume that an operator node with three assigned items A, B, and C, has three subnodes S1, S2 and S3. Further assume that the subnodes are traversed from left to right, and subnode S1 is laid out successfully with one of the possible selections, news item A. If subnode S2 fails to be laid out with either of the two possible selections, that is, news item B or C; then the layout of the subnode S2 is considered a failure, and so is its parent operator node. No attempt is made to go back to subnode S1 and try other possible assignments such as news item B or C for S1 because, if doing so, the layout algorithm may iterate endlessly.



Failure of S2 implies that the operator node also fails

Fig. 5.14 Layout Failure of Subnodes

Therefore, layout at a node fails if one of its subnodes fails. As a result of this layout failure treatment, those subnodes which are supposedly more difficult to be laid out receive higher traversing order.

Generally, a news page is measured by a relative smaller number of horizontal units (such as 6 or 8 columns) than vertical units (such as 100 lines). As a result, the success of virtual page construction for subnodes of a horizontal-type operator depends more on the leading tolerance than does that for the subnodes of a vertical-type-operator. That is, the subnode virtual pages of a horizontal type operator are more difficult to be constructed successfully than those of a vertical type operator. Therefore, the operator subnode (horizontal type) of a vertical operator node is assigned higher traversing precedence over a terminal subnode, and vice versa for a horizontal operator node. Furthermore, due to the fixed dimensions of a picture terminal node, an operator subnode with a picture descendant has precedence over an operator subnode without a picture descendant.

5.2.6 Summary of Layout Algorithm

This sub-section summarizes the important elements of the layout algorithm described in the previous sub-sections. The traversing process starts from the root node of the tree

and "walks" downward. The traversing sequence of the subnodes is determined by the type of the parent node as well as the subnodes (see section 5.2.1).

During the visit to each node, two items of information are assigned to the node by its parent node: first, a set of stories and pictures which matches the number as well as the type of the terminal descendants of the node, and second a virtual page whose area equals the total area of the assigned stories and pictures. During the layout (or visit) at each node, the main function is to produce these two items of information for each of its subnodes.

Upon completion of these two tasks, the subnodes are then laid out (or visited) one by one in a prescribed order, iterating the same layout procedure. After all its subnodes are laid out successfully (that is, all its subnodes have an assembled virtual page), the subnode virtual pages are assembled together to form an assembled virtual page for the parent operator node. The page layout is complete when the virtual page of the root node is assembled.

Figure 5.15 shows the complete flow chart for the layout actions performed during the visit of a syntax tree node. Note that the layout procedure is recursive and the activation of the recursion is indicated by the double-lined box in the

stories and pictures selected for the node (Inputs) width and height of a news block.

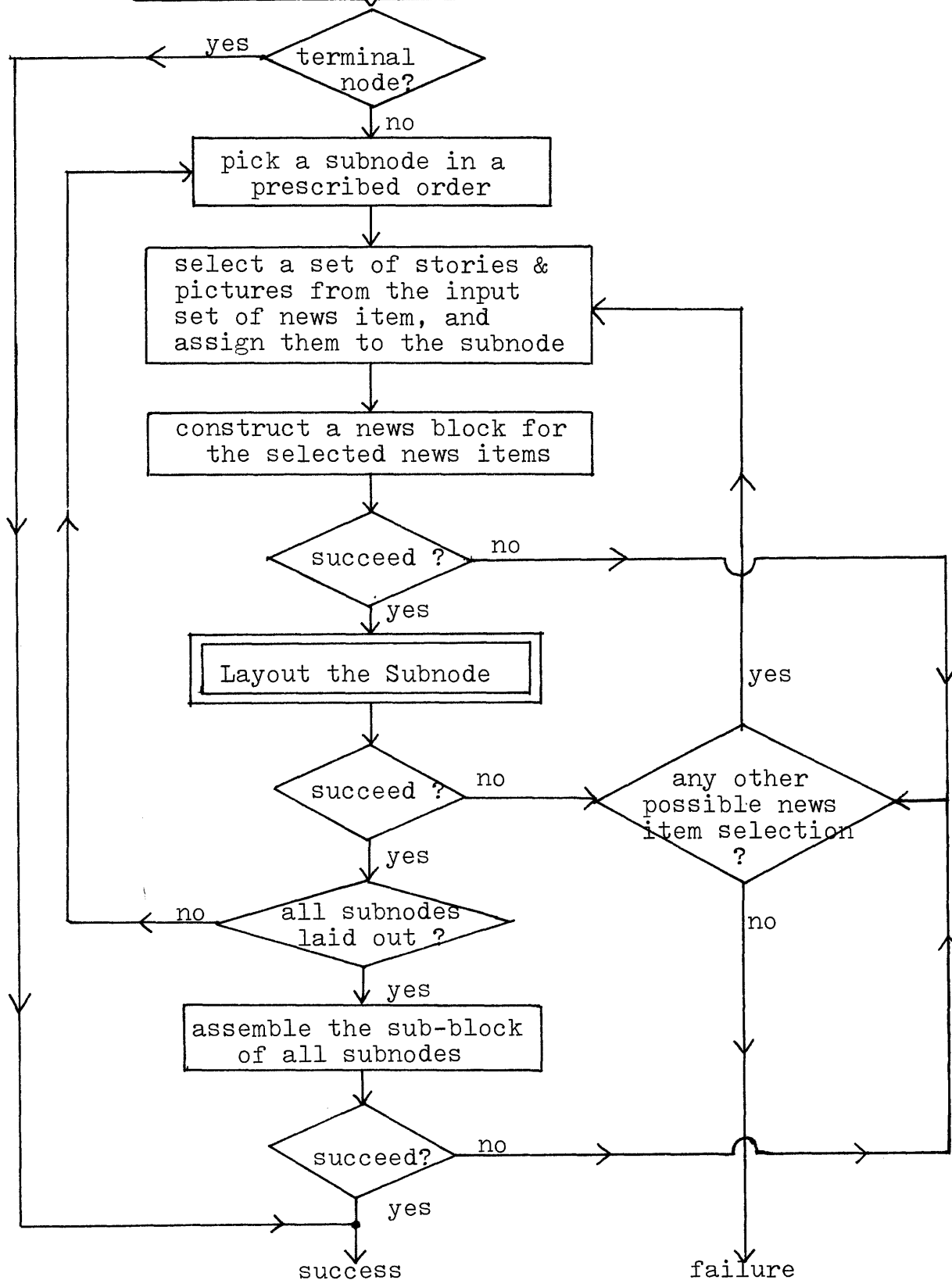


Fig. 5.15 Overview of Layout Actions During the Visit of a Node

flow chart. That is, the layout step goes back to the beginning of the flow chart when the double-lined box — "Layout the Subnode" — is reached.

5.2.7 Examples of a Layout with an Initial Failure

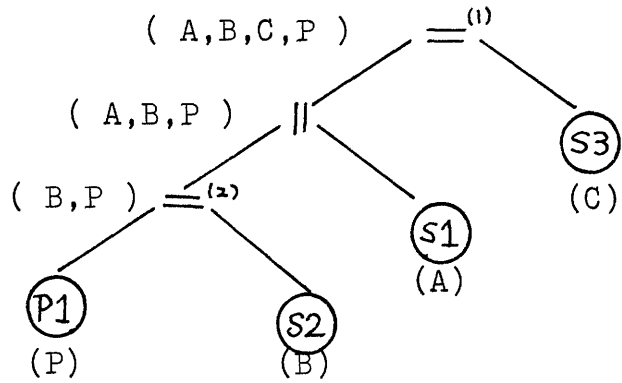
Consider a news page 6 columns wide and 100 lines high. Three stories A, B, and C, and one picture P (associated with story A) are assigned to the page. The areas of stories A, B, C are 175, 230, 120 column-lines, respectively, and the picture dimensions are 3 columns by 25 lines. Note that the total area of the four news items matches the news page area which is a consequence of the story-and-picture-assignment process.

The layout template

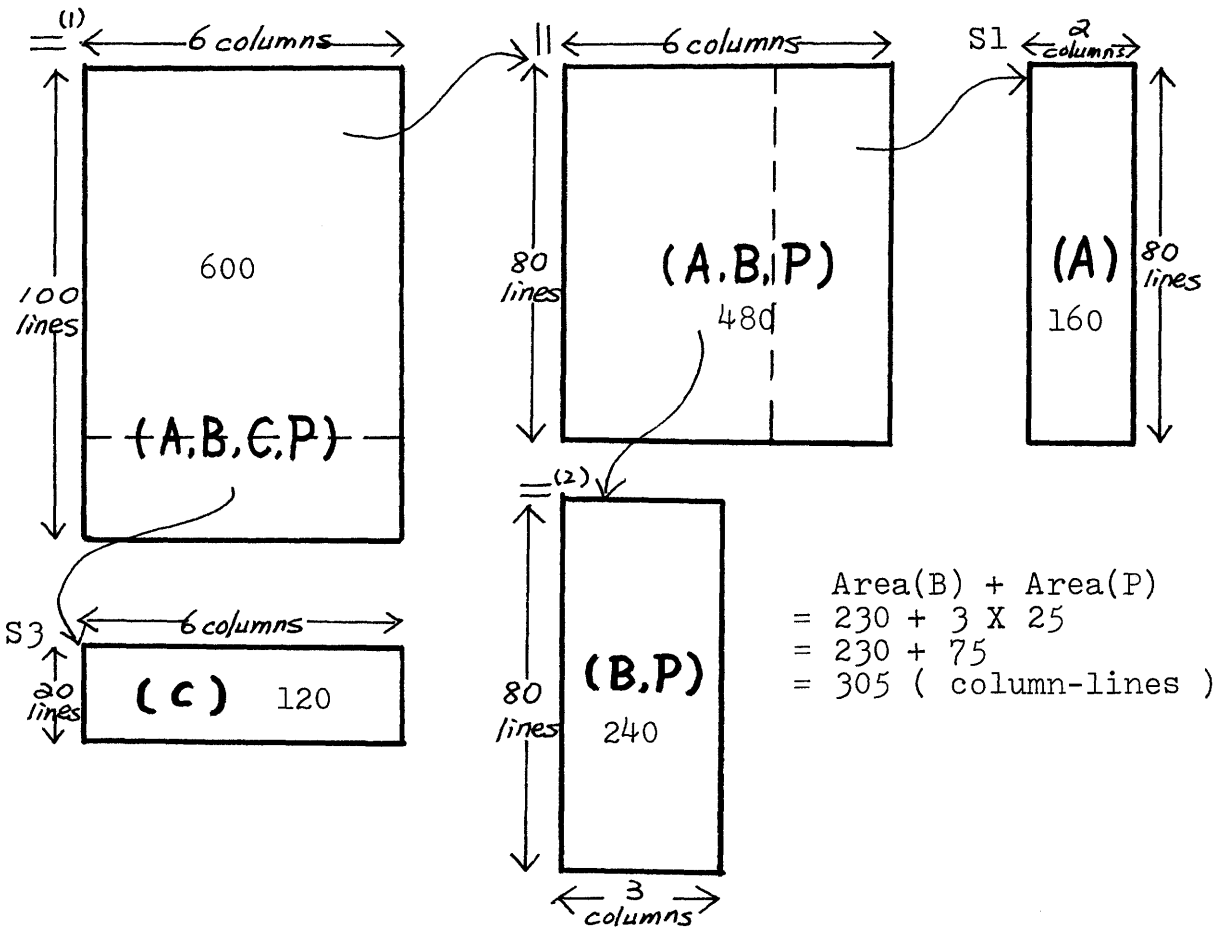
$$((P1 = S2) \parallel S1) = S3$$

is used as the structural guide for actual news item placement. The syntax-tree representation and traversing sequence of the template is shown in Fig. 5.6. Assume that story B has a higher importance ranking than story C; hence, story and picture selection 1 in Fig. 5.7(a) is tried first.

Figures 5.16(a) and (b) depict the results of the story and picture selection and the virtual-page construction, respectively, at various nodes. At the root node, the 600-



(a) Syntax Tree and Story Selection Results



(b) Unsuccessful Virtual Page Construction

Fig. 5.16 Example of Unsuccessful Layout

column-lines page is cut horizontally into two virtual subpages; one of 480 column-lines (that total area of story A, B, and picture P assigned to subnode ||), and the other of 120 column-lines (area of story C assigned to subnode S3). Then, during the visit to operator node || , the virtual page for subnode S1 is constructed successfully as 2-columns wide and 80-lines high allowing a $\pm 10\%$ leading tolerance. However, the virtual page of subnode $\equiv^{(2)}$ cannot be constructed successfully. The dimensions of that virtual page is required to be 3 columns by 80 lines because a 3-columns wide picture P is assigned to the subnode, and the page is constrained by the parent operator node to be 80-lines high. The area of the resultant virtual page (240 column-lines) cannot accommodate the assigned story B and picture P with a total area of 305 column-lines within the $\pm 10\%$ leading tolerance. Thus, layout of node $\equiv^{(2)}$ fails, and so does its parent node || . Hence, story and picture selection 2 of Fig. 5.7(b) is tried next.

Figure 5.17(a) depicts the syntax tree which results from story and picture selection 2. The numbers under the news items at each node are the total original areas of the news items selected for that node. Fig. 5.17(b) depicts the virtual pages constructed at each node, and the page areas are denoted by the numbers within the news blocks. In this

story sizes
(column-lines)

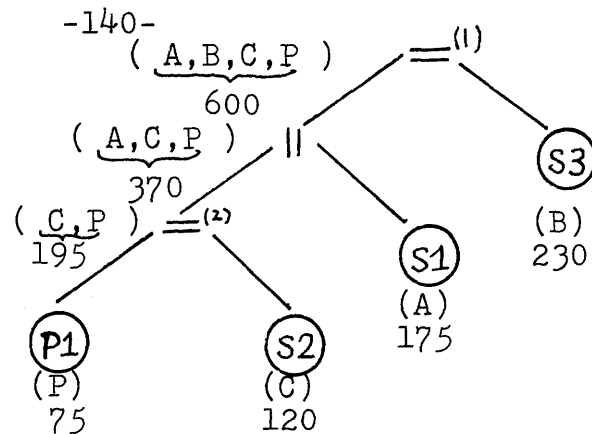
A : 175

B : 230

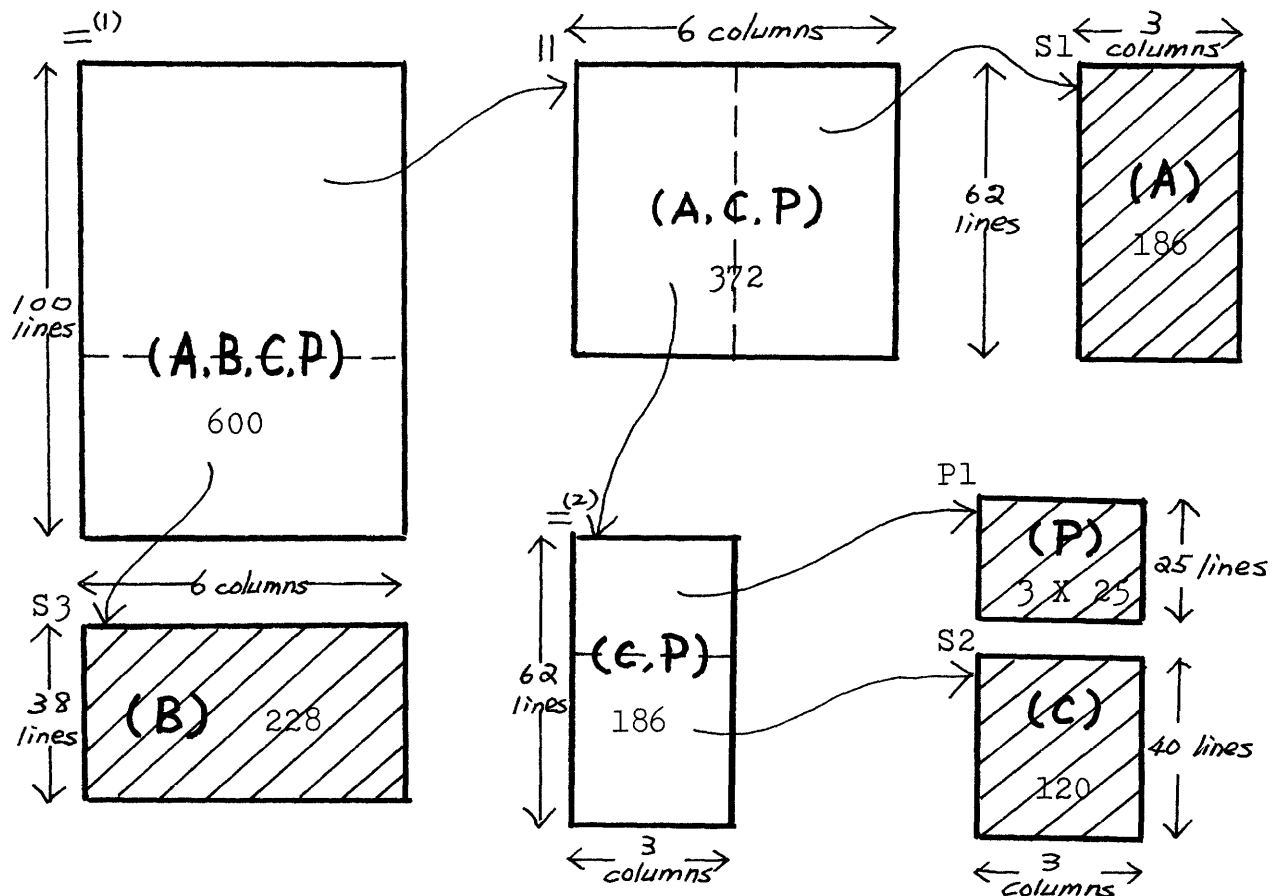
C : 120

picture dimensions
(columns X lines)

P : 3 X 25



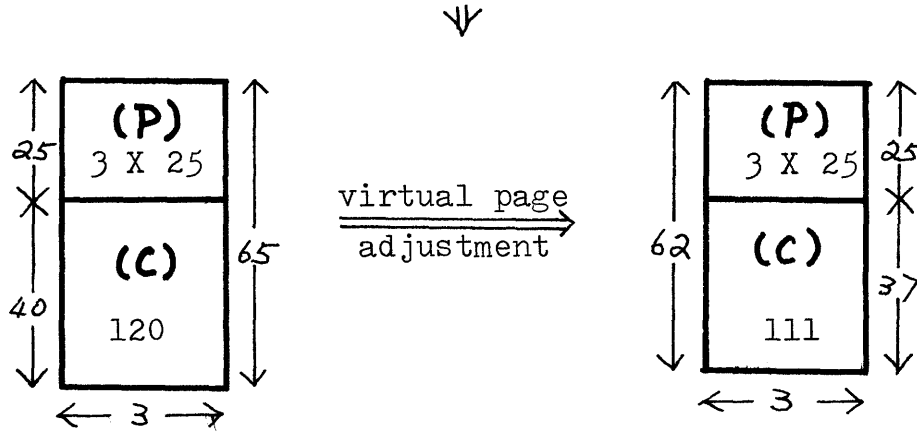
(a) Syntax Tree and Story Selection Results



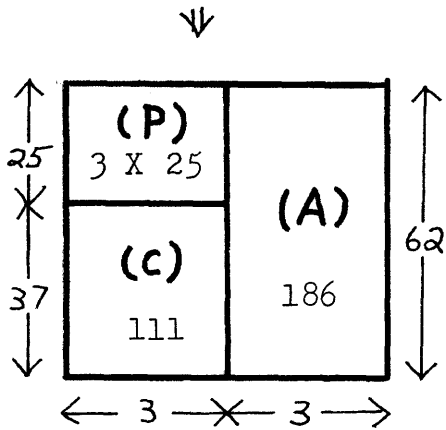
(b) Virtual Page Construction

Fig. 5.17 Example of Layout

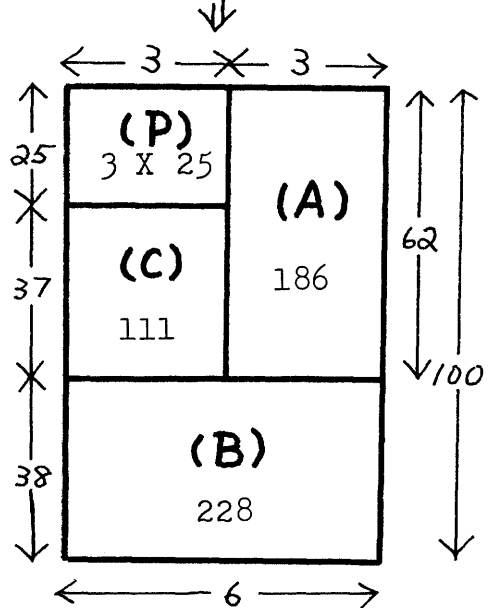
assembled virtual page of node $\equiv^{(2)}$



assembled virtual page of node II



assembled virtual page of root node $\equiv^{(1)}$



(c) Virtual Page Assembling

Fig. 5.17 (Continued)

case, a virtual page area within the specified leading tolerance of the selected news items can be obtained for each terminal node (shaded blocks of (b)); and thus the assembly can proceed starting from operator node $\equiv^{(2)}$. Figure 5.17(c) depicts the assembled virtual pages for each node of the syntax tree. Note that the assembled virtual page of operator node $\equiv^{(2)}$ is shortened by 3 lines in order to match the dimensions of constructed virtual page shown in (b). The assembled virtual page at the root node represents the final layout dummy where the areas of the news blocks are denoted by numbers. As the figure indicates, the structure of the news items placed on the page conforms to that specified by the layout template.

If any virtual page failed to be constructed successfully using story and picture selection 2 for node \equiv , no other acceptable story and picture selection combination is possible and a layout failure is identified.

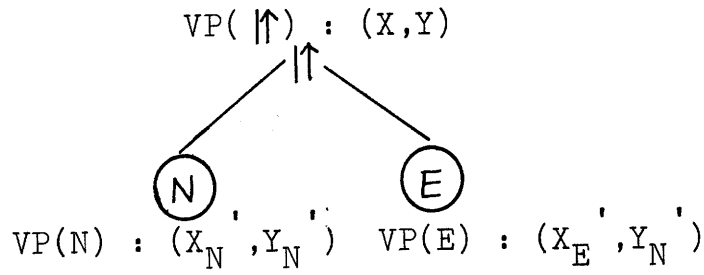
In the preceding discussion of layout techniques, layout templates are restricted to contain only basic or embedded operators. The next section describes the extension of such layout techniques to include the extended set of operators. Although the details of layout procedures are modified slightly, the basic layout concepts and techniques remains unaltered.

5.3 EXTENSION OF LAYOUT TECHNIQUES TO EXTENDED SET OF OPERATORS

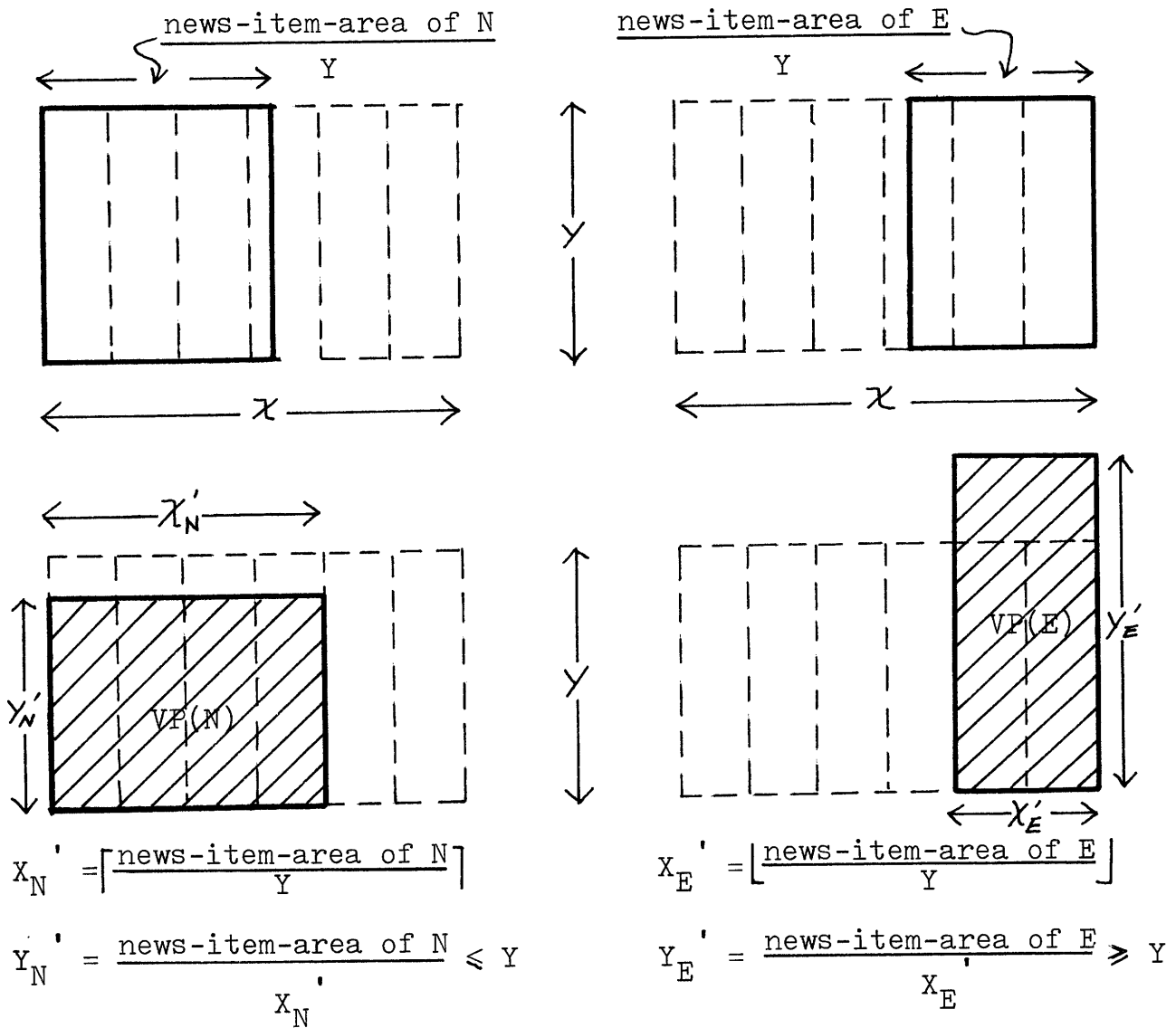
In this section there is discussed the necessary modifications of the basic layout techniques presented in the last section to include the extended set of operators. An extended operator, unlike a basic operator, does not require its operands to have the same dimension at their line of commonality. In other words, an extended operator differs from a basic operator only in that the virtual pages of its subnodes are no longer required to have either the same height, for an extended horizontal operator, or the same width, for an extended vertical operator. Therefore, in the determination of traversing sequence and selection of news items for its subnodes, the extended set of operators is treated exactly the same way as the basic or embedded set; only in the construction and assembly of virtual pages is a modification of layout techniques necessary.

5.3.1 Virtual-Page Construction for Extended Horizontal Operators

Consider an extended horizontal operator node such as the one shown in Fig. 5.18(a). As before, a rectangular news block (virtual page) is given for the operator node which matches the total area of the selected news items, and further, these news items are distributed to the two subnodes E and N. In accordance with the definition of the news language, the



(a)



(b)

(c)

VP = Virtual Page

Fig. 5.18 Virtual Page Construction for an Extended Operator

virtual page of the right subnode, VP(E), is required to be taller than that of the left subnode, VP(N). Hence, the interpretation of "cutting" the rectangular parent virtual page into two virtual sub-pages cannot be used for an extended operator node. Instead, two subnode virtual pages are constructed individually using different methods to determine their dimensions. For an extended operator node, the subnode whose area extends outward (with respect to its parent page area) is referred to as an extended subnode, while the subnode whose area does not extend is called a non-extended subnode. As examples, subnode E in Fig. 5.18(a) is an extended subnode, and subnode N is a non-extended subnode.

For the extended operator of Fig. 5.18(a), assume that X, Y are the given dimensions of the virtual page for the extended operator; and X_N' , Y_N' and X_E' , Y_E' are the dimensions of the virtual page VP(N) and VP(E) to be constructed, respectively. Then, the widths of the subnode virtual sub-pages are determined in the following way:

$$X_N' = \left\lceil \frac{\text{total area of news items selected for subnode N}}{Y} \right\rceil \quad (5-1)$$

where $\lceil X \rceil$ means the smallest integer greater than or equal to X.

$$X_E' = \left\lfloor \frac{\text{total area of news items selected for subnode E}}{Y} \right\rfloor \quad (5-2)$$

where $\lfloor X \rfloor$ means the largest integer less than or equal to X . Next, the heights of subnode virtual pages are calculated and rounded off to the nearest integer, as follows:

$$Y_N' = \frac{\text{total area of news items selected for subnode N}}{X_N'} \quad (5-3)$$

$$Y_E' = \frac{\text{total area of news items selected for subnode E}}{X_E'} \quad (5-4)$$

In other words, the virtual page of a non-extended subnode (such as subnode N in Fig. 5.18(a)) is shortened by rounding its width upward to the next integer column. On the other hand, for an extended subnode (such as subnode E in Fig. 5.18(a)), the width is rounded downward to its next integer column. That is, Equations (5-1) and (5-3) are used to calculate the dimensions for a non-extended subnode, and Equation (5-2) and (5-4) are for an extended subnode. As the result, two virtual pages of different heights are constructed, whose total width matches the width of the given parent virtual page.

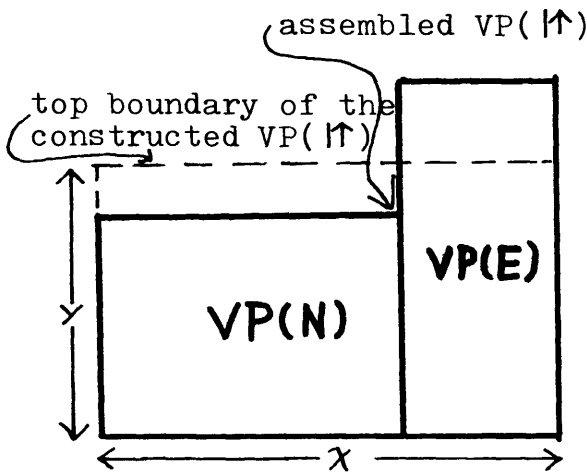
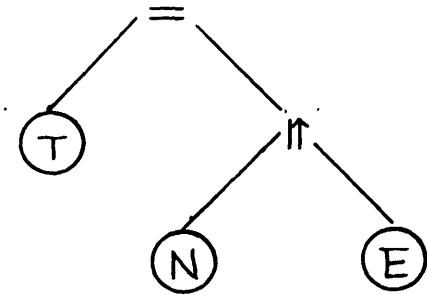
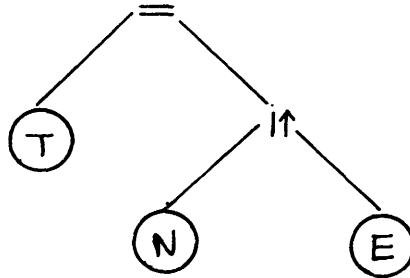
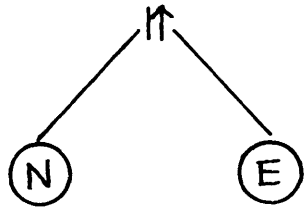
As an example, Fig. 5.18(b) and (c) depict the construction

process for the subnodes N and E, respectively. A 6-column parent virtual page is illustrated by dashed lines, and the resultant subnode virtual pages are denoted by shaded areas.

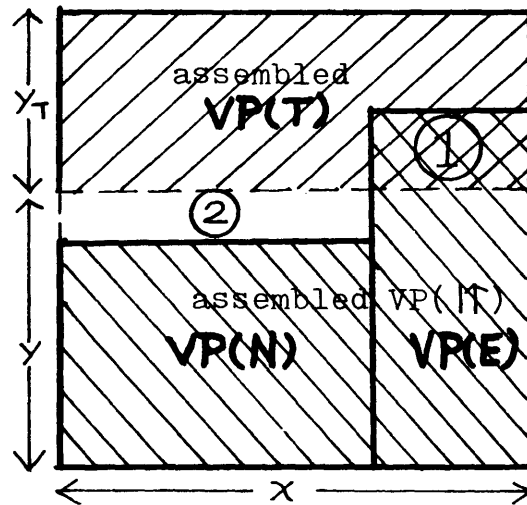
5.3.2 Virtual-Page Assembly for Extended Horizontal Operators

The assembling process of virtual pages with different heights is carried out the same way as before except the resultant assembled virtual page for the extended operator is no longer a rectangular news block. The subnode virtual pages are placed next to each other in such a way that either a flat top (for operator $\downarrow\downarrow$ and $\downarrow\downarrow$) or a flat base (for operator $\uparrow\uparrow$ and $\uparrow\uparrow$) is maintained. Since the assembling process requires that the assembled virtual pages have a straight line at their common boundary, the assembled non-rectangular virtual page for an extended operator uses an additional auxiliary line on the non-flat side for assembling with other nodes. The auxiliary line is the boundary line of previously constructed rectangular virtual page for the extended operator.

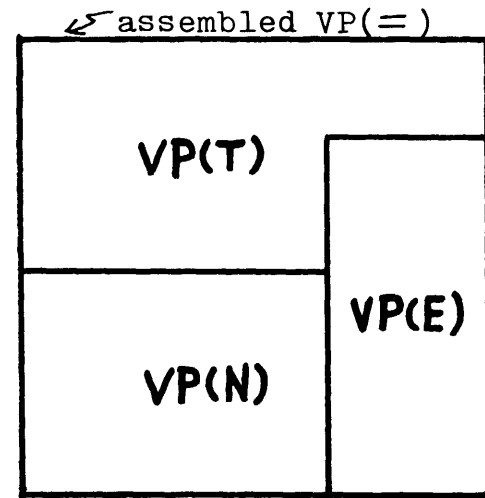
As an example, Fig. 5.19(a) depicts the assembled virtual page for the extended operator $\uparrow\uparrow$. The resultant virtual page, $VP(\uparrow\uparrow)$, has a flat base and a non-flat top boundary line. Therefore, the top line of the previously constructed virtual page for the operator (dashed line in (a))



(a)



(b)



(c)

Fig. 5.19 Virtual Page Assembly of an Extended Operator

is used as the auxiliary top boundary line for the assembled virtual page. When assembling this non-rectangular virtual page with other virtual pages, the straight auxiliary boundary line is actually attached beneath another assembled virtual page. Figure 5.19(b) depicts this situation where the virtual page of operator node \uparrow is placed beneath the virtual page of a terminal node T. The assembled virtual pages of operator node \uparrow and the terminal node T are denoted by shaded areas. Due to the different heights of VP(N) and VP(E) at the boundary of the two assembled virtual pages, the virtual page of the terminal node VP(T) is reshaped accordingly to create a contiguous rectangular assembled virtual page for the operator node. The resultant overall assembled virtual page for the operator node \uparrow is depicted in Fig. 5.19(c). Note that the size of the terminal virtual page VP(T) is retained during the reshaping process. That is, the virtual page of the terminal node, VP(T), has lost the area ① but is complemented by an exact same size area ②, as shown in Fig. 5.19(b).

Should a virtual page consisting of two or more assembled virtual sub-pages be placed on top of the virtual page for the operator node \uparrow , some size adjustment may have to be made to the virtual sub-pages. If the adjustment can not be made satisfactorily, that is, each virtual sub-page can

not be adjusted to a size close enough to the specified size of the original news item, the assembling process of the extended operator is considered a failure.

For example, assume the terminal node in the previous example is replaced by a horizontal operator \parallel with two story terminal nodes, T_1 and T_2 . That is, the assembled virtual page placed on top of the extended operator virtual page now consists of two sub-pages. Figure 5.20(a) depicts the complete syntax tree and the assembled virtual pages for the basic operator node $\uparrow\uparrow$ and the extended operator node $\uparrow\uparrow$. Figure 5.20(b) depicts how these two virtual pages are assembled together, where the shaded areas denote the virtual sub-pages. The resultant virtual page for the operator node $=$ is depicted in (c). By comparing (b) and (c), one should notice that the virtual-page area of terminal node T_2 is reduced (giving away area ① and gaining a smaller area ②), while virtual-page area of terminal node T_1 is expanded (adding area ③). If the area change is sufficient to make it intolerable after counting the leading allowance, an attempt is made to shift the vertical common boundary line of $VP(T_1)$ and $VP(T_2)$ to the left by one column. The area of the new $VP(T_1)$ and $VP(T_2)$, as shown in (d), is then rechecked. Should the area difference still be outside the leading tolerance, the assembling process for the extended operator

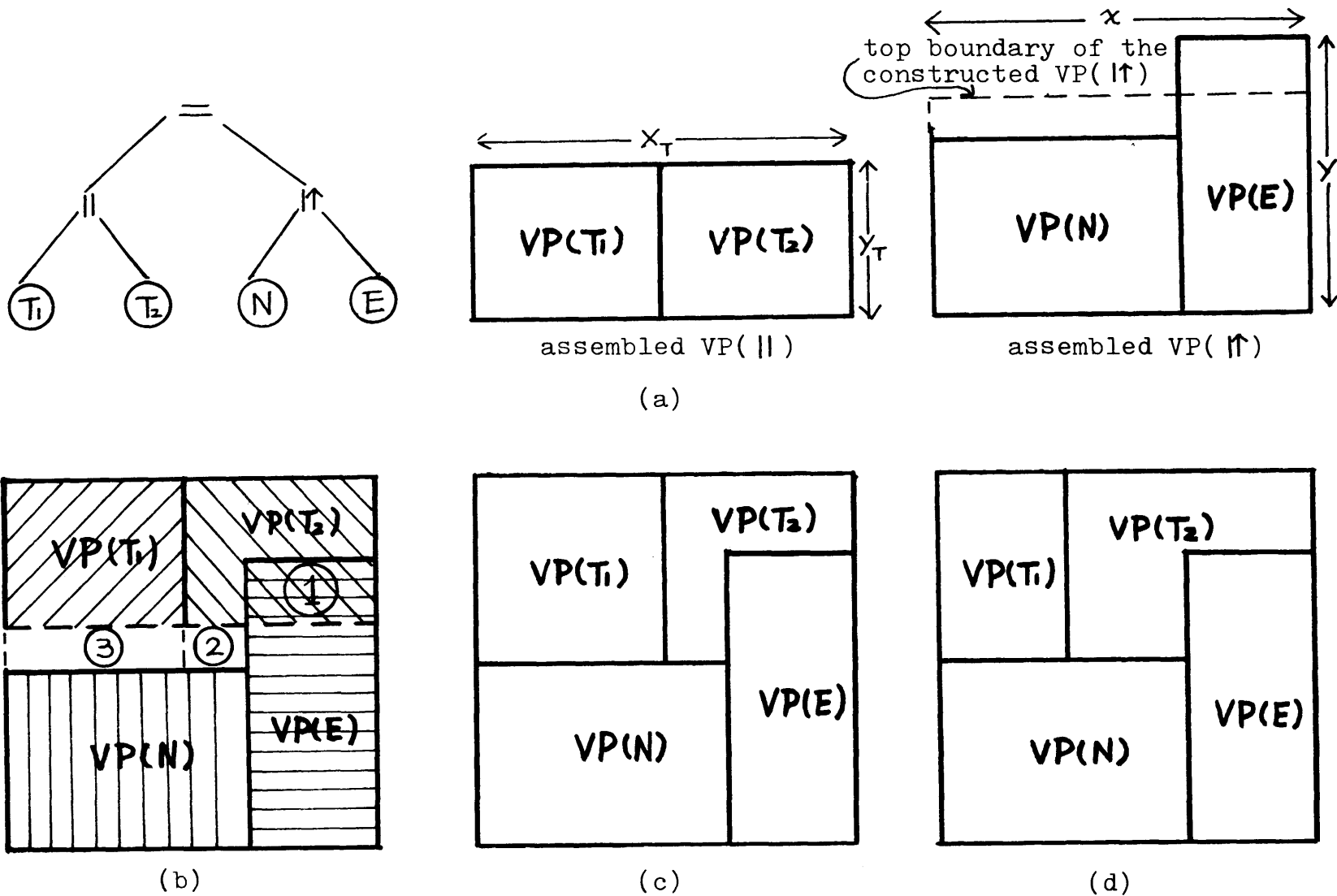


Fig. 5.20 Size Modification and Check of Neighboring Virtual Pages

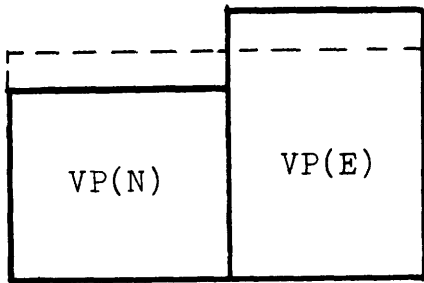
is then considered to have failed.

In our previous discussion of assembling virtual pages for the extended set of horizontal operators, we used extensively a particular operator, namely \uparrow , for illustration. However, the same techniques can also be applied to the other extended horizontal operators. Figure 5.21 depicts the assembled virtual page for each extended horizontal operator. The auxiliary straight boundary line for the assembled virtual page is denoted by dashed lines. The previously described virtual-page-size modification and check is carried out for the neighboring virtual page attached to the auxiliary boundary line.

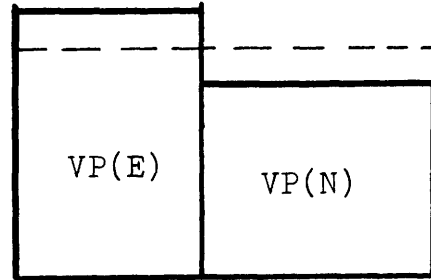
5.3.3 Virtual-Page Construction and Assembly for Extended Vertical Operators

In the construction of virtual pages for subnodes of extended vertical operators, the virtual page of a non-extended subnode is set to be one column less than its parent virtual page. That is, assuming that X and Y are the dimensions of the given parent virtual page for the extended vertical operator, the dimensions (X_N', Y_N') of the non-extended subnode virtual page, $VP(N)$, is determined as follows:

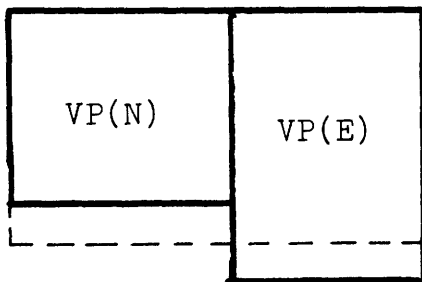
$$X_N' = X - 1 \quad (5-5)$$



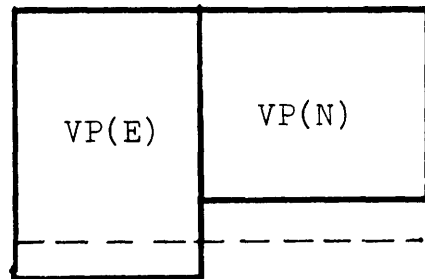
(a) VP(\uparrow)



(b) VP(\uparrow)



(c) VP(\downarrow)



(d) VP(\downarrow)

Fig. 5.21 Assembled Virtual Pages for Extended Horizontal Operators

$$Y_N' = \frac{\text{total area of news items selected for the non-extended subnode N}}{X_N'} \quad (5-6)$$

where Y_N' is rounded off to the nearest integer.

Then the dimensions (X_E', Y_E') of the extended subnode virtual page, $VP(E)$, is calculated in the following manner:

$$Y_E' = Y - Y_N' \quad (5-7)$$

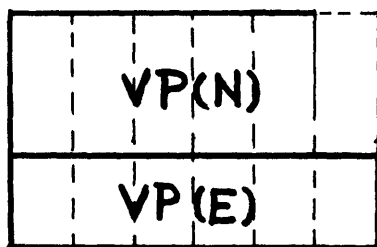
$$X_E' = \frac{\text{total area of news items selected for the extended subnode E}}{Y_E'} \quad (5-8)$$

where X_E' is rounded off to the nearest integer.

As a result, two subnode virtual pages of different widths are constructed whose total height is the same as the height of their parent virtual page. The width of virtual page $VP(E)$ is either greater than or equal to the width of the parent virtual page, depending on the relative size and shape of the two subnode virtual pages. If the virtual page of subnode N is large enough and wide enough to allow the 1-column area reduction to be absorbed by the leading tolerance, then the extended-subnode virtual page need not be widened. Otherwise, the virtual page $VP(E)$ has to be extended by one column to keep the total area of the two-subnode virtual page close to that of the given parent virtual page.

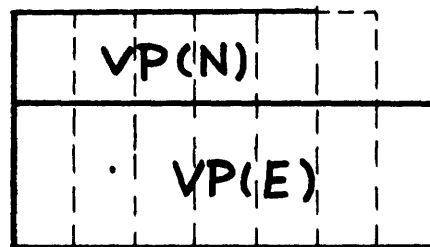
Figure 5.22 depicts these two possibilities for an extended vertical operator \Rightarrow with a 6-column wide virtual page. The dashed lines indicate the given virtual page for the extended operator.

As to the assembly of subnode virtual pages for extended vertical operators, the techniques used in 5.3.2 for extended horizontal operators can be applied. That is, subnode virtual pages are placed on top of each other to create a non-rectangular assembled virtual page with either a flat left-hand or right-hand side, depending on the particular operator. In the assembling process of the extended operator virtual page with other virtual pages, the previously constructed parent virtual page is used to determine the auxiliary boundaries for the non-flat side. Furthermore, virtual-page size modification and an area check are also performed for a virtual page attached to the non-flat side of the assembled virtual page. Figure 5.23 depicts the assembled virtual page for each extended vertical operator where the auxiliary boundaries are denoted by dashed lines.



one-column width difference

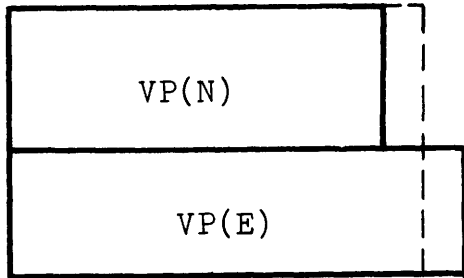
(a)



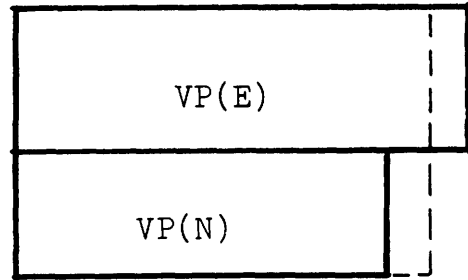
two-column width difference

(b)

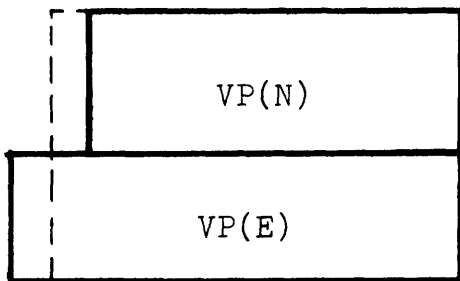
Fig. 5.22 Virtual Page Construction for Extended Vertical Operator



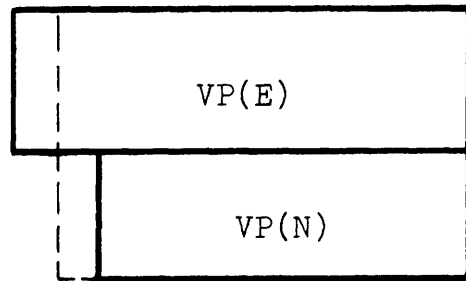
(a) $VP(\Rightarrow)$



(b) $VP(\Rightarrow)$



(c) $VP(\Leftarrow)$



(d) $VP(\Leftarrow)$

Fig. 5.23 Assembled Virtual Pages for Extended Vertical Operators

5.4 EXTENSION OF LAYOUT TECHNIQUES TO PAGES WITH DISPLAY-ADS

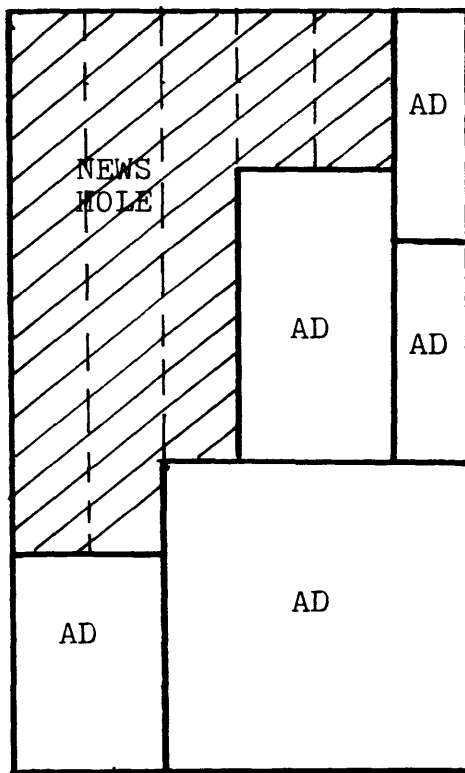
So far we have restricted the application of these layout techniques to pages without display-ads. In this section we extend the non-ads page-layout techniques to accommodate pages with ads, using a full-page non-ads layout template as a layout guide.

The layout of pages with ads differs from previously presented full-page layout techniques primarily in that the virtual pages (or news blocks) in the layout in general have non-rectangular shapes. Although the virtual-page concept of layout can still be applied, a virtual page can no longer be described by only two numbers which represent the width and height of a rectangular news block.

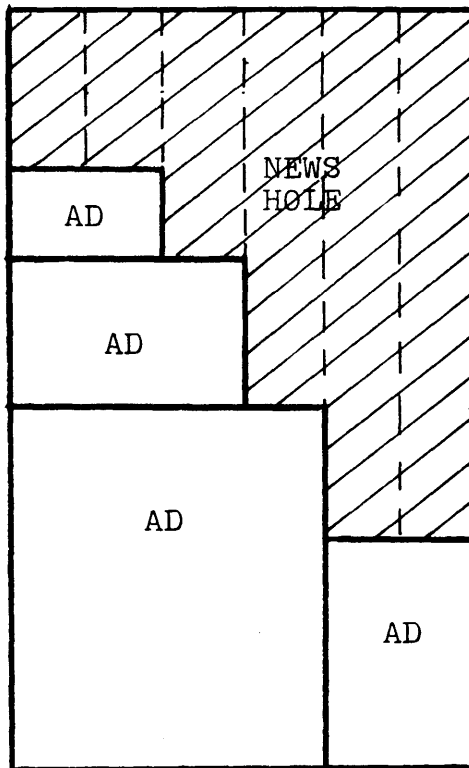
5.4.1 Non-Rectangular Virtual-Page Description

Figure 5.24 depicts three possible ads-layout styles, where the shaded areas denote the resultant news-hole. As depicted in the figure, all ads-layout styles follow the so-called "pyramid rule" which requires:

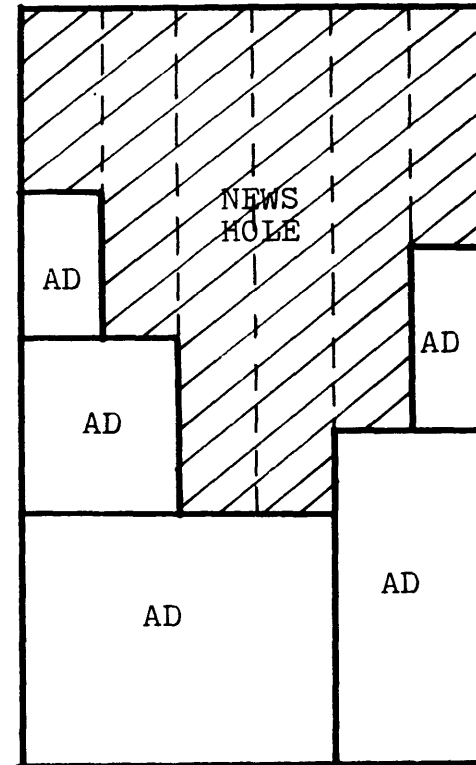
- (1) the width of an ad placed on top of another ad must be less than or equal to the width of the bottom ad.
- (2) the height of an ad to one side of another ad towards the center of the page must be less than or equal to the height of the outer ads.



(a) Right-Pyramid



(b) Left-Pyramid



(c) Double-Pyramid

Fig. 5.24 Ads Layout Styles and Its Remaining News-Hole

As the result, the remaining non-rectangular news-hole is always in a upside-down pyramid shape with a flat top boundary. Such a non-rectangular virtual page can be described uniquely and unambiguously by an array of numbers indicating the length of the news area in each column.

As an example, Fig. 5.25 illustrates a typical 8-column upside-down pyramid virtual page area along with its numerical representation. The virtual page description, an array of numbers on top of the page, indicates the length (in terms of vertical measuring units such as lines) of the area in each column.

Numerical Description of the Non-Rectangular Virtual Page

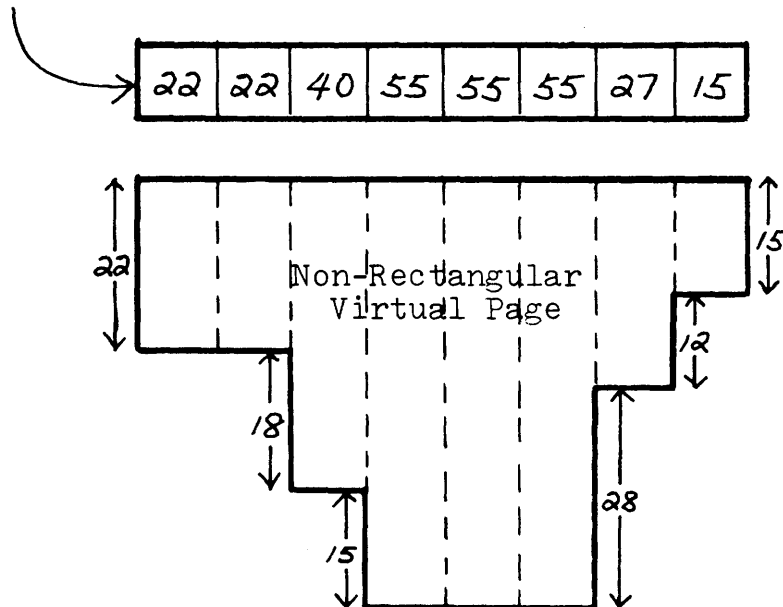


Fig. 5.25 Non-Rectangular Virtual Page and Its Numerical Description

5.4.2 Subnode Traversing Sequence

Being able to describe a non-rectangular virtual page appropriately, the basic layout technique of traversing the layout syntax tree and the notion of virtual page-layout can thus be applied easily to pages with ads. As before, the layout of a news page is accomplished by traversing the nodes of the syntax tree in a prescribed order. Furthermore, during the visit of each node, certain layout actions are performed, such as determining the subnode traversing sequence, and constructing and assembling the virtual sub-pages for subnodes.

In the determination of subnode traversing sequence, subnodes are first grouped into pairs according to their positions in the subtree. Figure 5.26 depicts how the subnodes are grouped into pairs. For operator node with odd number of subnodes, the last pair contains only one subnode. The pair of outer-most two subnodes is assigned the highest priority, and the inner pairs of subnodes are assigned lower priority. In other words, subnodes in the first pair P1 are traversed before subnodes in P2, P2 is before P3, and so forth. Within each pair, the traversing precedence of the two subnodes is determined in the same way as discussed in section 5.2.1; for a vertical construction operator node, an operator subnode has precedence over a terminal subnode, and vice versa for a horizontal construction operator node.

5.4.3 Construction and Assembly of Non-Rectangular Virtual Pages

During the layout of an operator node, news items assigned to the node are distributed to its subnodes according to the number, as well as the type, of the terminal descendants each subnode has. A news block, called a virtual page, is then constructed for each subnode, whose area matches the total area of the news items selected for the subnode. For layout of pages with ads, the given news-hole is non-rectangular, and so are the news blocks constructed for the subnodes.

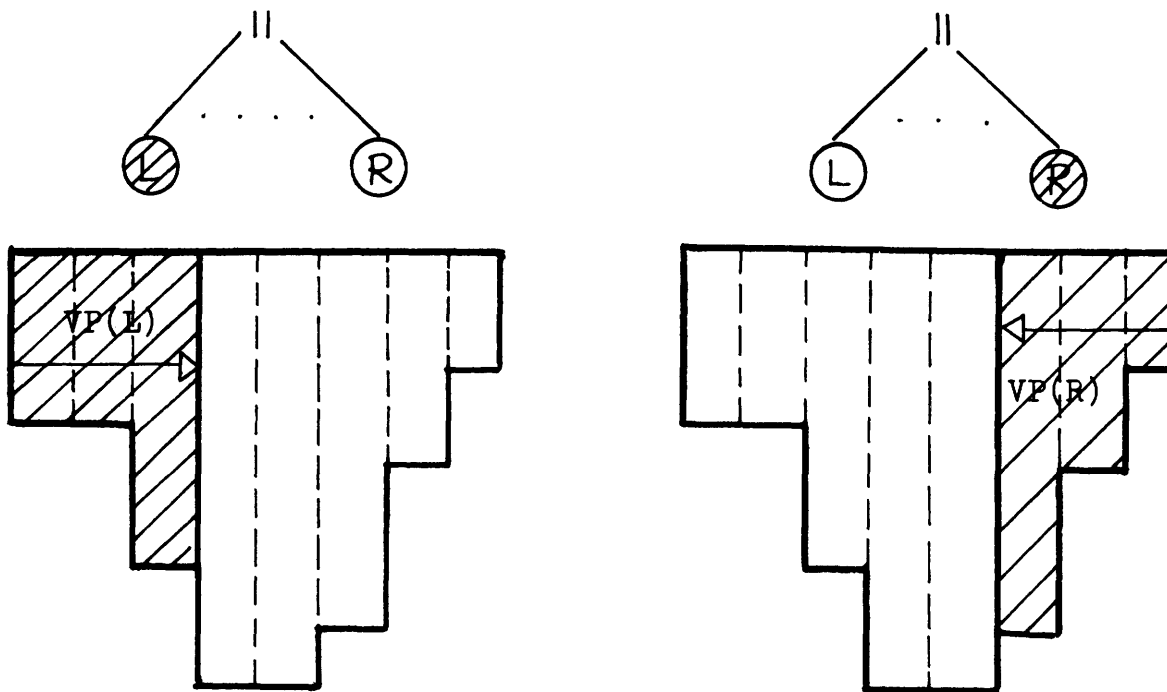
The non-rectangular virtual pages for subnodes are constructed following the same order as the subnode traversing sequence. In other words, virtual pages of outer subnodes are constructed before the inner subnodes. For each subnode, the virtual page is constructed by cutting off from the parent non-rectangular virtual page an area which, within the leading tolerance, matches the total area of the news items selected for the subnode. For vertical or horizontal construction type operator nodes, the cutting of the parent virtual page is made either vertically or horizontally and the subnode virtual page area is cut from one of the four sides of the parent page, depending on the type of the parent operator node and whether the subnode is a left or right subnode in the traversing precedence pair to which it belongs.

For an embedded-type operator node, the virtual page of the left subnode is the same as its parent virtual page, and the virtual page of the right subnode is cut from one of the three allowable corners of the parent virtual page.

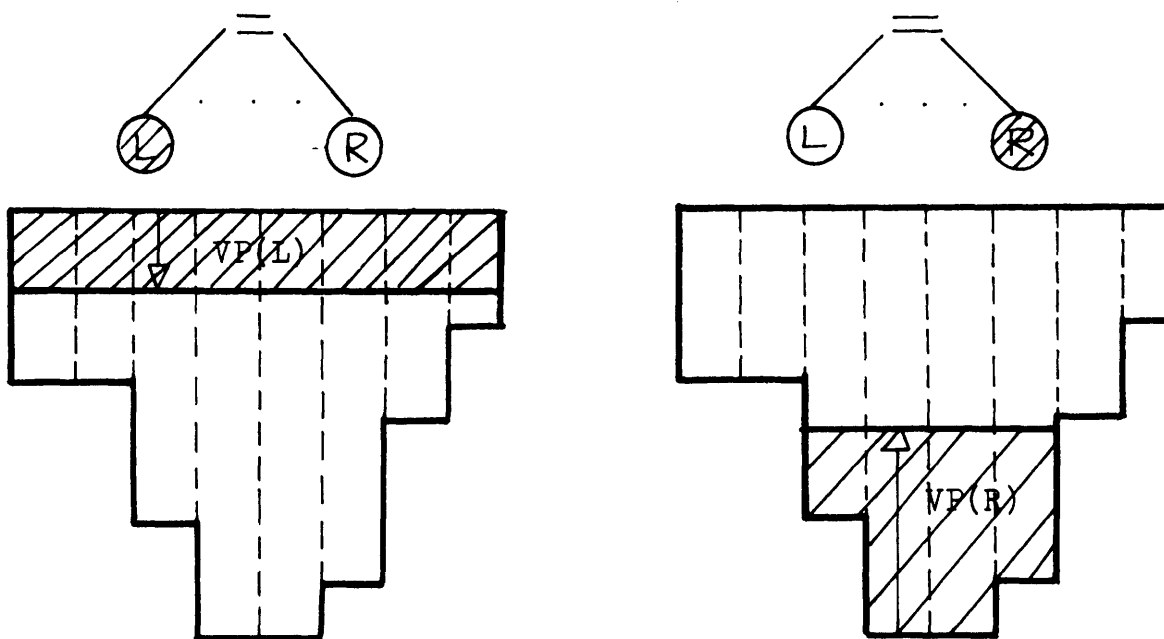
Figure 5.27 depicts how the cutting of the virtual sub-page is made for the pair of left-most and right-most subnodes L and R, respectively. In each case, the constructed virtual sub-pages, that is, the areas being cut off, are denoted by shaded areas. Note that the area being cut should match the total area of news items selected for the subnode. The arrows in the figures indicate the directions that the cutting lines are moved to accumulate an appropriate area.

After the virtual page for a subnode is constructed, that is, cut from its parent virtual page, the parent virtual page is then used as the current parent virtual page for construction of the next subnode virtual page. As a result, the virtual page of the last subnode to be traversed is the finally reduced parent virtual page.

As an example, Fig. 5.28 illustrates the virtual-page cutting process and the reduced parent virtual page at each stage for an operator with three subnodes L, M, and R. The non-rectangular news block (291 column-lines) depicted in Fig. 5.25 is used as the parent virtual page, and the news-item

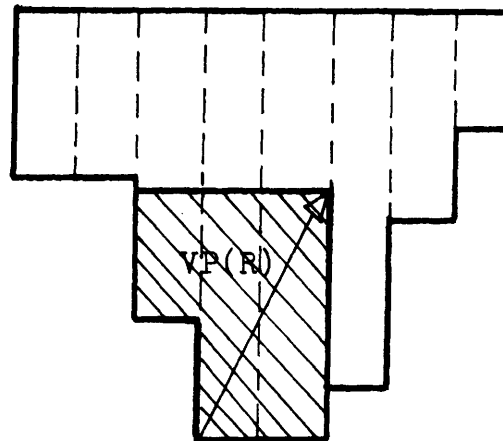
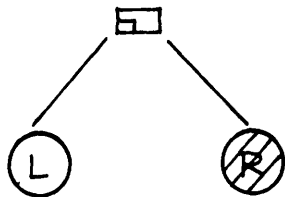
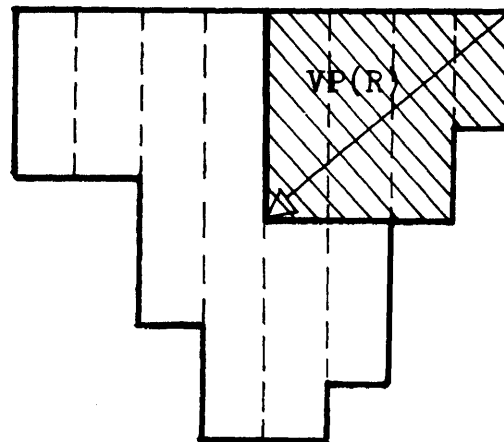
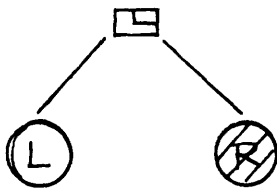
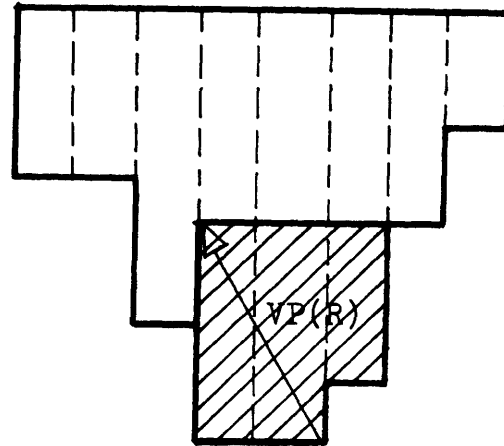
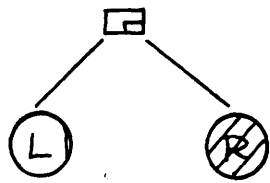


(a) Horizontal Construction Operator Node



(b) Vertical Construction Operator Node

Fig. 5.27 Cutting of Virtual Sub-Pages



(c) Embedded Operator Node

Fig. 5.27 (Continued)

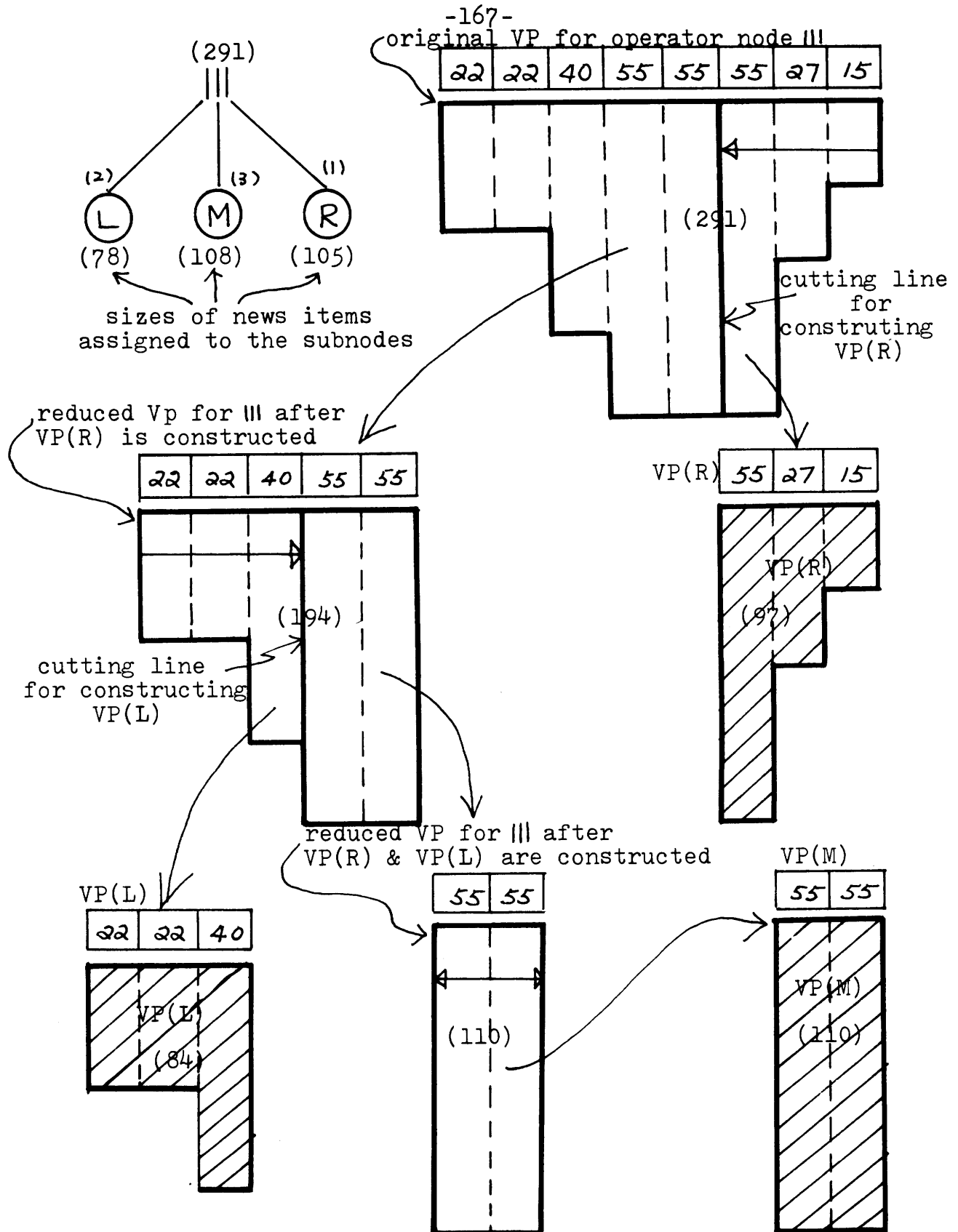
areas assigned to the subnodes L, M, and R are 78, 108, and 105 column-lines, respectively. Assume that subnode R is traversed first, then subnode L, and finally subnode M. Figures 5.28(a) and (b) depict the construction process for a horizontal and vertical operator node, respectively. The constructed subnode virtual pages are indicated by shaded areas, and the area of the virtual page constructed at each stage is denoted by parenthesized numbers within the news block area. The area is calculated by summing the numbers in the array on top of the news block.

Note that the virtual page constructed for subnode R in Fig. 5.28(b) has a very small area (2 lines high, one column wide) in the right-most column. Thus, this layout is inadequate for accommodating the headline of the story placed in VP(R).

In order to solve this problem, two numbers associated with each horizontal cutting line are defined.

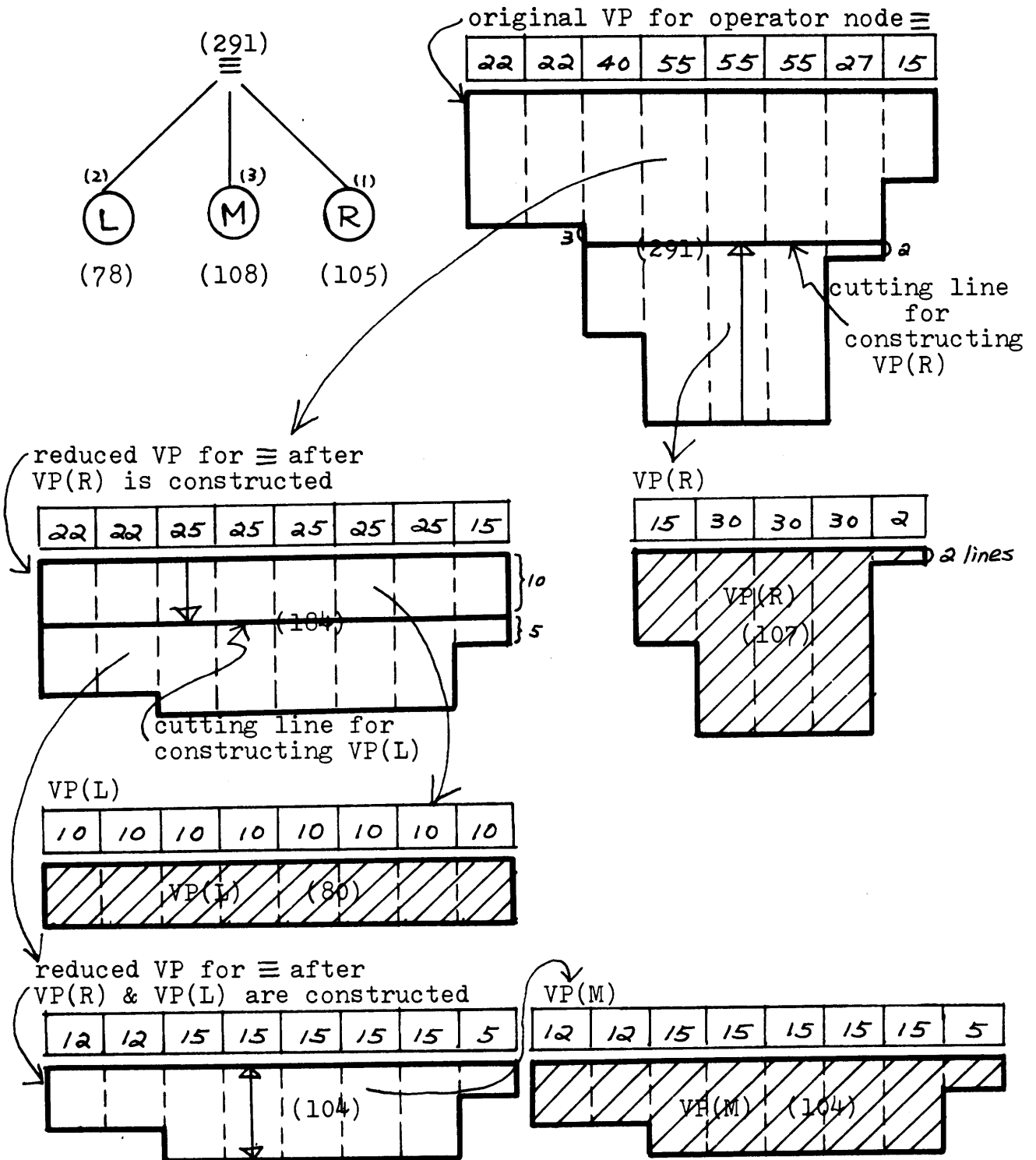
Overhead Distance --- the distance between the horizontal cutting line and the next transition (lower than the cutting line) of column heights.

Latency Distance --- the distance between the horizontal cutting line and the last transition (higher than the cutting line) of column heights.



(a) Horizontal Operator Node

Fig. 5.28 Construction of Non-Rectangular Virtual Pages



(b) Vertical Operator Node

Fig. 5.28 (Continued)

Figure 5.29 shows the overhead and latency distances for a typical horizontal cutting line. Note that the next lower or last higher column-height transition points can be either on the left-hand or right-hand side of the virtual page.

For layout of pages with ads, users are required to specify the minimum allowable overhead and latency distance. During the construction of subnode virtual pages for an vertical-operator node, the resultant overhead and latency distance for each cutting line is compared to the user specified minimum distance. If the distance is less than the minimum requirement, an attempt is made to move the line either upwards or downwards in order to reach the specified minimum-distance requirement. Should such a move be non-acceptable

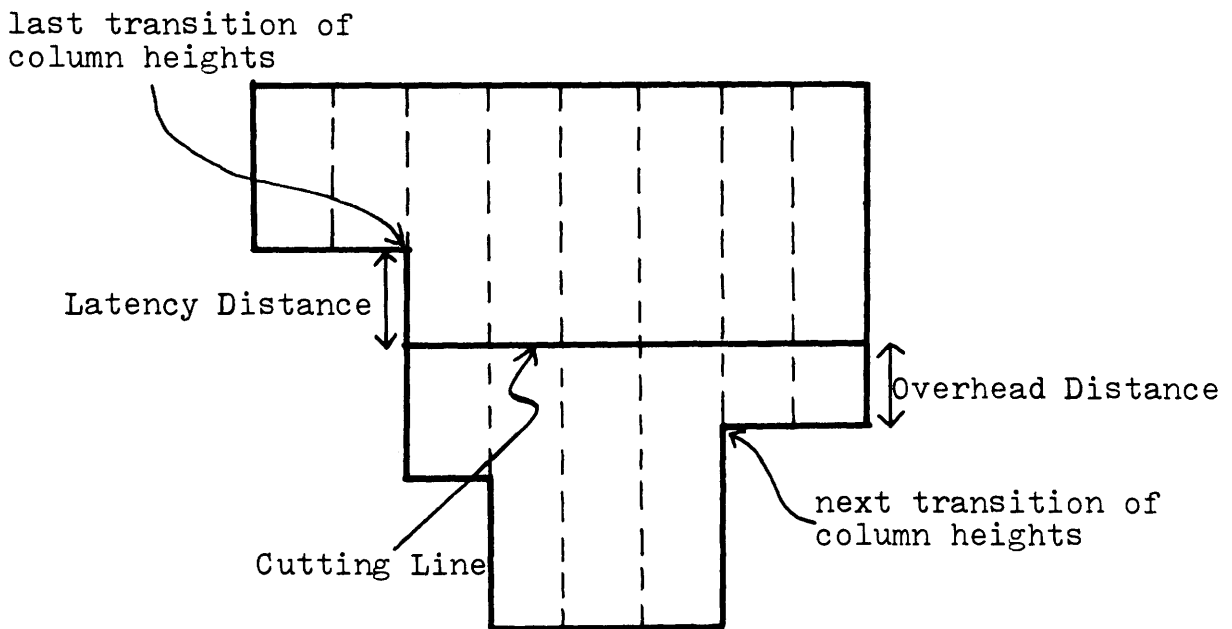
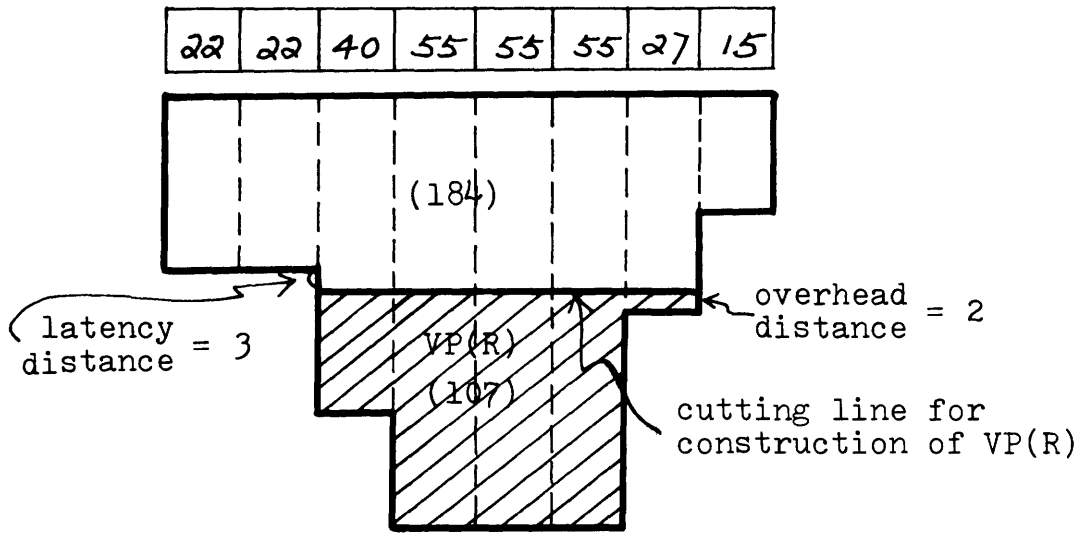


Fig. 5.29 Overhead and Latency Distance

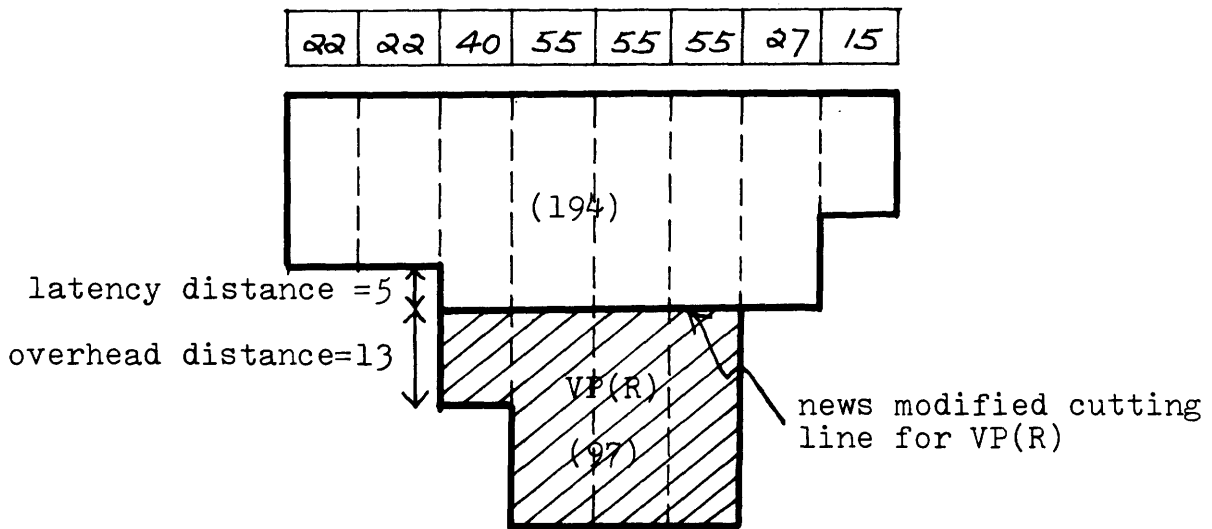
due to the area constraint of the news items, the construction of the subnode virtual page is considered to have failed.

As an example, assume the minimum overhead and latency distance for the layout depicted in Fig. 5.28(b) are specified as 5 and 3 lines respectively. The cutting of VP(R) from the original virtual page results in a 2 line overhead-distance and a 3 line latency-distance. Since the overhead-distance is less than the minimum requirement of 5 lines, the cutting line is moved downward by 2 lines to eliminate the top small area in the last column of VP(R). Figure 5.30 depicts the original and the modified cutting line. The new modified cutting line in (b) now has a 13-line overhead and 5-line latency distance, and creates a VP(R) of 97 column-lines. Since the difference between 97-column-lines VP(R) and the specified 105 column-lines for subnode R can be offset by a ± 10 percent leading, the VP(R) is thus constructed successfully.

Although the constructed virtual sub-pages are non-rectangular, they all have a flat line at their boundary of commonability due to the use of straight cutting lines during the construction. As the result, the techniques of assembling the sub-pages presented in section 5.2.4 can also be applied to the assembling of non-rectangular virtual pages without any modification.



(a)



(b)

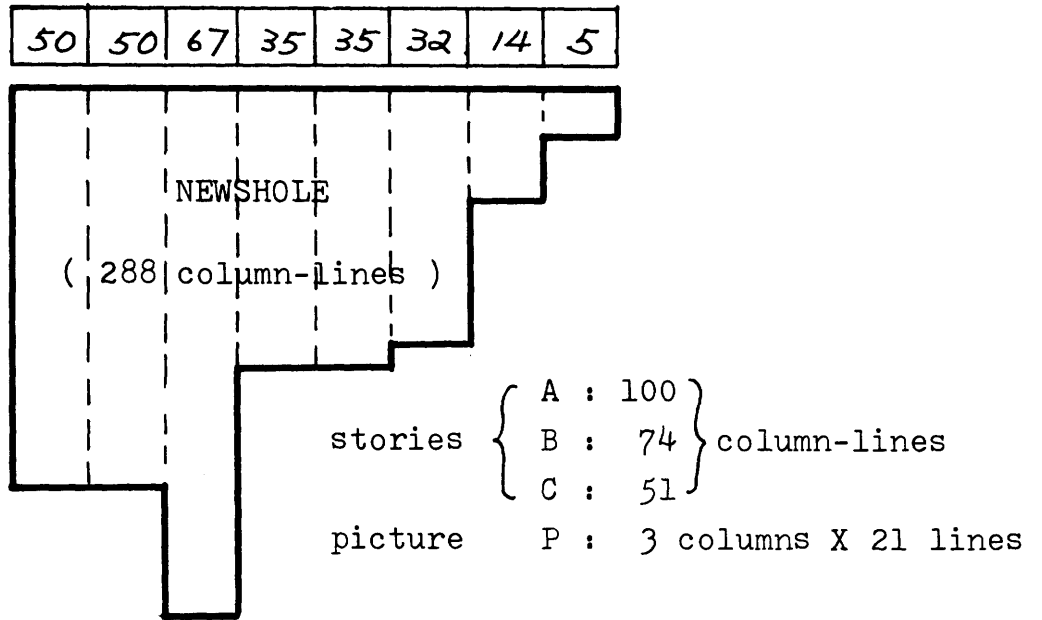
Fig. 5.30 Modification of Virtual Page Cutting Line

5.4.4 Layout Example of a News Page with Ads

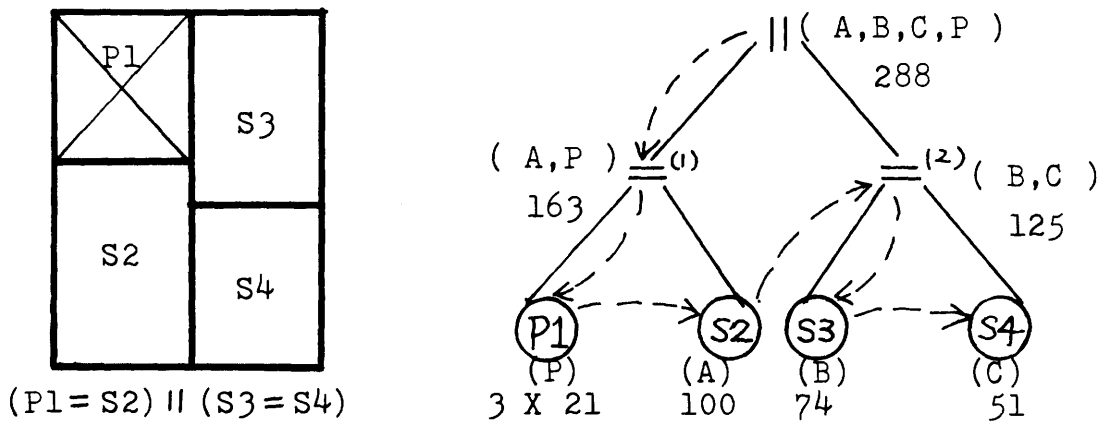
Consider the layout of a 288-column-lines non-rectangular news-hole area, as depicted in Fig. 5.31(a). Three stories A, B, and C, and one stand-alone picture P are assigned to the area. The areas of stories A, B, and C are 100, 74, and 51 column-lines, respectively; and the picture dimensions are 3 columns by 21 lines. Note that the total area of the four news items matches the area of the given news block, which is the result of the story-and-picture-assignment process.

The non-ads layout template $(P1 = S2) || (S3 = S4)$ is used as the structural guide for the news-item placement. The layout template and its syntax-tree representation is depicted in Fig. 5.31(b) where the two vertical operators are denoted as $\equiv^{(1)}$ and $\equiv^{(2)}$. Assuming that story A has the highest and story C the lowest importance ranking, the news items are selected for each node as listed within the parentheses in the figure. The numbers under the news items are the total areas of the news items selected for the nodes.

Figure 5.32(a) depicts the various stages during the construction of virtual pages for each node. At the root node $||$, the virtual page of operator node $\equiv^{(1)}$ is constructed by cutting off a three-column area (167 column-lines) from the left-hand side of the given non-rectangular news block.



(a) Given News-Hole and Story-Assignment Results

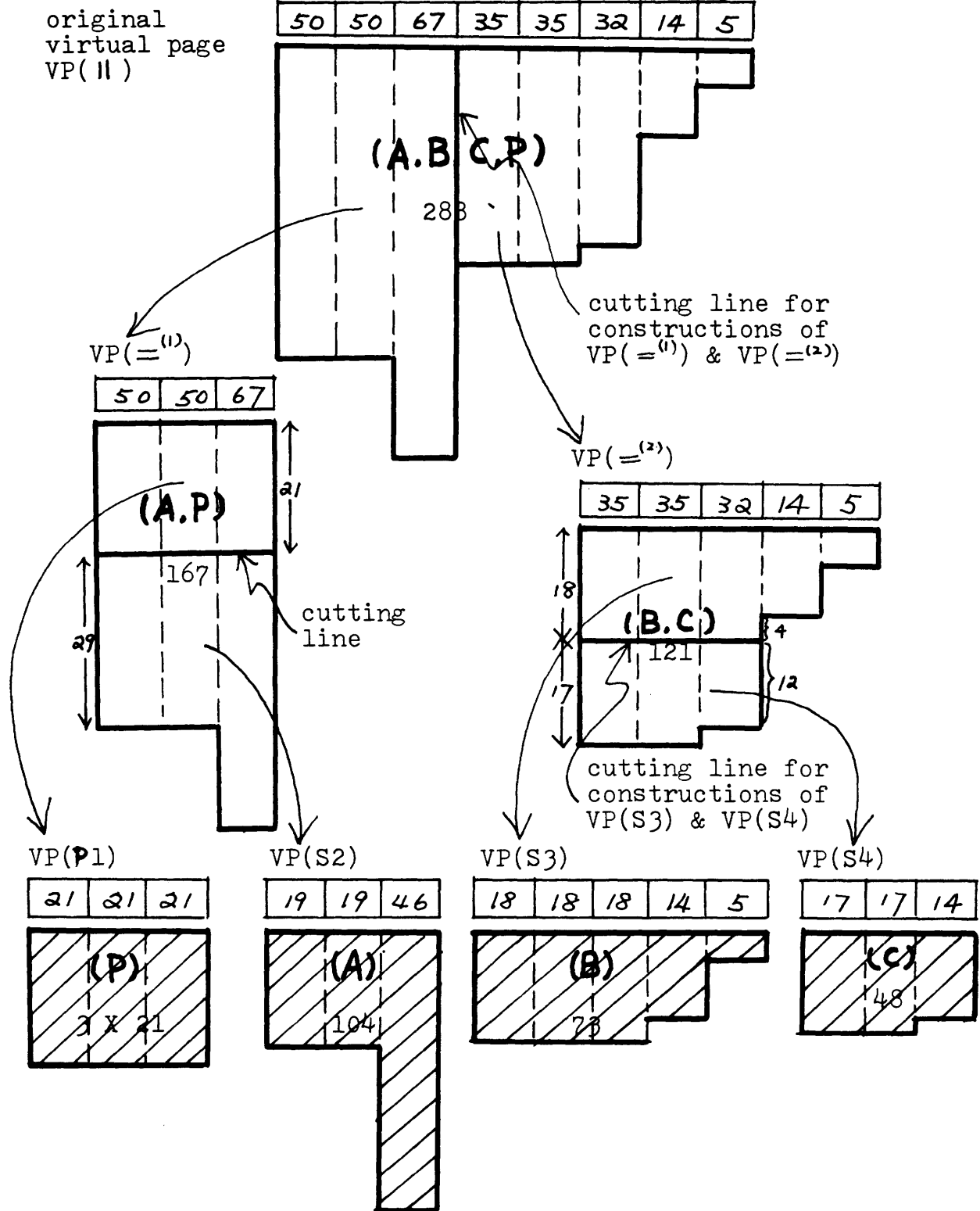


(b) Layout Template and Its Syntax Tree

Fig. 5.31 Inputs Of Layout Example

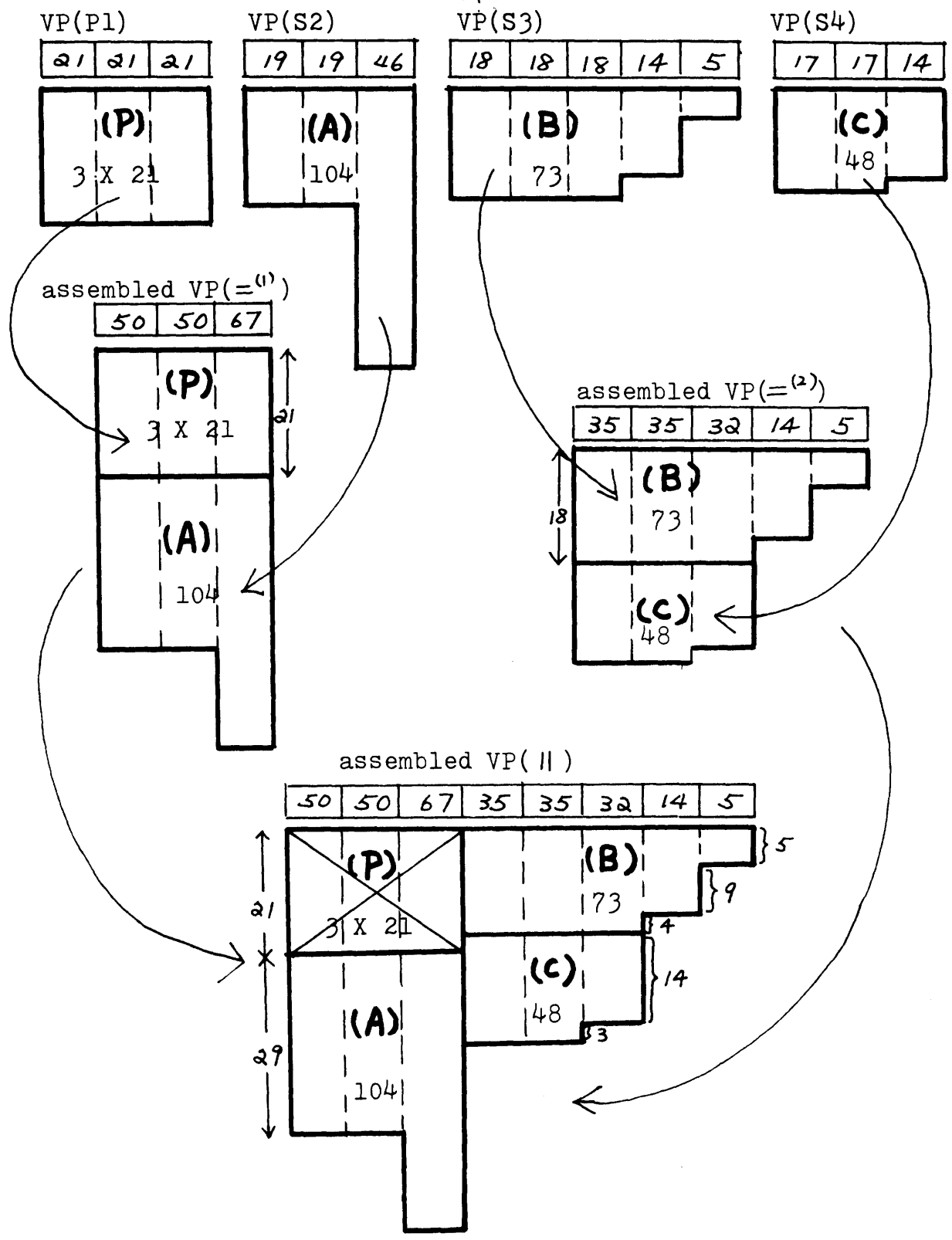
The remaining area (121 column-lines) becomes the virtual page for the other operator node $\equiv^{(2)}$. If a 10 percent leading tolerance is assumed, the areas of these two virtual pages (167 and 121 column-lines) are within the allowable tolerance of their original total area specifications (163 and 125 column-lines), respectively. Each constructed virtual page is further cut horizontally to create two terminal virtual sub-pages. If the minimum overhead and latency distances are specified as 5 and 3 lines respectively, all four terminal virtual pages satisfy these requirements and are constructed successfully. The resultant terminal virtual pages, VP(P1), VP(S2), VP(S3), and VP(S4), are shown as shaded areas in Fig. 5.32(a) where the number in each virtual page denotes the area of the page.

Since a virtual page whose area is within the specified leading tolerance of the selected news item can be obtained for each terminal node, the assembling process can thus proceed starting from the operator node $\equiv^{(4)}$. Figure 5.32(b) depicts the assembled virtual pages for each node of the syntax tree. The final assembled virtual page at the root node represents the news layout dummy where the news-item identification and its area are denoted within each news block. As the figure indicates, the structure of the news items



(a) Constructions of Virtual Pages

Fig. 5.32 Layout Example of News Page with Ads



(b) Assembly of Virtual Pages

Fig. 5.32 (Continued)

placed on the page conforms to that specified by the layout template.

In summary, this chapter presents all the basic techniques needed to place the assigned stories and pictures on pages using a layout template as a structural guide. A symbolic layout template is first parsed into a syntax-tree representation. The actual page-layout algorithm is based on the concept of traversing the layout syntax tree in a prescribed order. Furthermore, a virtual-page concept of layout which treats a reduced news block as a full news page is employed to allow the algorithm to work recursively.

The basic algorithm for laying out full news pages with only basic and embedded operators in the template is then refined to include the extended set of operators, and the refined algorithm is further extended to accommodate pages with ads. Although the detailed algorithms may vary slightly in each case, the basic layout concepts and techniques remain unaltered. The next chapter presents experimental results derived from applying the template-driven layout techniques to real situations. In each test case, data taken from an actual newspaper, the Boston Globe, are used as inputs, and the results generated from the template-layout algorithms are compared with the original manual layouts as they appeared in the Globe.

CHAPTER 6

EXPERIMENTAL RESULTS OF TEMPLATE-DRIVEN LAYOUT TECHNIQUES

In this chapter, experimental results generated by the template-driven layout techniques are presented. Data taken from two news pages without ads and one page with ads selected from a local newspaper, the Boston Globe, are used as inputs. The news pages without ads and the page with ads have a 6-column and 8-column layout format, respectively. For the purpose of our experiments, pages in both formats are divided into 100 lines vertically. Then, the areas of stories, pictures, and ads on the pages are measured in columns and lines. For simplicity, headline and caption areas are considered as part of the story and picture area, respectively.

In the test cases, the set of input data taken from the paper includes, for each news item on the page, the measured story area or picture dimensions and the importance ranking of the story or picture. The importance rankings are assigned according to the location and appearance of the news item on the page. Following the layout algorithm described in Chapter 5, several layout templates whose structures differ from the page as laid out by the Globe are then used as the structural guide for placing the news items taken from the paper. The results

are presented for the successful layouts, and explanations are made for the layout failures. In all experimental cases, a ± 10 percent leading of story area is allowed.

6.1 LAYOUT EXPERIMENT I

Page three of the July 22, 1976 issue of the Globe is used as the first test case of a page without ads. As laid out by the Globe, there are five stories and one stand-alone picture on this page. Two of the five stories have pictures associated with them. The measured areas or dimensions of the news items together with their assigned importance rankings, are listed in Table 6.1.

Table 6.1 Input Data for Experiment I
(Page 3 of July 22, 1976 issue of Boston Globe)

<u>News Item</u>	<u>Classifications</u>	<u>Areas or Dimensions</u> [*]	<u>Importance Rankings Assigned</u>
Election	Story Associated Picture	152 2 X 26	1
Farmer	Story Associated Picture	94 2 X 19	2
Bars	Story	66	3
Red-Tape	Story	84	4
Naval	Story	48	5
Zoo	Stand-Alone Picture	2 X 33	6

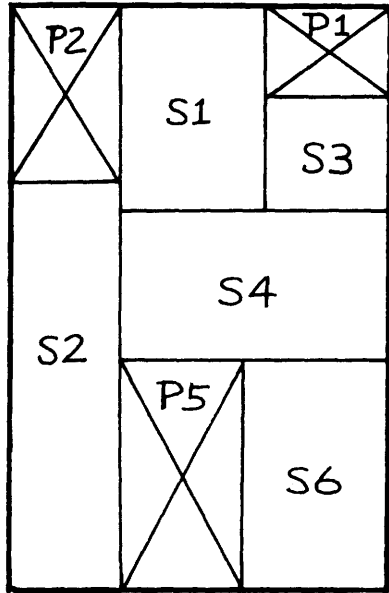
* story areas are in column-lines and picture dimensions are designated as columns X lines.

Figure 6.1 depicts the four layout templates, T1 to T4, used in the layout experiment. In the templates, the integer part of the news item identifier indicates the relative importance ranking of the news item, and a story and picture having the same integer are associated with each other. For example, in template T1, picture P1 is associated with story S1, P2 with S2; and P1 and S1 are considered more important than P2 and S2. Note also that each template has exactly the same number of news items in each type category as the input data: 3 S-type, 2 SP-type, 2 PS-type, and 1 P-type. The page dummy as laid out by the Globe is depicted in Fig. 6.2(a) where the area of each news block is denoted by the parenthesized number within the block, and pictures are indicated by cross-lines.

The template-driven algorithm successfully produced layouts from both templates T1 and T2. The resulting layout dummies are shown in Fig. 6.2(b) and (c), respectively. To gain the effect of a completed newspaper, the original news page as it appeared in the paper is shown in Fig. 6.3, and the two computer-generated dummies after manually pasting up the actual stories and pictures are shown in Figs. 6.4 and 6.5. For simplicity, the small block "Correction" is considered as part of the story "Naval". Note that in the layout results of Figs. 6.4 and 6.5, the structures of the news items placed on the page do conform to the layout templates T1 and T2.

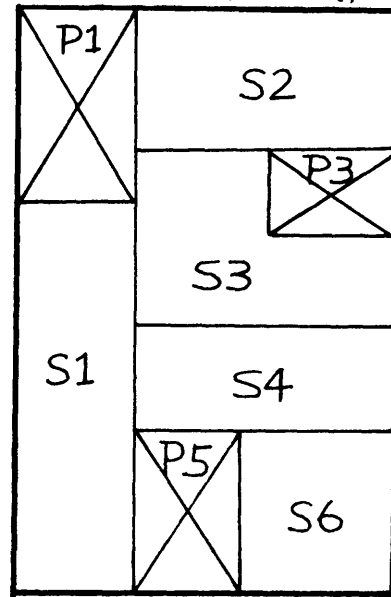
On the other hand, templates T3 and T4 in Fig. 6.1 fail

$$(P2=S2) \parallel ((S1 \parallel (P1=S3))=S4=(P5 \parallel S6))$$



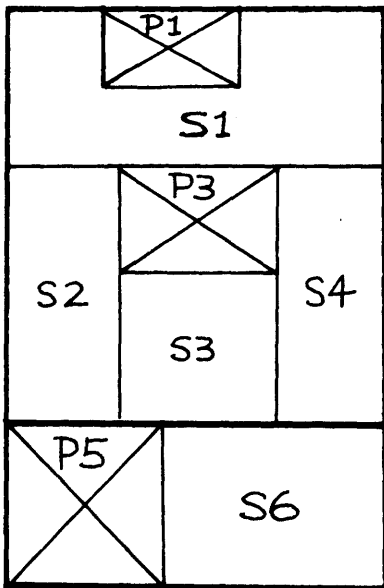
(a) T1

$$(P1=S1) \parallel (S2=(S3 \square P3)=S4=(P5 \parallel S6))$$



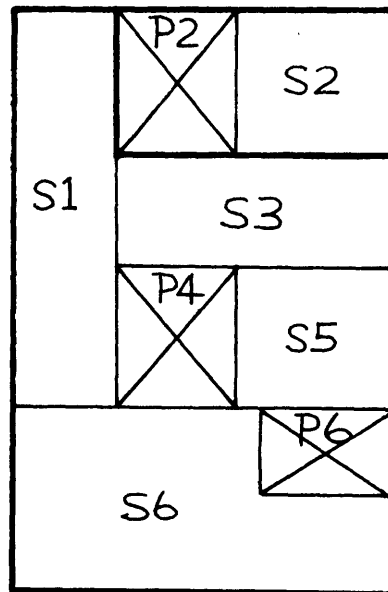
(b) T2

$$(S1 \square P1)=(S2 \parallel (P3=S3) \parallel S4)=(P5 \parallel S6)$$



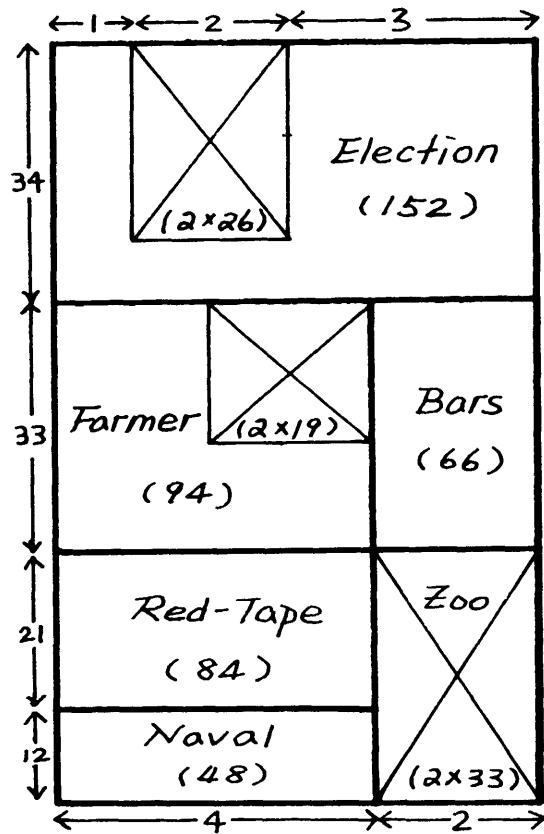
(c) T3

$$(S1 \parallel ((P2 \parallel S2)=S3=(P4 \parallel S5))=(S6 \square P6))$$

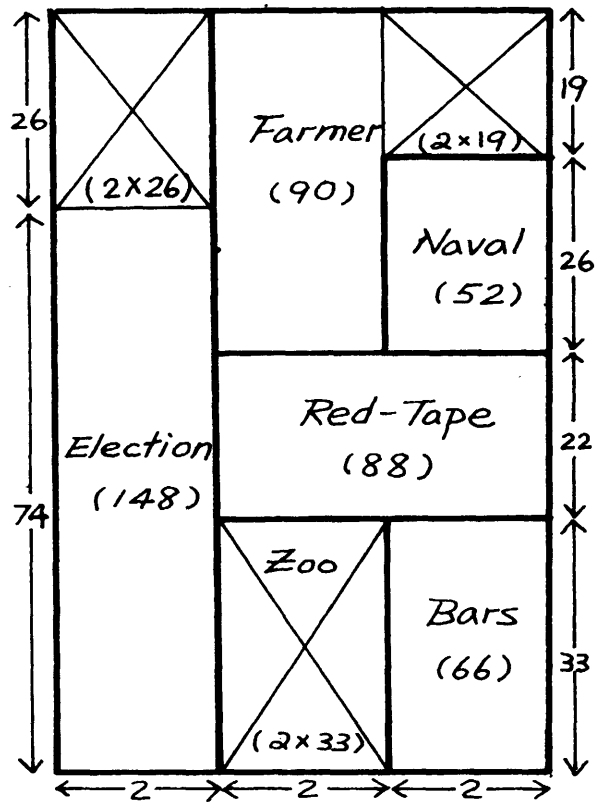


(d) T4

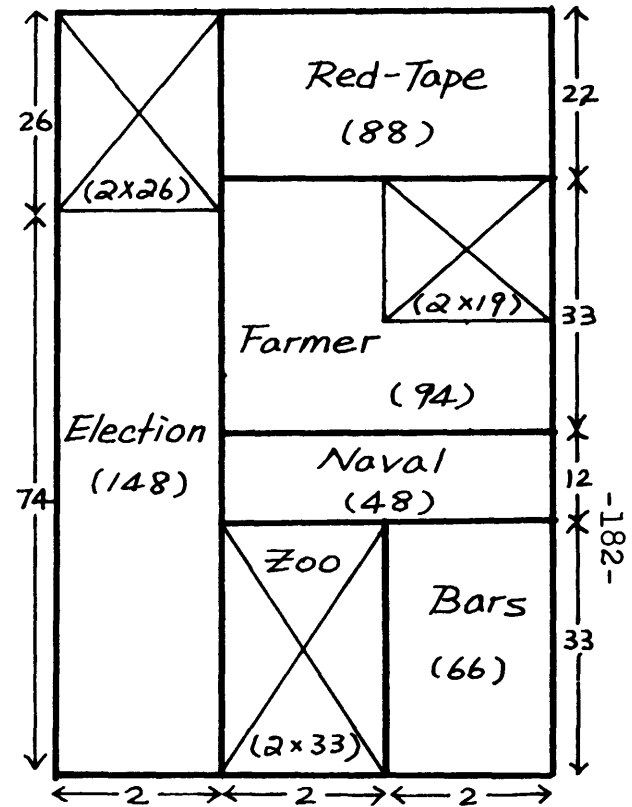
Fig. 6.1 Layout Templates Used in Experiment I



(a) Page as Laid out by Globe



(b) Template-Generated Page Using T1 as a Guide



(c) Template-Generated Page Using T2 as a Guide

Fig. 6.2 Layout Dummies of Experiment I

Times have changed, and Burke has election opponents

By Maria Karagianis
Globe Staff

The nearly two decades, US Rep. James Aloysius Burke, 66, of Milton, has represented the 11th Congressional District.

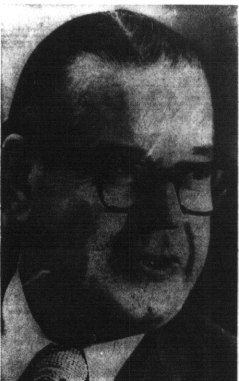
Virtually unchallenged, except for the doomed candidates of three Republicans running against him in a heavily Democratic district and a token fight in the last primary, Rep. Burke has sailed into office every 24 months for the past 18 years as surely as the swallows return to Capisnon.

But times have changed—Nixon, Watergate, Congressional scandals—all have taken their toll on the good ole boys in Congress, many of whom have been picked off in recent years by younger, more aggressive candidates.

In the generally conservative 11th District, the question now is whether or not a politically astute warhorse like Jim Burke can best the challenge at not one, but two new faces.

Running against him in the Democratic primary Sept. 14 is Patrick Henry McCarthy, a 29-year-old Harvard Law School graduate and former child aide to US Rep. Joe Moakley. McCarthy is bright, ambitious and articulate.

Also on the ballot, as an independent in the general election, is Theodor J. Benedictus, 30-year-old attorney from Milton. Bright, energetic and determined, he is a former assistant attorney general, a founder of the First Women's Bank and former counsel to the state Public Utilities Commission.



REP. JAMES A. BURKE... "there's no race"

Over the years, much of Rep. Burke's success—besides the obvious fact that 11th district voters have had few other choices on the ballot—has come from his carefully cultivated

Jim Burke is known for quiet diligence and a near-perfect attendance record.

At home, in a district stretching south from Dorchester and Hyde Park to Quincy, the shoe-manufacturing city of Brockton and such working-class suburbs as Holbrook, Stoughton and Whitman, he's Rep. Jimmy Burke, an old-style political veteran groomed in the hurly-burly of Boston politics. Always willing to do a favor or shake a hand, he's the kind of Congressman who remembers to send congratulations when his constituents have a baby, graduate from college or turn 100.

He is also known as a congressman who takes full advantage of his franking privilege, sending constituents reams of newsletters at the public expense.

Although Burke is rumored to have a solid grip on the district, some observers are speculating privately that the solid organization he is purported to have has withered and died.

Like many of his colleagues, Rep. Burke has not been without his problems recently.

Some of his stunts have been controversial and his critics have accused him of having a pro-big-business voting record.

Also, not long ago, he was forced to deny allegations made by a former Gulf Oil employee, who said he had turned over to a Burke aide an envelope filled with an unspecified amount of cash from an illegal slush fund in 1965.

Burke also has been forced to deny recent reports that he dyes his hair,

that his health is failing and that he's too old for another term.

Wowing to defeat Burke on the issue, McCarthy has been in the district 14 hours a day, seven days a week since December. At scores of coffee parties, on street corners and outside factory gates, he's telling voters what he calls "the other side of the story about Cong. Burke."

Using the \$31,000 he has raised so far for the plan to raise and spend about \$84,000 and relying on advice from political advertising wizard John Martella, McCarthy is running an aggressive, grassroots campaign based on bread-and-butter issues. At the same time, McCarthy has launched a direct frontal attack on Burke's voting record in Congress, which the Congressmen, so far, has chosen to ignore.

"There's no race as far as I'm concerned," said Burke last week, reiterating his pledge not to spend a dime and not to begin campaigning until Labor Day, which is less than 19 days before the primary election.

Ignoring the opposition, of course, is an old political tactic. Relying on the power of his incumbency not wanting to promote the name of Pat McCarthy, Burke is refusing publicly to comment on the primary race or to defend his record. Some observers believe it is a wise move. However, organizers in the McCarthy camp say Burke will eventually be forced to defend himself before the end of the campaign.

Although Burke says he has not been immediately available last night to confirm whether the licenses had been surrendered.

Among the messages McCarthy is bringing to the voters is that Rep. Burke voted recently to raise the price of gas, milk and bread, that he votes more like a big business Republican than a northern Democrat and that he has brought less Federal revenue into the district than many of his more junior colleagues.

"Burke is saying that he has muscle and Massachusetts needs muscle," said McCarthy. "I say we need muscle, not flab."

Neither Burke nor his aides would respond to these charges.

Saying she is campaigning on the issue, particularly the economy, dis-Benedictus said last week she is not conducting a media-oriented, old-style political campaign.

"To me, McCarthy is a younger version of Burke," she said, claiming McCarthy has repeatedly asked her to drop out of the race. "I'm advocating a system of two, four-year terms for Congressmen."

"I think we should stop breeding another generation of professional politicians," she added, saying, "I'd like to do away with the buddy system altogether."

The 11th District, which voted overwhelmingly for Gov. George Wallace in the last presidential primary, is a largely working-class area inhabited by second and third generation Jews, Italians and Irish. Many of them are working-class people, refugees from south city neighborhoods as Dorchester and Hyde Park.

Farmer can't buy water to save Hingham corn

By William B. Hamilton
Globe Staff

Bill Costa waved his hand disgustfully at the rows of waist-high corn stalks that stood motionless in his Hingham field yesterday in the muggy atmosphere.

"There's nothing here," he said. "There's not even 10 percent. You can see that. If I'd had water last Friday morning when I asked for it, I could have saved this field."

Costa didn't get that water, not because there was no available water, but because the Hingham Water Co. wouldn't sell it to him. As a result, he says, he stands to lose about \$25,000 on the 20 acres of corn he has planted in Hingham.

"The issue to him is clear: His fields are dusty for lack of moisture. There are three fire hydrants within 100 feet of his fields. Why shouldn't the Hingham Water Co., a private utility which supplies the town with water, allow him, for a price, to use the hydrants and save his crop?"

"To James Cypher, manager of the water company, the issue is just as clear. 'The point is,' he said yesterday, 'the inconvenience to our customers day in and day out wouldn't be right.'"

The inconvenience, he said, would come in two ways. First, taking any substantial amount of water from the hydrants would stir up sediment and

result in dirty water for consumers within a half-mile radius of Costa's fields.

Second, the amount of water that Costa would need for his 20 acres—Cypher says it would be a million gallons—would reduce pressure in the area and would deplete reserves that need to be needed later this summer.

"Could you guarantee me that we're going to get 4 inches of rain next week? It's a long-range thing. You don't know what's going to happen in September," he said.

Lined up in support of Cypher's position is Fletcher K. Patch, Hingham's acting fire chief, who said "Mr. Cypher feels that it would impair that area with low water pressure and I have to agree with him. I feel sorry for him (Costa); I feel sorry for everybody who burned down. But I have no control over it."

In Costa's corner, however, is the Massachusetts Department of Agriculture.

"A guy in a situation like that, he's dead. He's got no other choice—he loses it," said Guy Paris, the department's assistant director for marketing, who spent a lot of time this week trying to help Costa out.

But, he said yesterday: "I don't know what the heck you can do."

Even if Costa does lose most of his crop in Hingham, he still has about 120 additional acres of corn planted in irri-



Farmer William Costa of Hingham holds stunted corn. (Globe photo by Ted Dwyer)

gated fields in Halifax, Plymouth, Sci-tuate, Newell, Marshfield and Plympton. He sells some of the corn wholesale and the rest at Pennington Hill Farm, a stand on Route 53 in Hingham.

Ironically, in Hingham, much of the land farmed by Costa, who also works in the Boston Globe composing room, is owned by the Hingham Water Co.

According to Paris, the Agriculture Department officials, there are a few vegetable farmers such as Costa whose fields are not irrigated, but most truck farmers are coping successfully.

Paris emphasizes that, although it is a serious situation, the lack of rain is not yet critical throughout the state.

Last night's downpour, which followed a day of intermittent showers, did not have any significant effect on the crops in Hingham. There has been less rain in those areas, Paris explained, and the expense makes it impossible for those farmers to irrigate their pastures.

Two Bay Village bars ordered by court to stay closed 60 days

The doors of two controversial bars in the Bay Village section were bolted last night in apparent compliance with Federal bankruptcy court ruling ordering them closed for 60 days.

US District Court Judge Walter Jay Skinner ruled yesterday that the state Alcoholic Beverages Control Commission may enforce 60-day suspensions of the liquor licenses of the two bars.

Boston police vice squad detectives went last night to confirm whether the licenses had been surrendered.

Attorneys for Jacques and The Other Side, located opposite each other in Bay Village, had petitioned a Federal bankruptcy court to block the closing ordered by the ABCC for violation of a midnight closing order issued by the Boston Licensing Board.

Residents have complained repeatedly that the two bars, which are frequented by homosexuals, attract an undesirable element that leads to noise and rowdiness in the neighborhood.

Both bars, owned by the Yara liquor interests, claim that they are insolvent and are seeking to reorganize

under Chapter 11 of the bankruptcy statutes.

Attorneys for the bars claimed that Federal bankruptcy laws prohibit the state from closing them, but Skinner said the "Bankruptcy Act was never intended by Congress to subvert the valid police power of the states in this manner."

Skinner said that if the arguments of the bars' attorneys were adopted, "Chapter 11 would provide an instantly available, cheap and easy sanctuary from all state regulatory enforcement proceedings."

A temporary restraining order barring the ABCC from closing the bars was issued in May by Bankruptcy Court Judge Paul W. Gleason. He later rescinded the order, but kept it in effect pending the outcome on an appeal to Skinner.

"I'm delighted with it (the ruling) because it shows that the Yaras aren't going to be able to use a phony bankruptcy to frustrate the laws of Massachusetts," Rep. Barney Frank, D-Buck Bay, said last night.

Neither Francis Kirby, attorney in the bankruptcy, nor Frank Cashman, manager of the bars, could be reached for comment last night.

Red tape helps broken sewer to pollute home

By Walter V. Robinson
Globe Staff

John McLean, his wife, June, and their seven children would like the Boston city bureaucracy to know that they will not have to commiserate a City Hall bathroom after all.

Yesterday, five days after "it" happened, their sewer line was fixed, and their toilets were restored to order—despite the best efforts of a city sewer inspector.

"It" is the raw sewage (John McLean didn't call it that) that kept backing into their home in Cesteravale Park, Dorchester, after a city contractor apparently broke the sewer pipe while laying electrical line outside.

"I swept it out; I shoveled it out; I humped it out. It was 3 inches deep on the cellar floor," McLean said of his five-day ordeal.

Between shoveled, McLean tried to get help from the city, the contractor, Legal Aid, Neawville, his 12-year-

old sons, Danny and Shawn, carried buckets and the whole family used buckets instead of their useless toilets.

It was Tuesday when McLean, a skilled craftsman who is unemployed, decided that raising a stink about the stink was not going to solve his problem.

So, shovel in hand, he began to dig out front of his white garbion colonial on the tree-lined street in an attempt to find and repair the sewer pipe himself.

After nine hours of digging, he was about to uncover the broken pipe yesterday morning when the bureaucracy intervened.

"Bill Hannigan from the Sewer Department came by and said it was against the law for me to dig here," McLean said.

"He said I needed a building permit but that I can't get one anyway," June McLean said. "We're here

with no plumbing for five days, and he tells us we need a building permit."

Hannigan could not be reached for comment at City Hall yesterday afternoon. Someone at the Sewer Department said he had gone home.

McLean said Hannigan then ordered the contractor's backhoe operator to fill in the hole McLean had dug. "So I jumped in," McLean said.

The McLeans' German shepherd, Trip, was the only family member unbothered by the ordeal.

He owned every tree and hydrant—a chucking Mr. McLean said.

After yesterday morning's confrontation with the city, McLean found a city employee willing to fight for him—Mary Aaron, assistant manager of the Fields Corner Little City Hall—and yesterday afternoon the original

contractor, Strytek Inc., arrived to fix the pipe.

The sewer pipe was not the only problem, of course. Because it was broken, the McLeans could not use the water in their house, since draining water only caused more sewage to back up.

On Tuesday night, June McLean said, she called the Sheraton Tara Motel in Braintree and made a reservation for a room for yesterday so her children could shower, "but when they got there this morning they were told we didn't have a reservation until tomorrow."

Then daughter Kathleen came home from work with a severe toothache and was sent to a dentist. Mrs. McLean shook her head, sighed, smiled and said: "The kids say to me, 'Do what you tell us to do. Count your blessings.'"

John McLean shrugged as he watched the men work and said: "The contractor told me he's going to send me a bill for this work."

Correction

A story in the morning and afternoon Globes yesterday listed an erroneous title for one of the 10 candidates for the post of chief of Suffolk Superior Court for Civil Business. The story said John J. Shannon is assistant clerk of that court. He is not. He is employed at the probate department of the Boston Municipal Court. The assistant clerk of Suffolk Superior Court is Michael J. Donohue, also a candidate for the clerk post.

S. Boston backs Naval Annex industrial plan

By Stephen Crimmon
Globe Correspondent

South Boston residents and elected officials last night soundly unannounced approval of a plan, proposed by the Boston Economic Development and Industrial Corp. (BEDIC), for redeveloping the former South Boston Naval Annex.

BEDIC wants to purchase the Naval Annex, make necessary repairs, and then rent space at the site to private industries. If approved, the plan would

provide some 2000 jobs by 1980, according to BEDIC officials.

This far, nine companies, with 300 jobs, have been revealed to BEDIC officials. In the event of the job are held in Boston residents as compared to present when the US Navy owned the base. Michael Westgate, BEDIC executive director, said:

"At a public hearing called by the Massachusetts Government Land Bank last week, the Rev. Dr. Fred Shoberg of

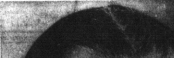
South Boston, Westgate asked Land Bank members to approve its plan and to finance BEDIC with \$4.8 million to finance purchase of the annex site.

If Land Bank approves the plan, it will transfer the property to BEDIC, a city organization created by the Massachusetts Legislature to aid private industrial development in Boston.



Tudi, a female black rhinoceros born yesterday at Boston's Franklin Park Zoo, stands in her mother's shadow as she makes her debut. Tudi, who tipped the scales at 50 pounds, is the first rhino ever born in New England and one of only 13 born in captivity throughout the world in the last three years. Her mother, Miredadi, is one of 12 adult rhinos at Franklin Park. (Globe photo by Bill Curtis)

Burke has election opponents



By William B. Hamilton
Globe Staff

Bill Costa waved his hand dispassionately at the rows of water-high corn stalks that stood motionless in his Hingham field yesterday in the muggy afternoon air.

"There's nothing here," he said. "There's not even 10 percent. You can see that. If I had water last Friday morning when I asked for it, I could have saved this field."

Costa didn't get that water, not because there was no available, but because the Hingham Water Co. wouldn't sell it to him. As a result, he says he stands to lose some \$25,000 on the 20 acres of corn he has planted in Hingham.

"The issue to him is clear. His fields are dusty for lack of moisture. There are three free hydrants within 100 feet of his fields. Why shouldn't the Hingham Water Co., a private utility which supplies the town with water, allow him, for a price, to use the hydrants and save his crop?"

"To James Cypher, manager of the water company, the issue is just as clear. 'The point is,' he said yesterday, 'the inconvenience to our customers in day out wouldn't be right.'"

The inconvenience, he said, would come in two ways. First, taking any substantial amount of water from the hydrants would stir up sediment and

REP. JAMES A. BURKE... there's no rain?

By Maria Karaganis
Globe Staff

By nearly two decades, US Rep. James Aloysius Burke, the 65-year-old, cigar-smoking Democrat of Milton, has represented the 11th Congressional District.

Virtually unchallenged, except for the deepest candidates of this Republican running against him in a heavily Democratic district and a liberal fight in the last primary, Rep. Burke has sailed into office every 24 months for the past 18 years as easily as the swallows return to Capistrano.

But times have changed—Nixon, Watergate, Congressional scandals—all have taken their toll on the good ole boys in Congress, many of whom have been picked off in recent years by younger, more aggressive candidates.

In the generally conservative 11th District, the question now is whether or not a politically astute warrior like Jim Burke can keep the challenge at one, but two new faces.

Running against him in the Democratic primary Sept. 14 is Patrick Henry McCarthy, a 39-year-old Harvard Law School graduate and Vietnam veteran. Schooled in politics as former chief aide to US Rep. Joe Moakley, McCarthy is bright, ambitious and articulate.

Also on the ballot, as an independent in the general election, is Daniela di Benedetto, 30-year-old attorney from Milton. Bright, energetic and determined, she is a former assistant attorney general, a founder of the First Woman's Bank and former counsel to the state Public Utilities Commission.

Jim Burke is known for quiet diligence and a near-perfect attendance record.

At home, in a district stretching south from Dorchester and Hyde Park to Quincy, the shoe-manufacturing city of Brockton and such working-class suburbs as Mattapan, South Boston and Whitman, he's Rep. Jimmy Burke, an old-style political veteran groomed in the busy-busy of Boston politics. Always willing to do a favor or shake a hand, he's the kind of Congressman who remembers to send congratulations when his constituents have a baby, graduate from college or turn 100.

He is also known as a congressman who takes full advantage of his frank telephone privileges, sending constituents reams of newsletters at the public expense.

Although Burke is rumored to have a solid grip on the district, some observers are speculating privately that the solid organization he is purported to have has withered and died.

Like many of his colleagues, Rep. Burke has not been without his problems recently.

Some of his stances have been controversial and his critics have accused him of having a pre-big-business voting record.

Also, not long ago, he was forced to deny allegations made by a former Gulf Oil employee, who said he had turned over to a Burke aide an envelope filled with an unspecified amount of cash from an illegal slush fund in 1962.

Burke also has been forced to deny recent reports that he dyes his hair,

Among the messages McCarthy is bringing to the voters is that Rep. Burke voted recently to raise the price of gas, milk and bread; that he votes more like a big business Republican than a northern Democrat and that he has brought less Federal revenue from the district than many of his more junior colleagues.

"Burke is saying that he has muscle and Massachusetts needs muscle," said McCarthy. "I say we need muscle, not fish."

Neither Burke nor his aides would respond to these charges.

Saying she is campaigning on the issues, particularly the economy, di Benedetto said last week she is not conducting a media-oriented, old-style political campaign.

"To me, McCarthy is a younger version of Burke," she said, claiming McCarthy has repeatedly asked her to drop out of the race. "I'm advocating a period of two, four-year terms for Congressmen."

"I think we should stop breeding another generation of professional politicians," she added, saying, "I'd like to do away with the buddy system altogether."

The 11th District, which voted overwhelmingly for Gov. George Wallace in the last presidential primary, is a largely working-class neighborhood by second and third generation Jews, Italians and Irish. Many of them are working-class people, refugees from such city neighborhoods as Dorchester and Hyde Park.

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Yowing to defeat Burke on the issues, McCarthy has been in the district 14 hours a day, seven days a week, since December. At scores of coffee parties, on street corners and outside factory gates, he's telling voters what he calls "the other side of the story about Cong. Burke."

Using the \$25,000 he has raised so far (he plans to raise and spend about \$40,000) and relying on advice from political advisers, wizard John Martella, McCarthy is running an aggressive, grassroots campaign based on bread-and-butter issues. At the same time, McCarthy has launched a direct frontal attack on Burke's voting record in Congress, which the Congressman, so far, has chosen to ignore.

"There's no race as far as I'm concerned," said Burke last week, reiterating his pledge not to spend a dime and not to begin campaigning until Labor Day, which is less than 10 days before the primary election.

Ignoring the opposition, of course, is an old political tactic. Helping on the power of his incumbency not wanting to promote the name of Pat McCarthy, Burke is refusing publicly to comment on the primary race or to defend his record. Some observers believe it is a wise move. However, organizers in the McCarthy camp say Burke will eventually be forced to defend himself before the end of the campaign.

Although Burke says he has not been campaigning, he has recently been frequenting the district, holding regular post office hours, marching in parades and otherwise greeting his constituents.

reputation as a man who takes care of his constituents.

On Capitol Hill, where he is second ranking Democrat on the powerful House Ways and Means Committee,

Farmer can't buy water to save Hingham corn

By William B. Hamilton
Globe Staff

Bill Costa waved his hand dispassionately at the rows of water-high corn stalks that stood motionless in his Hingham field yesterday in the muggy afternoon air.

"There's nothing here," he said. "There's not even 10 percent. You can see that. If I had water last Friday morning when I asked for it, I could have saved this field."

Costa didn't get that water, not because there was no available, but because the Hingham Water Co. wouldn't sell it to him. As a result, he says he stands to lose some \$25,000 on the 20 acres of corn he has planted in Hingham.

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The inconvenience, he said, would come in two ways. First, taking any substantial amount of water from the hydrants would stir up sediment and

result in dirty water for consumers within a half-mile radius of Costa's fields.

Second, the amount of water that Costa would need for his 20 acres — Cypher says it would be a million gallons — would reduce pressure in the area and would deplete reserves that might be needed later this summer.

"Could you guarantee me that we're going to get 6 inches of rain next week? It's a long-range thing. You don't know what's going to happen in September," he said.

Lined up in support of Cypher's position is Fletcher K. Patch, Hingham's acting fire chief, who said: "Mr. Cypher feels that it would impair that area with low water pressure and I have to agree with him. I feel sorry for him (Costa); I feel sorry for everybody who has burned down. But I have no control over it."

In Costa's corner, however, is the Massachusetts Department of Agriculture.

"A guy in a situation like that, he's dead. He's got no other choice — he loses it," said Guy Paris, the department's assistant director for marketing, who spent a lot of time this week trying to help Costa out.

But, he said yesterday: "I don't know what the heck you can do."

Even if Costa does lose most of his crop in Hingham, he still has about 100 additional acres of corn planted in irrigated fields in Halifax, Plymouth, Seaside, Newell, Marshfield and Plymouth. He sells some of the corn wholesale and the rest at Penman Hill Farm, a stand on Route 51 in Hingham.

Ironically, in Hingham, much of the land farmed by Costa, who also works in the Boston Globe composing room, is owned by the Hingham Water Co.

According to Paris, the Agriculture Department official, there are a few vegetable farmers such as Costa whose fields are not irrigated, but most truck farmers are coping successfully.

Paris emphasizes that, although it

is a serious situation, the lack of rain is not yet critical throughout the state.

Last night's downpour, which followed a day of intermittent showers, did not have any significant effect on the lower-than-average rainfall total the Boston area has received, according to the National Weather Service.

Those most affected right now, he said, are dairy farmers, particularly those in Worcester County and in the southeastern part of the state. There has been less rain in those areas, Paris explained, and the expense makes it impossible for those farmers to irrigate their pastures.

with no plumbing for five days, and he tells us we need a building permit."

Hannigan could not be reached for comment at City Hall yesterday afternoon. Someone at the Sewer Department said he had gone home.

McLean said Hannigan then ordered the contractor's backhoe operator to dig out the hole.

"So I jumped in," McLean said.

Hannigan called police, who arrived and persuaded McLean to get out, and the hole was filled again.

The McLeans' German shepherd, Trip, was the only family member untroubled by the ordeal.

"He owned every tree and hydrant," a chuckling Mrs. McLean remarked.

After yesterday morning's confrontation with the city, McLean found a city employee willing to fight for him.

Bryan Aaron, assistant manager of the Fields Corner Little City Hall — and yesterday afternoon the original

Red tape helps broken sewer to pollute home

By Walter V. Robinson
Globe Staff

John McLean, his wife, June, and their seven children would like the Boston city bureaucracy to know that they will not have to commandeer a city Hall bathroom after all.

Yesterday, five days after "it" happened, the sewer was fixed, and despite the best efforts of a city sewer inspector.

"It" is the raw sewage (John McLean didn't call it that) that kept backing into their home in Centerville Park, Dorchester, after a city contractor apparently broke the sewer pipe while laying electrical line outside.

"I swept it out. I shoveled it out; I bagged it out. It was 2 inches deep on the cellar floor," McLean said of his five-day ordeal.

Between themselves, McLean tried to get help from the city, the contractor, Legal Aid. Meanwhile, his 12-year-old son, Danny and Shawn, carried buckets and the whole family used buckets instead of their useless toilets.

It was Tuesday when McLean, a skilled craftsman who is unemployed, decided that raising a stink about the stink was not going to solve his problem.

So, about in hand, he began to dig out foot-long white garbage can along the tree-lined street in an attempt to find and repair the sewer pipe himself.

After nine hours of digging, he was about to uncover the broken pipe yesterday morning when the bureaucracy intervened.

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John McLean shrugged as he watched the sewer work and said: "The contractor told me he's going to send me a bill for this work."



Farmer William Costa of Hingham holds a corn cob. (Globe photo by Ted D'Elia)

S. Boston backs Naval Annex industrial plan

By Stephen Crimmin
Globe Correspondent

South Boston residents elected officials last night voted unanimously to purchase the site from the Federal government's General Services Administration (GSA), and then resell the property to EDIC, a city organization created by the Massachusetts Legislature to aid private industrial development in Boston.

EDIC wants to purchase the Naval Annex, make necessary repairs, and then rent space to the state to private industry. It approved, the plan would provide some 2000 jobs by 1980, according to EDIC officials.

Thus far nine companies, with 300 jobs, have been recruited by EDIC. Of these 300, 40 percent of the jobs are held by Boston residents, as compared to 17 percent when the US Navy owned the base. Michael Westgate, EDIC executive director, said.

At a public hearing called by the Massachusetts Government Land Bank at the Joseph P. Tynan School in South Boston, Westgate asked Land Bank members to approve his plan and

Correction

"A story in the morning and afternoon Globe yesterday listed an erroneous title for one of the 10 candidates for the post of clerk of Suffolk Superior Court for Civil Business. The story said John F. Shannon is assistant clerk of that court. He is not. He is employed at the probation department of the Boston Municipal Court. The assistant clerk of Suffolk Superior Court is Michael J. Donovan, also a candidate for the clerk post."

Two Bay Village bars ordered by court to stay closed 60 days

The doors of two controversial bars in the Bay Village section were bolted shut last night in apparent compliance with a Federal bankruptcy court ruling ordering them closed for 60 days.

US District Court Judge Walter Jay Skinner ruled yesterday that the state Alcoholic Beverages Control Commission may enforce 60-day suspensions of the liquor licenses of the two bars.

Boston police vice squad detectives were not immediately available last night to confirm whether the licenses had been surrendered.

Attorneys for Jacques and The Other Side located opposite each other in Bay Village, had petitioned a Federal bankruptcy court to block the closing ordered by the ABCC for violation of a midnight closing order issued by the Boston Licensing Board.

Residents have complained repeatedly that the two bars, which are frequented by homosexuals, attract an undesirable element that leads to noise and rowdiness in the neighborhood.

Both bars, owned by the Vasa Iliadis interests, claim that they are insolvent and are seeking to reorganize

under Chapter 11 of the bankruptcy statutes.

Attorneys for the bars claimed that Federal bankruptcy laws prohibit the state from closing them, but Skinner said the "Bankruptcy Act was never intended by Congress to subvert the valid police power of the states in this manner."

Skinner said that if the arguments of the bar attorneys were adopted, "Chapter 11 would provide an instantly available, cheap and easy sanctuary from all state regulatory enforcement proceedings."

A temporary restraining order barring the ABCC from closing the bars was issued by May Bankruptcy Court Judge Paul W. Gleason. He later rescinded the order, but kept it in effect pending the outcome on an appeal to Skinner.

"I'm delighted with it (the ruling) because it shows that the Vasa aren't going to be able to use a shifty bankruptcy to frustrate the laws of Massachusetts," Rep. Barney Frank, D-Bay, said last night.

Neither Francis Kirby, attorney in the bankruptcy, nor Frank Cashman, manager of the bars, could be reached for comment last night.

Fig. 6.4 Layout of Fig. 6.3 Using Template T1

Burke has election opponents

By Walter V. Robinson
Globe Staff

John McLean, his wife, June, and their seven children would like the Boston city bureaucracy to know that they will not have to commandeer a City Hall bathroom after all.

Yesterday, five days after "it" happened, their sewer line was fixed, and their toilets were restored to order—despite the best efforts of a city sewer inspector.

"It is the raw sewage (John McLean didn't call it that) that kept backing into their home in Centerville Park, Dorchester, after a city contractor apparently broke the sewer pipe while laying electrical line outside."

"I swept it out. I shoveled it out. It went in. It was 3 inches deep on the cellar floor," McLean said of his five-day ordeal.

Between abovealls, McLean tried to get help from the city, the contractor, Legal Aid. Meanwhile, his 12-year-old sons, Danny and Shawn, carried buckets instead of their useless toilets.

It was Tuesday when McLean, a skilled craftsman who is unemployed, decided that splicing a sink about the sink was not going to solve his problem.

So, shovel in hand, he began to dig out front of his white garbison colonial on the tree-lined street in an attempt to find and repair the sewer pipe himself.

After nine hours of digging, he was about to uncover the broken pipe yesterday morning when the bureaucracy interceded.

"Bill Hannigan from the Sewer Department came by and said it was against the law for me to dig here," McLean said.

"He said I needed a building permit but that I can't get one anyway."

June McLean said: "We're here with no plumbing for five days, and he tells us we need a building permit."

Hannigan could not be reached for comment at City Hall yesterday afternoon. Someone at the Sewer Department said he had gone home.

McLean said Hannigan then ordered the contractor's backhoe operator to fill in the hole McLean had dug.

"So I jumped in," McLean said. Hannigan called police, who arrived and persuaded McLean to get out, and the hole was filled again.

The McLeans' German shepherd, Trip, was the only family member untroubled by the ordeal.

"He owned every tree and hydrant," a chuckling Mrs. McLean remarked.

After yesterday morning's confrontation with the city, McLean found a vegetable farmer named Costa whose fields are not irrigated, but most truck farmers are irrigating successfully.

Even if Costa does lose most of his crop in Hingham, he still has about 100 additional acres of corn planted in irrigated fields in Hingham, Plymouth, St. Louis, Newell, Marshfield and Plymouth. He sells some of the corn wholesale and the rest at Pennington Hill Farm, a stand on Route 53 in Hingham.

Ironically, in Hingham, much of the land farmed by Costa, who also works in the Boston Globe composing room, is owned by the Hingham Water Co.

According to John, the Agriculture Department official, there are a few vegetable farmers such as Costa whose fields are not irrigated, but most truck farmers are irrigating successfully.

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Red tape helps broken sewer to pollute home

By William B. Hamilton
Globe Staff

Costa waved his hand disgustedly at the rows of waist-high corn stalks that stood motionless in his Hingham field yesterday in the muggy afternoon air.

"There's nothing here," he said. "There's not even 10 percent. You can see that. If I'd had water last Friday morning when I asked for it, I could have saved this field."

Costa didn't get that water, not because there was no available water, but because the Hingham Water Co. wouldn't sell it to him. As a result, he says he stands to lose some \$20,000 on the 20 acres of corn he has planted in Hingham.

"The issue to him is clear: His fields are dusty fields of moisture. There are three fire hydrants within 100 feet of his fields. Why shouldn't the Hingham Water Co. as a private utility which supplies the town with water, allow him for a price, to use the hydrants and save his crop?"

"To James Cypher, manager of the water company, the issue is just as clear: 'The point is, he said yesterday, 'the inconvenience to our customers day in and day out wouldn't be right.'"

"The inconvenience, he said, would come in two ways. First, taking any substantial amount of water from the hydrants would stir up sediment and result in dirty water for consumers within a half-mile radius of Costa's fields."

Second, the amount of water that Costa would need for his 20 acres — Cypher says it would be a million gallons — would reduce pressure in the area and would depress reserves that might be needed later this summer.

"Could you guarantee me that we're going to get 4 inches of rain next week? It's a long-range thing. You don't know what's going to happen in September," he said.

Lined up in support of Cypher's position is Fletcher K. Patch, Hingham's acting town clerk, who said: "Mr. Cypher feels that it would impair that area with low water pressure and I have to agree with him. I feel sorry for him (Costa); I feel sorry for everybody who has binned losses. But I have no control over it."

In Costa's corner, however, is the Massachusetts Department of Agriculture. "A guy in a situation like that, he's dead. He's got no other choice — he loses it," said Guy Paris, the department's assistant director for marketing, who spent a lot of time this week trying to help Costa out.

But, he said yesterday, "I don't know what the heck you can do." Even if Costa does lose most of his crop in Hingham, he still has about 100 additional acres of corn planted in irrigated fields in Hingham, Plymouth, St. Louis, Newell, Marshfield and Plymouth. He sells some of the corn wholesale and the rest at Pennington Hill Farm, a stand on Route 53 in Hingham.

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Farmer can't buy water to save Hingham corn

By William B. Hamilton
Globe Staff

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REP. JAMES A. BURKE . . . "there's no race"

By Maria Karagiannis
Globe Staff

For nearly two decades US Rep. James Aloysius Burke, the 65-year-old, cigar-smoking Democrat of Milton, has represented the 11th Congressional District.

Virtually unchallenged, except for the doomed candidacy of three Republicans running against him in a heavily Democratic district and a loquacious light in the last primary, Rep. Burke has sailed into office every 24 months for the past 18 years as easily as the swallows return to Capistrano.

But times have changed—Nixon, Watergate, Congressional scandals—all have taken their toll on the good ole boys in Congress, many of whom have been picked off in recent years by younger, more aggressive candidates.

"Burke is saying that he has muscle and Massachusetts needs muscle," said McCarthy. "I say we need muscle, not fish."

Neither Burke nor his aides would respond to these charges.

Saying she is campaigning on the issue, particularly the economy, district residents said last week she is not conducting a media-oriented, old-style political campaign.

"Tom, McCarthy is a younger version of Burke," she said, claiming McCarthy has repeatedly asked her to stop out of the way. "I'm advocating a system of two, four-year terms for Congressmen."

"I think we should stop breeding another generation of professional politicians," she added, saying, "I'd like to go away with the buddy system, though."

The 11th District, which voted overwhelmingly for Gov. George Wallace in the last presidential primary, is a largely working-class area inhabited by second and third generation Jews, Italians and Irish. Many of them are working-class people, refugees from such city neighborhoods as Dorchester and Hyde Park.

That Burke is failing and that he's too old for another term.

Yowing to defeat Burke on the issue, McCarthy has been in the district 14 hours a day, seven days a week, since December. At scores of coffee parties, on street corners and outside factory gates, he's telling voters what he calls "the other side of the story about Cong. Burke."

Using the \$10,000 he has raised so far (he plans to raise and spend about \$40,000) and relying on advice from political advertising wizard John Martella, McCarthy is running an aggressive, grassroots campaign based on bread-and-butter issues. At the same time, McCarthy has launched a direct frontal attack on Burke's voting record in Congress, which the Congressman, so far, has chosen to ignore.

"There's no race as far as I'm concerned," said Burke last week, re-emphasizing his pledge not to spend time and not to begin campaigning until Labor Day, which is less than 10 days before the primary election.

Ignoring the opposition, of course, is an old political tactic. Relying on the power of his incumbency not wanting to promote the name of Pat McCarthy, Burke is refusing publicly to comment on the primary race or to defend his record. Some observers believe it is a wise move. However, organizers in the McCarthy camp say Burke will eventually be forced to defend himself before the end of the campaign.

Although Burke says he has not been campaigning he has recently been frequenting the district, holding regular post office hours, marching in parades and otherwise greeting his constituents.

reputation as a man who takes care of his constituents.

On Capitol Hill, where he is second ranking Democrat on the powerful House Ways and Means Committee,

Correction

A story in the morning and afternoon Globes yesterday listed an erroneous title for one of the 10 candidates for the post of clerk of Suffolk Superior Court for Civil Business. The story said John P. Shannon as assistant clerk of that court. He is not. He is employed in the probation department of the Boston Municipal Court. The assistant clerk of Suffolk Superior Court is Michael J. Douvan, also a candidate for the clerk post.

S. Boston backs Naval Annex industrial plan

By Stephen Crampton
Globe Correspondent

South Boston residents and elected officials last night voted unanimous approval of a plan, proposed by Boston Economic Development and Industrial Corp. (EDIC), for redeveloping the former South Boston Naval Annex.

EDIC wants to purchase the Naval Annex, make necessary repairs, and then rent space at the site to private industries. If approved, the plan would provide some 200 jobs by 1980, according to EDIC officials.

Thus far nine companies, with 200 jobs, have been recruited by EDIC. Of these 200, 45 percent of the jobs are held by Boston residents, as compared to 17 percent when the US Navy owned the base. Michael Westgate, EDIC executive director, said.

At a public hearing called by the Massachusetts Government Land Bank at the Joseph P. Ryan School in South Boston, Westgate asked Land Bank members to approve its plan and to provide EDIC with \$4.8 million in finance purchase of the annex site.

If Land Bank approves the plan, it will purchase the site from the Federal government's General Services Administration (GSA), and then resell the property to EDIC, a city organization created by the Massachusetts Legislature to aid private industrial development in Boston.

Two Bay Village bars ordered by court to stay closed 60 days

The doors of two controversial bars in the Bay Village section were bolted shut last night in apparent compliance with a Federal bankruptcy court ruling ordering them closed for 60 days.

US District Court Judge Walter Jay Skinner ruled yesterday that the state Alcoholic Beverages Control Commission may enforce 60-day suspensions of the liquor licenses of the two bars.

Boston police vice squad detectives were not immediately available last night to confirm whether the licenses had been surrendered.

Attorneys for Jacques and the Other Side, located opposite each other in Bay Village, had petitioned a Federal bankruptcy court to block the closings ordered by the ABCC for violation of a midnight closing order issued by the Boston Licensing Board.

Residents have complained repeatedly that the two bars, which are frequented by homosexuals, attract an undesirable element that leads to noise and rowdiness in the neighborhood.

Both bars, owned by the Varsa brothers, claim that they are insolvent and are seeking to reorganize under Chapter 11 of the bankruptcy statutes.

Attorneys for the bars claimed that Federal bankruptcy laws prohibit the state from closing them, but Skinner said the "Bankruptcy Act was never intended by Congress to subvert the valid police power of the states in this manner."

Skinner said that if the arguments of the bars' attorneys were adopted, "Chapter 11 would provide an unacceptably available, cheap and easy sanctuary, from all state regulatory enforcement proceedings."

A temporary restraining order barring the ABCC from closing the bars was issued in May by Bankruptcy Court Judge Paul W. Glendon. He later rescinded the order, but kept it in effect pending the outcome on an appeal to Skinner.

"I'm delighted with it (the ruling) because it shows that the Varsa aren't going to be able to use a phony bankruptcy to frustrate the laws of Massachusetts," Rep. Barney Frank, D-Bay, said last night.

Neither Francis Kirby, attorney in the bankruptcy, nor Frank Cashman, manager of the bars, could be reached for comment last night.

Fig. 6.5 Layout of Fig. 6.3 Using Template T2

to generate acceptable layouts for this particular set of news data. In the bottom portion of the page (denoted by heavier lines in Fig. 6.1(c)), template T3 calls for an independent picture P5 and a stand-alone story S6 of the same height. Since the dimensions of the only independent picture "Zoo" are 2 columns by 33 lines, the story located beside the picture must fit into an area of 4 columns by 33 lines (132 column-lines). Unfortunately, none of the areas of the three given stories, "Bars" (66 column-lines), "Red-tape" (84 column-lines), and "Naval" (48 column-lines), are within the leading tolerance of the required areas. As a result, the layout attempt using T3 as a structural guide fails.

When template T4 is used, the layout requires a story along with its associated picture to be placed in the upper-right corner of the page (denoted by heavier lines in Fig. 6.1(d)). Due to the existence of story item S1 next to it, which occupies at least a one-column-wide area, the maximum width of the P2-and-S2 area is 5 columns. Because both of the given associated pictures are 2-columns wide, the area for S2 is at most 3-columns wide and either 26-lines high (if the picture associated with "Election" is chosen) or 19-lines high (if the picture associated with "Farmer" is chosen). In either case, the specified story areas for "Election" and "Farmer", 152 and 94 column-lines respectively, do not fit into the S2 area. Consequently, the layout following the structure of T4 is unsuccessful.

6.2 LAYOUT EXPERIMENT II

Page three of the July 27, 1976 issue of the Globe is used to derive the inputs for our second layout experiment. Again, there are five stories, two of them with an associated picture, and one stand-alone picture on the page. The input data of the news items are listed in Table 6.2, and the two templates, T5 and T6, used in the layout experiment are depicted in Fig. 6.6(a) and (b), respectively.

Note that the structure of template T5 has the same structure as the page used in Experiment I from the July 22 issue of the Globe (see Fig. 6.3). In other words, an attempt is made to lay out the news items from the July 27 page in the same structure as the July 22 page. The successful template-generated layout dummy are depicted in Fig. 6.7 along with the page dummy used by the Globe. During the layout process an additional embedded operator was assumed, one in which the embedded item is located in the top middle of the other item, such as the "Kennedy" picture in Fig. 6.7(a). Although our embedded set of operators defined in Chapter 4 does not include this operator, it should be obvious that the operator set can be easily augmented and the layout technique extended to allow this structure.

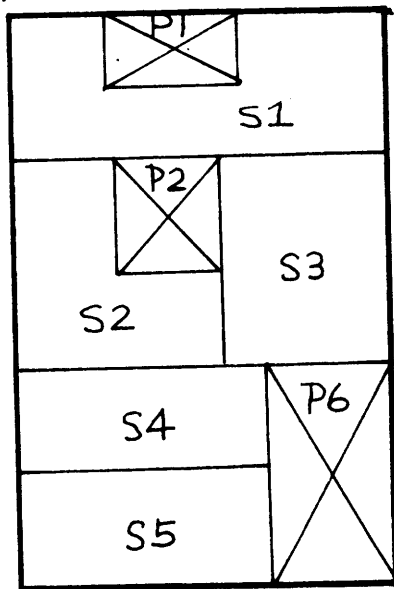
The original page 3 of the July 27 issue and the manual paste-up of the template-generated results are shown in Figs. 6.8

Table 6.2 Input Data for Experiment II
 (Page 3 of July 27, 1976 issue of Boston Globe)

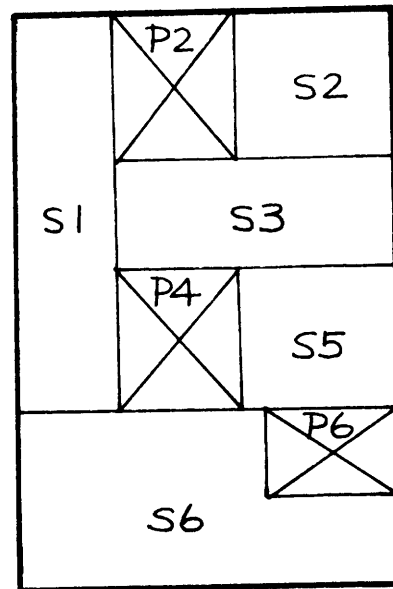
<u>News Items</u>	<u>Classifications</u>	<u>Areas or Dimensions *</u>	<u>Importance Rankings Assigned</u>
Kennedy	Story Associated Picture	140 2 X 17	1
Patients	Story	82	2
Police-Patrols	Story Associated Picture	75 3 X 16	3
Lineup-Case	Story	41	4
Housing	Story	120	5
Summer	Stand-Alone Picture	2 X 30	6

* in column-lines or columns X lines

$$(S1 \square P1) = ((S2 \square P2) \parallel S3) = ((S4=S5) \parallel P6) \quad (S1 \parallel ((P2 \parallel S2) = S3 = (P4 \parallel S5))) = (S6 \square P6)$$

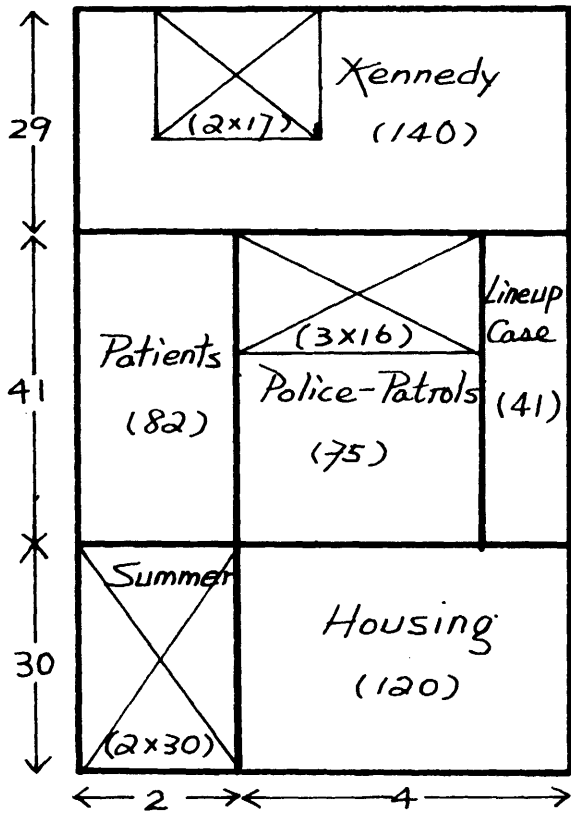


(a) T5

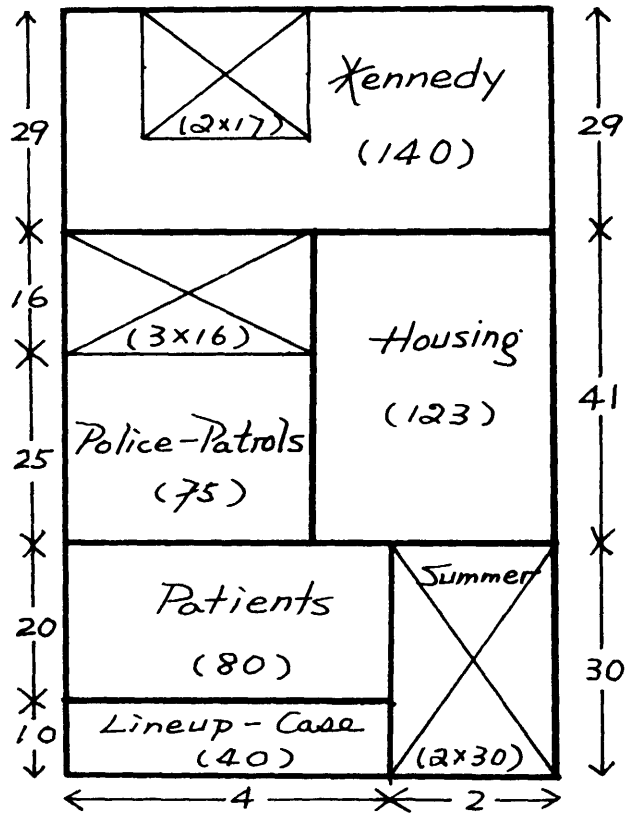


(b) T6

Fig. 6.6 Layout Templates Used in Experiment II



(a) Page as Laid out by Globe



(b) Template-Generated Page Using T5 as a Guide

Fig. 6.7 Layout Dummies of Experiment II

and 6.9, respectively. Note that the picture associated with "Police-Patrols" in Fig. 6.9 is positioned on top of the story text, despite the call by template T5 for an embedded layout at the upper-right corner (S2 and P2 in Fig. 6.6(a)). This occurs because a 3-column area is constructed for the news item "Police-Patrols" (story and picture combined) during its layout, and the associated picture is also 3-columns wide; consequently, the picture occupies the entire top part of the area.

Template T6, shown in Fig. 6.6(b), is the same as T4 in Fig. 6.1(d). It again fails to produce a successful layout due to the large story text areas of "Kennedy" and "Police-Patrols" and their relatively small associated pictures. Again, as in Experiment I, neither of these two news items is able to fit into the upper-right corner (S2 and P2 in Fig. 6.6(b)) in the structure required by template T6.

Kennedy's busing stand hurting him in some Boston wards

By Charles Clafey
Globe Staff

On Sept. 9, 1974, U.S. Sen. Edward M. Kennedy was struck with a tomato and punched and kicked when he tried to address opponents of the city's school desegregation plan at a rally at City Hall Plaza.

Last February, a group of busing foes broke up an anti-fare hearing by Kennedy at the JFK building in Boston almost before it began.

And last April, Kennedy was jostled and poked by a crowd of anti-busing demonstrators in Quincy as he tried to elbow his way to his car outside a junior high school where he had given a speech.

Kennedy's support of court-ordered school busing to achieve desegregation has cost the senior senator from Massachusetts support which traditionally have been part of the Kennedy power base in Massachusetts.

As a result, his bid for re-election this year to a third six-year term has opened four Democratic opponents into the Sept. 14 primary, all of whom are opposed to court-ordered busing.

Although none of the four is considered a serious threat to Kennedy's



Sen. Kennedy discusses court-ordered busing with group of South Boston High School students in photo taken in his high office in January. At second left is Robert Dismore, attorney for South Boston Home and School Assn. (UPI photo)

incumbency, the number of tokens opponents is viewed by some as a sign of erosion in the senator's impressive hold on public office in Massachusetts.

Only one of Kennedy's opponents in the primary is a professional politician, Boston City Councilman Frederick C. Langone.

It is Langone that Kennedy campaign aides reportedly feel poses the

only half-serious opposition.

Kennedy workers, concerned that his supporters might be so confident of an easy victory that they won't bother with the primary, are working to get out the vote.

If the senator, as expected, wins the primary, he will face a political unknown, Michael Robertson, 41, a public relations man in the Bristol

County town of Berkley.

Besides Langone, the challengers are:

-Robert E. Dismore, 44, of Milton, a Boston attorney active in handling cases for opponents of busing.

-Albert J. Onesimo, 54, a Somerville real estate man.

-Bernard Shannon, 44, president of a Stoughton construction firm.

Langone, a 12-year council veteran, said he feels he has a chance to win because "there is a lot of antagonism toward Kennedy."

The councilman said Kennedy's primary consideration "is his national image. He can't do anything that would hurt his image with a black in New York City or a chicano in Los Angeles."

"I have no national image to protect," Langone said. "What affects the people of Massachusetts would be what concerns me."

He said it is not school busing as such that is at issue "but giving the people of Boston a day in court the way they did in Louisville and Detroit. We never got that opportunity."

Langone is critical of the announced closings of military installations in Massachusetts and said that as senator, he would work on keeping them open, "and I won't have to trade votes on national issues to get it done."

Dismore, like the other candidates, believes that "people want a change," while adding that in opposing Kennedy he is "fighting a brand name."

He has never run for public office before and acknowledges that "I'm not going to get help from any [political] pros."

Helping in his campaign are legal associates, Len Gold, his wife, Helen, and several of his eight children, as well as members of his office staff.

Dismore feels that governmental social policies "forced on the people of Massachusetts are repugnant."

Among other things, he believes in the right of people to decide "the manner and place in which their children will be educated."

His interpretation of freedom of choice also extends to gun control. He favors legislation that would set reasonable criteria for people desiring to carry guns.

Onesimo's only bid for public office was as a sticker candidate for mayor in Somerville.

He calls himself an "antibureaucrat" and contends that New England residents are paying the price of bureaucracy in high fuel oil and gasoline costs.

Onesimo also opposes forced busing and said he would work hard to prevent the announced closings of military bases in the state.

Thus far, his campaigning has been confined to Greater Boston communities, but he said he plans to extend his operations to the state's central and western parts.

Shannon, whose campaign bumper stickers describe him as "A Man for All Reasons," says Kennedy is "leading our nation's headlong plunge toward socialism by enacting programs which allow the Federal government to infiltrate every facet of our private lives."

A self-characterized liberal turned moderate-conservative, he has charged that Kennedy is at the "forefront of those who are perverting social legislation into socialist legislation."

He opposes the Equal Rights Amendment, calling it "the most important issue before this country since slavery."

Loans, purchases reported

Fernald patients' funds misused, Buczko says

By Nils Brunhus
Globe Staff

Officials of the Walter E. Fernald State School made a number of "questionable" expenditures with funds belonging to the retarded residents of the school, State Auditor Theaddeus Buczko said yesterday.

The expenditures included three small loans to employees of the school in "clear violation of the residents' rights," the report said, and the purchase of washing machines, dryers and furniture for the school. Buying two of the loans had not been repaid, the auditor said. "Future actions of this sort should be punished harshly."

The loans totaled \$200. Buczko and others have repeatedly found improperities in the handling of patients' funds at the institutions of the state Mental Health Department, and now regulations are being drawn up to cope with the allegedly questionable expenditures.

The audit report, which covered a 13-month period up to February 24, 1976, said it found a number of discrepancies in accounting and instances of inadequate record keeping.

"It is quite obvious that better record keeping is needed to insure proper internal controls and to protect the rights of the residents," the report says.

Fernald is one of two state schools for the retarded that is threatened with the loss of up to \$10 million in Federal funds because of major failings in patient care, numbers of staff, pharmacy services, food handling, medical records and other services.

Acting Superintendent John Gracy said he could not comment specifically on the allegations of misuse of patients' funds because he had not yet seen the auditor's report.

He said, however, that to conform with recently issued departmental guidelines, the Fernald administration

has "developed an entirely new set of policies and procedures governing expenditure and accountability for clients' funds." He said they are expected to be issued within 10 days.

Since he became acting superintendent a month ago, Gracy said he has personally approved all expenditures of patients' funds and "to my understanding there have been no irregularities" in that period.

In addition to the loans, the audit report said it found a number of other questionable expenditures from personal funds belonging to the retarded residents of the school. It cited \$973 spent on "shampoo and dryer" and \$600 spent on "nursing services." Patient funds were also reportedly used to purchase a color television set, a dishwasher and wall fans.

The report said "it appeared" these items should have been paid for with expenditures from the "maintenance appropriation."

The personal patients' funds held by the school come from several areas, according to mental health department sources. Some of the funds received by residents having Supplemental Security Income, some are funds provided by resident families, and some come from other sources such as Social Security.

Individual bank accounts maintained for 161 of the 1400 patients at the school totaled nearly \$600,000 as of Feb. 24, the report said.

Buczko's audit also questioned a number of expenditures from funds donated to the school "for the benefit of patients." Without citing amounts or providing details, it listed expenditures for such items as "loans to employees, Activity Center dedication, payment for travel and luncheons, advertising for hospital" and "loans to Walter E. Fernald State School for postage."



Standing in Coplay Square before members of Boston Police 41st Squad (left) and Mayor White tell reporters about issuance Department's mounted patrol, Police Com. Robert J. in size of unit.

Mounted police patrols expanding

Covering Newbury and Boylston streets, Jamaica Pond

By David A. Rogers
Globe Staff

The mayor said a few words, the police commissioner added a few words of his own, the mounted patrolmen smiled, and the horses said nothing.

Lined up in Coplay Square across from the Boston Public Library yesterday, they were the silent stars of a mounting party for the city's mounted patrol, which after more than a century of service, seems to be an idea old enough to be considered new again.

Led by Sgt. Alfred J. McNeil, riding a big chestnut Morgan with the title Farfield Fortitude 24, the unit has grown in the last year from about 10 mounts to 18, complemented now by 28 officers to ensure permanent patrol in some sections of the city.

Yesterday's party was to make the announcement of five new patrolmen to the unit, including the second woman officer and to celebrate the institution of permanent horse patrols.

"The deployment of mounted police as crime deterrents is a relatively new idea in Boston and has been welcomed

as a much needed addition to foot and car patrols," said Mayor Kevin White, in a statement released for the occasion. "The officers and horses have been extremely popular with residents, businessmen and visitors," he said.

"Mounted officers can see and be seen for three blocks. This not only deters criminal acts but adds to the overall sense of security felt by people living, working or shopping in the downtown and Back Bay areas," White said.

While the patrol has been used historically on the Boston Common, its role has been expanded in the past year, first at the prompting of the city's theater district, which had complained of prowling and muggers driving away patrons. Since April, the patrols have been added on an experimental basis in commercial areas in the Back Bay and these will now be made permanent" on Newbury and Boylston streets as well as the Fenway.

Aside from Newbury, the Jamaica Pond area will be patrolled daily, and, on Sunday's, the area Westport Park and Arnold Arboretum.

"People always said the horses were good, but it has taken a while before anything was done for them," said Joseph McLennan, a hostler at the Brandeis Hotel in Jamaica Plain, where the animals are stabled and trained. "Now the feed is better and we have a few extra dollars to care for them. Things are looking up."

Still less than one percent of the city's police budget, the patrol often relies on horses donated by private owners. These include a grade Morgan named Freecot, first given by the mayor to his wife as a Christmas present.

White, who has used such occasions as small press outings, seemed content to share the good reception enjoyed by the animals and pose alongside Com. Robert DiGracia, who has recently been reported on the out with the mayor.

"Is there any friction, Bob?" asked White.

"Why, I adore you," said DiGracia.

The mounted patrolmen smiled and the horses said nothing.

Charges may be dropped

Lineup case is deferred for police

By Nils Brunhus
Globe Staff

Eighteen Boston patrolmen charged with disobeying a direct order to participate in an identification lineup pleaded no contest to the charge yesterday and prosecution of the matter will be deferred for six months.

If the officers avoid any similar complaints in the next six months, the charges will be dropped. The arrangement was proposed by the police and accepted by Police Com. Robert J. DiGracia.

"I'm satisfied with the disposition and I'm pleased that the men are," DiGracia said.

The charges were leveled by superior officers after the men refused to stand in a lineup in connection with complaints that two off-duty surveillance Charlestown residents last October.

The officers who refused to take part in the lineup "are all members of the Mobile Operations Unit. They would be ordered on the basis of their attorney, Frank McLean, saying the order was unconstitutional."

Stephen D'Amico, an aide to DiGracia, said late yesterday the commissioner's agreement is not part of his attempts at reconciliation with the patrolmen's union, but is solely a decision on a single case.

DiGracia and Charles J. Broderick, chairman of the Boston Police Patrolmen's Assn., agreed last week to meet regularly in the future to discuss police department matters and to attempt to end the bitterness that has sometimes characterized their relationship over the past four years.

South End housing: Haves vs. have-nots, Round 2

By Anne Kirchheimer
Globe Staff

The hell is over. The battle between the haves and the have-nots in Boston's South End has begun anew after a year of relative calm.

What got the troops going this time was a recently issued Federal housing directive, made public late last week, that apparently puts an end to building any more subsidized housing in the South End.

The directive, based on little-used U.S. Department of Housing and Urban Development (HUD) guidelines, is aimed at guiding the construction of subsidized housing away from neighborhoods with high concentrations of poor persons and subsidized living units.

If strictly enforced, the guidelines have wide-ranging implications for the character of other, poorer Boston neighborhoods and their residents, and for the state.

And in the South End, where more than half the residents are low income and a growing number of others are middle- and upper-middle-class homeowners, the implications of the HUD ruling are already becoming known.

The directive on subsidized housing could not but have one step ahead of the have-nots.

The basic controversy is simple: One group of residents, who have called themselves Citizens for a Bal-

anced South End in the past and the Section 8 Committee more recently, say they want to make sure the area maintains a "balance" between the poor and the affluent, an aspect that has characterized the South End.

The other group, made up of poor persons and more affluent advocates of low-income housing, want to see the South End's subsidized housing improved to ensure that those who came to the neighborhood before townhouse urban living became fashionable have the opportunity to remain.

There are not the only players in what could be termed a class struggle. The battle is further complicated by HUD and the Boston Redevelopment Authority (BRA), which has directed the South End Urban Renewal plan since its inception in 1965.

For two of the last three years the

lawyer, Thomas Philip DeLeon, or mentioned in the HUD directive is what happens to persons living in subsidized housing in the South End and more than 300 South Enders who qualify for subsidized housing and cannot find it.

The BRA will first appeal the HUD directive by letter. But BRA officials say court action may follow.

Charles Speliotis, BRA director of housing and general counsel, said "Impact and undue concentration" are all new words and nice concepts but... it's our obligation to improve the conditions for people living there."

Charles Speliotis, BRA director of housing and general counsel, said "Impact and undue concentration" are all new words and nice concepts but... it's our obligation to improve the conditions for people living there."

Many local political figures, including members of the Massachusetts Black Caucus, and community groups will band together, they say, to try to force HUD to reverse the directive.

State Rep. Mel King (D-South End) says it is unlikely that South Enders, in particular blacks and Spanish-speaking persons... will move to South Boston, East Boston or Charlestown despite the intent of HUD's directive to disperse poor people and subsidized housing.

Right now, the only certain thing is that 16 units of subsidized housing for the South End have been halted, and the future of hundreds of more additional planned units is uncertain.

Fig. 6.8 Original Page 3 as Printed in the July 27, 1976 Issue of Boston Globe

Kennedy's busing stand hurting him in some Boston wards

By Charles Claffey
Globe Staff

On Sept. 9, 1974, US Sen. Edward M. Kennedy was struck with a tomato and punched and kicked when he tried to address opponents in Quincy as he tried to show his way to his car outside a junior high school where he had given a speech.

Last February, a group of busing fans broke up an airline fare hearing by Kennedy at the JFK building in Boston almost before it began.

And last April, Kennedy was jostled and poked by a crowd of anti-busing demonstrators in Quincy as he tried to show his way to his car outside a junior high school where he had given a speech.

Kennedy's support of court-ordered school busing to achieve desegregation has cost the senior senator from Massachusetts support in some of Boston's Democratic wards which traditionally have been part of the Kennedy power base in Massachusetts.

As a result, his bid for re-election this year to a third six-year term has lured four Democratic opponents into the Sept. 14 primary, all of whom are opposed to court-ordered busing.

Although none of the four is considered a serious threat to Kennedy's



Sen. Kennedy discusses court-ordered busing with group of South Boston High School students in photo taken in his Hub office in January. At second left is Robert Dinamore, attorney for South Boston Home and School Assn. (UPI photo)

incumbency, the number of token opponents is viewed by some as a sign of erosion in the senator's impregnable hold on public office in Massachusetts.

Only one of Kennedy's opponents in the primary is a professional politician, Boston City Councilman Frederick C. Langone.

It is Langone that Kennedy campaign aides reportedly feel poses the

only half-serious opposition. Kennedy workers, concerned that his supporters might be so confident an easy victory that they won't bother with the primary, are working to get out the vote.

If the senator, as expected, wins the primary, he will face a political unknown, Michael Robertson, 41, a Republican businessman in the Bristol

County town of Berkley. Besides Langone, the challengers are:

Robert E. Dinamore, 44, of Milton, a Boston attorney active in handling cases for opponents of busing.

Albert J. Onesimo, 54, a Somerville real estate man.

Bernard Shannon, 44, president of a Stoughton construction firm. Langone, a 12-year council veteran, said he feels he has a chance to win because "there is a lot of antagonism towards Kennedy."

The councilman said Kennedy's primary consideration "is his national image. He can't do anything that would hurt his image with a black in New York City or a chicano in Los Angeles."

"I have no national image to protect," Langone said. "What affects the people of Massachusetts would be what concerns me."

He said it is not school busing as such that is at issue "but giving the people of Boston a day in court the way they did in Louisville and Detroit. We need not that opposition to carry guns."

He calls himself an "anti-busocrat" and contends that New England residents are paying the price of bureaucracy in high fuel oil and gasoline costs.

Onesimo also opposes forced busing and said he would work hard to prevent the announced closings of military bases in the state.

Thus far, his campaigning has been confined to Greater Boston communities, but he said he plans to extend his operations to the state's central and western parts.

Shannon, whose campaign bumper stickers describe him as "A Man for All Reasons," says Kennedy is "leading our nation's headlong plunge toward socialism by espousing programs which allow the Federal government to infiltrate every facet of our private lives."

A self-characterized liberal turned moderate-conservative, he has charged that Kennedy is at the "forefront of those who are perverting social legislation into socialist legislation."

He opposes the Equal Rights Amendment, calling it "the most important issue before this country since slavery."

Mounted police patrols expanding

Covering Newbury and Boylston streets, Jamaica Pond

By David A. Rogers
Globe Staff

The mayor said a few words, the police commissioner added a few of his own, the mounted patrolmen smiled, and the horses said nothing.

Lined up in Copley Square across from the Boston Public Library yesterday, they were the silent staff of a coming out party for the city's mounted patrol, which, after more than a century of service, seems to be an idea old enough to be considered new again.

Led by Sgt. Alfred J. McNeil, riding a big chestnut Morgan with the title Partridge Portulaca 50, the unit has grown in the last year from about 10 mounts to 18, complemented now by 10 officers to ensure permanent patrols in some sections of the city.

Yesterday's party was to make the announcements of five new patrolmen to the unit, including the second woman officer and to enhance the tradition of permanent horse patrols.

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What got the chips going this time was a recently issued Federal housing directive, made public last week, that apparently puts an end to building any more subsidized housing in the South End.

The directive, based on little-used US Department of Housing and Urban Development (HUD) guidelines, is aimed at dispersing the concentration of subsidized housing away from neighborhoods with high concentrations of poor persons and subsidized living units.

It strictly enforces the guidelines have wide-ranging implications for the character of other, poorer Boston neighborhoods and their residents, and for the state.

And in the South End, where more than half the residents are low income and a growing number of others are middle- and upper-middle-class home owners, the implications of the HUD ruling are already becoming known.

The directive on subsidized housing could now put the haves one step ahead of the have-nots.

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Fernald patients' funds misused, Buczko says

By Nils Brunelius
Globe Staff

Officials of the Walter E. Fernald State School made a number of "questionable" expenditures with funds belonging to the retarded residents of the school, State Auditor Theodosius Buczko said yesterday.

The expenditures included three small loans to employees of the school in "clear violation of the residents' rights," the report said, and the purchase of washing machines, dryers and furniture for the school. None of the two of the loans had not been repaid, the auditor said. "Future actions of this sort should be punished harshly."

The loans totaled \$360. Buczko and others have repeatedly found improprieties in the handling of patients' funds at the institutions of the state Mental Health Department, and new regulations are being drawn up to cope with the allegedly questionable expenditures.

Lineup case for police is deferred

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Eighteen Boston patrolmen charged with disobeying a direct order to participate in an identification lineup up pleaded no contest to the charges yesterday and prosecutors in the matter will be deferred for six months.

If the officers avoid any similar complaints in the next six months, the charges will be dropped. The arrangement was proposed by the police and

as a much needed addition to foot and car patrols," said Mayor Edwin White, in a statement released for the occasion. "The officers and horses have been extremely popular with residents, businessmen and visitors," he said.

"Mounted officers can see and be seen for three blocks. This not only deters crime, but adds to the overall sense of security felt by people living, working or shopping in the downtown and Back Bay areas," White said.

White's patrol has been used historically on the Boston Common, its role has been expanded in the past year, first at the prompting of the city's theater district, which had complained of premature and lingering drug away patrons. Since April, the patrols have been added on an experimental basis in commercial areas in the Back Bay, and these will now be made permanent on Newbury and Boylston streets as well as the Parkway. Aside from the Common, the Jamaica Pond area will be patrolled daily, and, on Sunday, the new Waterfront Park and Arnold Arboretum.

the lawyer, Thomas Philip DeLeon, or what happens to persons living in more than 4300 remaining substandard units in the South End, and to more than 3000 South Enders who qualify for subsidized housing and cannot get it.

The BRA will first appeal the HUD directive by letter. But BRA officials say they will also sue HUD to force it to reverse the directive.

Charles Speletis, BRA director of housing and general counsel, said: "Impact and undue concentration are all nice words and nice concepts but... it's our obligation to improve the conditions for people living there."

Speletis is further complicated by the fact that HUD officials are already becoming known. The battle is further complicated by city politics, apartment, realtor, HUD and the Boston Redevelopment Authority (BRA), which has directed the South End Urban Renewal plan since its inception in 1965.

For two of the last three years the all nice words and nice concepts but through my familiarity with the South End, I know there are many people living in substandard housing, and it's our obligation to improve the conditions for people living there."

Many local political figures, including members of the Massachusetts House of Representatives, and community groups will band together, they say, to try to force HUD to reverse the directive.

State Rep. Mel King (D-South End) says it is unlikely that South

has "developed an entirely new set of policies and procedures governing expenditure and accountability for clients' funds." He said they are expected to be issued within 10 days.

Since he became acting superintendent a month ago, Cracy said he has personally approved all expenditures of patients' funds and "to my understanding there have been no irregularities" in that regard.

In addition to the loans, the audit report said it found a number of other questionable expenditures from personal funds belonging to the retarded residents of the school. It cited \$113 spent on "washing and dryer" and \$300 spent on "tutoring services." Patient funds were also reportedly used to purchase a color television set, a dishwasher and wall fans.

The report said "it appears" these items should have been paid for with expenditures from the "maintenance account."

The audit report, which covered a 13-month period up to February 24, 1976, said it found a number of discrepancies in accounting, and instances of inadequate record keeping.

"It is quite obvious that better record keeping is needed to insure proper internal controls and to protect the rights of the residents," the report said.

Fernald is one of two state schools for the retarded that is threatened with the loss of up to \$10 million in Federal funds because of major fatigue in patients' care, numbers of staff, pharmacy services, food handling, medical records and other services.

Acting Superintendent John Cracy said he could not comment specifically on the allegations of misuse of patients' funds because he had not yet seen the auditor's report.

He said, however, that to conform with recently issued departmental guidelines, the Fernald administration

accepted by Police Com. Robert J. McGraw.

"I'm satisfied with the disposition and I'm pleased that the men are," McGraw said.

The charges were leveled by superior officers after the men refused to stand in a lineup in connection with complaints that two officers assaulted several Charlestown residents last

of his attempts at reconciliation with the patrolman's union, but is solely a decision on a single case.

McGraw and Charles J. Broderick, chairman of the Boston Police Patrolmen's Assn., agreed last week to meet regularly in the future to discuss police department matters and to attempt to end the bitterness that has sometimes characterized their relationship over the past four years.



Mina Regina Martin performs in graceful silence at Boston's Prokofiev Center. Martin and members of National Hills Theatre entertain visitors last night as part of the center's Summer Shakespeare series. (Globe photo by Stan Greenfield)

Fig. 6.9 Layout of Fig. 6.8 Using Template T5

6.3 LAYOUT EXPERIMENT III

In order to test the layout of pages with ads, data are taken from page 8 of the July 28, 1976 issue of the Globe and used as inputs for the layout algorithm. The page as laid out by the Globe has an 8-column format and contains six ads, three stories, and one stand-alone picture. Table 6.3 lists the areas or dimensions of the news items and ads as measured from the original page, and Fig. 6.10 depicts three layout templates, T7 to T9, used in the experiment. The minimum overhead and latency distance specified for this experiment is 5 and 3 lines, respectively.

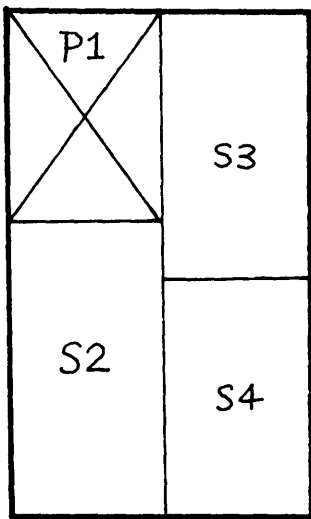
The original page layout as it appeared in the paper is depicted in Fig. 6.11(a), where the ads-area is denoted by the shaded area and the remaining non-rectangular news-hole is described by the numbers on top of the page. These numbers represent the news-hole depth for each column. Figure 6.11(b) depicts the layout dummy obtained by using template T7. The details of the layout are presented in section 5.4.4 where the case was used as an example of the layout algorithm. Figures 6.12 and 6.13 show the original news page on the Globe and our algorithmic layout results obtained by pasting up the dummy in Fig. 6.11(b), respectively.

In the second test case of this experiment, the ads-dummy of the original page is modified and template T8 is used.

Table 6.3 Input Data for Experiment III
 (page 8 of July 28, 1976 issue of Boston Globe)

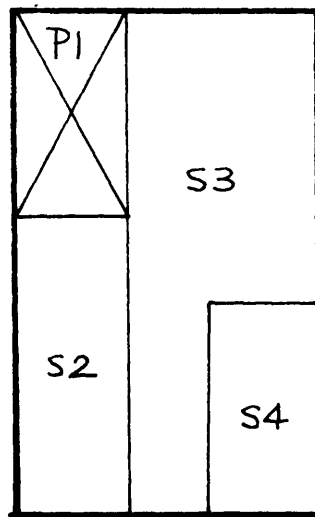
<u>News or Ads</u>	<u>Classifications</u>	<u>Areas or Dimensions</u>	<u>Importance Rankings Assigned</u>
Rent-Hike	Story	100	1
Car-Insurance	Story	74	3
Metco-Cuts	Story	51	4
Children's-Zoo	Stand-Alone Picture	3 X 21	2
Stearns-Coat	Ad	3 X 68	
Staerns-Glasses	Ad	3 X 33	
Sears	Ad	2 X 50	
Lakes-Region	Ad	2 X 32	
Congressman	Ad	2 X 18	
Simpson's	Ad	1 X 9	

(P1 = S2) || (S3 = S4)



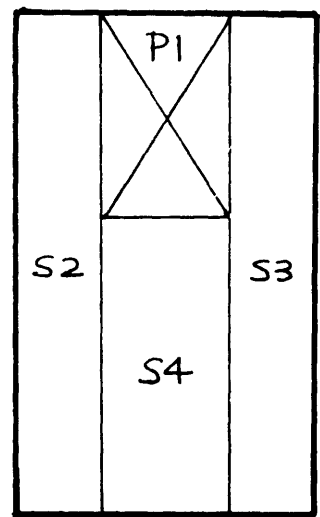
(a) T7

(P1 = S2) || (S3 ⊆ S4)



(b) T8

S2 || (P1 = S4) || S3



(c) T9

Fig. 6.10 Layout Templates Used in Experiment III

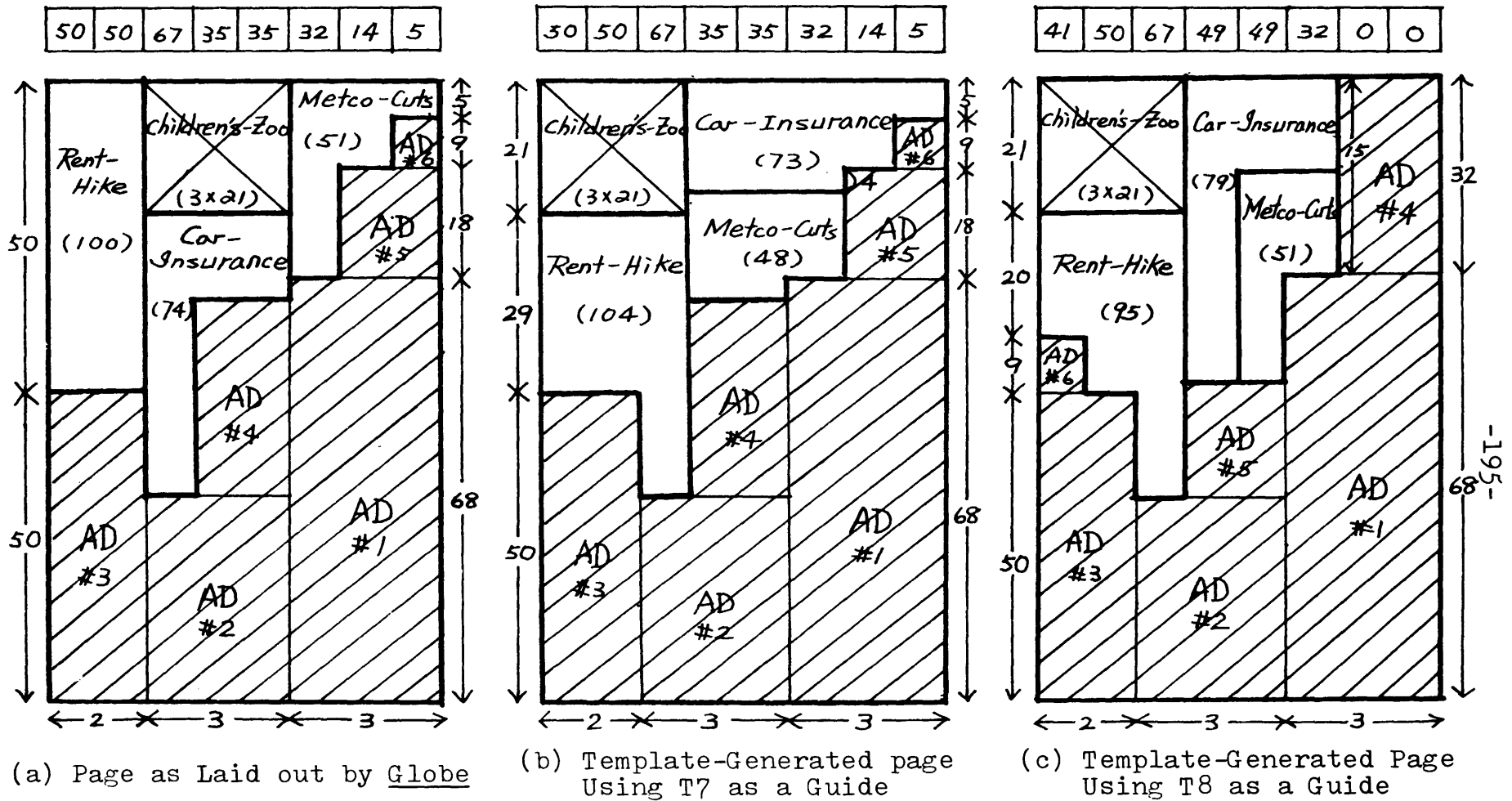


Fig. 6.11 Layout Dummies of Experiment III

BHA delays hikes in Aug. 1 rents pending review

By Marvin Pave and Walter Middlebrook Globe Staff

The board chairman of the Boston Housing Authority (BHA) said yesterday that a moratorium has been placed on the proposed Aug. 1 rent increases for tenants in the city's public housing project, pending review of individual cases.

Dominick Pasciucco made the announcement during a hearing before the Boston City Council's Committee on Housing, and he drew a loud response from the overflow gallery of 250 onlookers, most of them senior citizens.

Pasciucco announced the rent freeze after taking a telephone poll of board members who were not present at the hearing.

Jerrold Hickey, a spokesman for the BHA, said the "across-the-board rent delays are pending individual review" of tenants who request them. He said a number of tenants had already come to the BHA and requested reviews since the announcement of the scheduled rent increases.

"A good deal of it is already going on," he said. Hickey said all BHA tenants would be notified within a few days, "probably by mail," of their right to request a review.

When questioned about the legality of such a moratorium, Pasciucco said that the question would have to be answered by the BHA's principal funding sources, the US Department of Housing and Urban Development (HUD) and the state Department of Community Affairs (DCA).

"I'm not sure HUD or the DCA would approve it," Pasciucco said at yesterday's hearing. "I just can't predict if we'd be overruled."

BHA general counsel Kevin Feeler, however, said he couldn't recall any cases in which funds were cut off from municipal housing authorities because of local voters on rent increases.

Fifty tenants of BHA-run public housing had already filed a complaint in Boston Housing Court to prohibit the scheduled rent increases.

Michael Harro, counsel with Greater Boston Legal Services, said the complaint was brought as a class action suit against the BHA on behalf of all tenants affected by the increases.

The Tenant Status Review, which is supposed to be conducted every two years regarding senior citizen incomes and yearly for family developments in the housing units, is in accordance with Federal and state statutes. The review was just recently completed and is the major reason for the proposed increases.

"Some of the increases are justified," said Myra Melton of the Boston Housing Tenants Housing Council. "They are badly timed, though. Tenants have suffered tremendously this year," she said, citing the living conditions in many of the housing projects.



Seven-year-old Mark Houston, visiting Bab with group from New Bedford, gets kissed by Coffee the camel at the Children's Zoo. (Globe photo by Ted Dally)

Framingham firm on Metco cuts

By Tom Jones Globe Correspondent

The Framingham School Committee last night rejected by a vote of 6-1 a proposal by the Massachusetts Department of Education to eliminate two of the town's Metco staff members at a cost of \$19,000 and also refused to make any payments to Metco's central support office.

In the words of member Charles F. Rousseau, "services are not endangered by last night's vote. We are maintaining 144 students and we still have a coordinator to maintain ties to the families."

The vote, which came less than a month after the Newton School Committee cut \$81,000 from the voluntary busing program, will "endanger the validity of the program to youngsters," state Secretary of Education Paul Parks, who was at the meeting, said last night.

School Committee Chairman Joseph P. Conlon said the vote was the School Committee responding to its fiscal responsibility.

"When the state cuts back money, the towns must also cut back," he said.

At stake in last night's

IMMEDIATE CASH

Bumkins, jewelry, Antiques and Old Gold

Car insurance changes approved

* AUTO INSURANCE

Continued from Page 1

But it was apparent that a compromise had already been reached. The new committee adopted the same report with one addition.

The addition guaranteed that safe drivers placed in the assigned risk pool would be charged rates as closely as the commissioner approves as practicable to the rates charged to similar drivers from the same area not in the facility.

"It can't happen here and it can't happen in the House, the votes aren't there." He urged his fellow senators to accept the compromise bill.

The Senate approved the report, 28-4, with four senators from Boston casting negative votes. They are Timothy, William M. Bulger, Bill Owens and Joseph B. Walsh, all Democrats.

The report was shipped to the House immediately, where it was approved on a voice vote. Enactment in both branches followed within a half hour.

Under the proposed merit rating system, unsafe drivers would be assessed surcharges that would go into a pool to be divided among the safe drivers in the form of rebates. Each geographic area would have a separate pool, Stone said, permitting safe drivers in high risk areas to receive larger rebates.

Insurance Comr. James M. Stone, who lobbied extensively on behalf of the provision, said he was satisfied that it protected safe drivers in the assigned risk pool.

The second conference committee report was the subject of the lengthy discussion in the Senate.

Sen. Daniel J. Foley (D-Worcester), chairman of the Insurance Committee, made a strong pitch for both the merit rating system and competitive rates, but he argued against the amendment.

The original bill, he said, had "adequate protection for every driver in the commonwealth," including those in the assigned risk pool. But he bowed to pressure exerted by supporters of the amendment.

Rep. Royal Bolling Jr. (D-Mattapan) originally sponsored the amendment.

Sen. Joseph F. Timothy (D-Mattapan) objected to the continuation of geographical distinctions in setting rates in regard to a flat rate for the entire state. D'Carlo agreed, noting that he had sponsored a flat rate bill which was soundly defeated last month.

But D'Carlo also said:

NEW HAMPSHIRE'S LAKES REGION

RESORTS • ATTRACTIONS • RESTAURANTS

YOUR GUIDE TO

This guide appears in the Tuesday morning, Wednesday morning, all day Thursday, and Saturday morning Globe.

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MEET THE CANDIDATE PUBLIC INVITED

TONIGHT — WED. 7:30 P.M. JULY 28th

at — AUGUSTINE'S REST. — SAUGUS

SPECIAL GUEST APPEARING LOUIS ARMSTRONG & TV'S BONANZA STAR

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Fig. 6.12 Original Page 8 as Printed in the July 28, 1976 Issue of Boston Globe



Seven-year-old Mark Houston, visiting club with group from New Bedford, greeted by coffee the usual at the Children's Zoo. (Globe photo by Ted Dully)

BHA delays hikes in Aug. 1 rents pending review

By Marvin Pave and Walter Middlebrook Globe Staff

The board chairman of the Boston Housing Authority (BHA) said yesterday that a moratorium has been placed on the proposed Aug. 1 rent increases for tenants in the city's public housing projects, pending review of individual cases.

Dominick Pasquocci made the announcement during a hearing before the Boston City Council's Committee on Housing, and he drew a loud response from the overflow gallery of 250 onlookers, most of them senior citizens.

Pasquocci announced the rent freeze after taking a telephone poll of board members who were not present at the hearing.

Jerrold Hickey, a spokesman for the BHA, said the "on-the-board rent delays are pending individual review" of tenants who request them. He said a number of tenants had already come to the BHA and requested reviews since the announcement of the scheduled rent increases.

"A good deal of it is already going on," he said. Hickey said all BHA tenants would be notified within a few days, "probably by mail," of their right to request a review.

When questioned about the legality of such a moratorium, Pasquocci said that the question would have to be answered by the BHA's principal funding source, the US Department of Housing and Urban Development

(HUD) and the state Dept. (DCA).

"I'm not sure HUD or DCA would approve it," Pasquocci said at yesterday's hearing.

BHA general counsel N. H. Healey said he couldn't recall any cases from municipal housing in which tenants had requested waivers on rent increases.

Fifteen tenants of BHA ready filed a complaint in Boston Superior Court to prohibit the scheduled rent increases. Michael Harco, counsel for the tenants, said the complaint was filed against the BHA, not the rent increases.

The Tenant Status Revue conducted every two years come and yearly for family projects, is in accordance with the review was just a major reason for the problem.

"Some of the increases made by the Boston Housing Authority are badly timed and tend to be in excess of what tenants can afford. They are badly timed and tend to be in excess of what tenants can afford."

DCA would approve it," he said. "I just can't pre-

dict on that," he said. He said in which funds were cut off subsidies because of local

run public housing had at- tention Housing Court to pro- cess.

With Greater Boston Legal was brought as a class ac- tion behalf of all tenants af- fected.

law, which is supposed to be regarding senior citizens in developments in the housing. The Federal and state statu- tions are completed and in the id increases.

are justified," said Myra Tenants Housing Comm. though. "Tenants have suf- fered," she said, citing the living ing projects.

Car insurance changes approved

* AUTO INSURANCE

Continued From Page 1

But it was apparent that a compromise had already been reached. The new committee adopted the same report with one addition. The addition guaranteed that safe drivers placed in the assigned risk pool would be charged rates "as closely as the commissioner approves as practicable" to the rates charged to similar drivers from the same area not in the facility.

Insurance Comr. James M. Stone, who lobbied extensively on behalf of the provision, said he was satisfied that it protected safe

"It can't happen here and it can't happen in the House, the votes aren't there." He urged his fellow senators to accept the compromise bill.

The Senate approved the report, 29-4, with four senators from Boston casting negative votes. They are Timothy, William M. Bulger, Bill Owens and Joseph B. Walsh, all Democrats.

The report was shipped to the House immediately, drivers in the assigned risk pool.

The second conference committee report was the subject of the lengthy discussion in the Senate.

where it was approved on a voice vote. Enactment in originally sponsored by Rep. Royal Bolling Jr. (D-Mattapan).

Under the proposed merit rating system, unsafe drivers would be assessed surcharges that would go into a pool to be divided among the safe drivers in the form of rebates. Each geographic area would have a separate pool. Stone said, permitting safe drivers in high risk areas to receive larger rebates.

Sen. Daniel J. Foley (D-Worcester), chairman of the Insurance Committee, made a strong pitch for both the merit rating system and competitive rates, but he argued against the

porters of the amendment sponsored by Rep. Royal Bolling Jr. (D-Mattapan).

Sen. Joseph F. Timilty (D-Mattapan) objected to the continuation of geographical distinctions in setting rates a rating in the entire state. DiCarlo agreed, noting that he had sponsored a flat rate bill which was soundly defeated last month.

But DiCarlo also said: Sen. Daniel J. Foley (D-Worcester), chairman of the Insurance Committee, made a strong pitch for both the merit rating system and competitive rates, but he argued against the

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Framingham firm on Metco cuts

By Tom Jones Globe Correspondent

The Framingham School Committee last night rejected by a vote of 8-1 a proposal by the Massachusetts Department of Education to reinstate two of the town's Metco staff members at a cost of \$18,000 and also refused to

decision was a request by the department of education that the town of Framingham modify its original reduction of the Metco staff from ten to six and restore two of the eliminated positions.

Jean McGuire, executive director of the 28-member Metco central staff, which the School Committee refused to fund by last night's vote, said that if no compromise is reached, no services for the town of Framingham will be provided and she still have a coordinator to maintain ties to the families."

The vote, which came less than a month after the Newton School Committee cut \$81,000 from the voluntary busing program, will "endanger the validity of the program to youngsters," state Secretary of Education Paul Parks, who was at the meeting, said last night.

School Committee Chairman Joseph P. Conlon said the vote was the School Committee re-

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Fig. 6.13 Layout of Fig. 6.12 Using Template T7

The modified ads-locations as well as the template-generated layout dummy is depicted in Fig. 6.11(c). Although the positions of ads are slightly different from the original layout in Fig. 6.11(a), the total ads area and hence the new-hole area, is retained. Again, layout dummy is used to guide the paste-up of the news items and the resultant news page is shown in Fig. 6.14.

As another test case, the modified news-hole in Fig. 6.11(c) is laid out using template T9, shown in Fig. 6.10(c), as the layout guide. As depicted in Fig. 6.15, after the virtual pages for stories "Rent-Hike" and "Car-Insurance" are constructed on each side of the given news-hole, the remaining area (denoted by the shaded area) is only 2 columns wide. Although the area (116 column-lines) comes very close to the total area (114 column-lines) of the remaining story and picture ("Metco-Cuts" and "Children's-Zoo"), the picture will not fit into the area because of its specified 3-column width. Therefore, the layout attempt using template T9 fails.



Seven-year-old Mark Houston, sitting high with green from New Bedford, gets kissed by coffee the camel at the Children's Zoo. (Globe photo by Ted Dully)

BHA delays hikes in Aug. 1 rents pending review

By Marvin Pevs and Walter Middlebrook
Globe Staff

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Dominick Pasciocco made the announcement during a hearing before the Boston City Council's Committee on Housing, and he drew a loud response from the overflow gallery of 250 onlookers, most of them senior citizens.

Pasciocco announced the rent freeze after taking a telephone poll of board members who were not present at the hearing.

Servid Hickey, a spokesman for the BHA, said the "I'm not sure HUD or Pasciocco said at yesterday's hearing, however, said that if we'd be overruled in which funds were cut off."

BHA general counsel said he couldn't recall any case from municipal housing where on rent increases. Boston Housing Court to prosecute.

Fifteen tenants of BHA with Greater Boston Legal Society filed a complaint in court on behalf of all tenants of public housing in Boston. Michael Haroz, counsel for the tenants, said the complaint was filed with the US Department of Housing and Urban Development.

The complaint, which is supposed to be regarding senior citizens in developments in the housing with Federal and state state-recently completed and is the first of its kind.

As are justified," said Myra using Housing Council, though tenants have suffered, she said, citing the living wage projects.

"Across-the-board rent de-reviews" of tenants who re-let of tenants had already requested reviews since the latest rent increases.

"A good deal of it is Hickey said all BHA tenants a few days, probably by a review.

When questioned about the moratorium, Pasciocco said that he was ordered by the BHA the US Department of Housing and Urban Development.

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Car insurance changes approved

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Continued from Page 1

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The addition guaranteed that safe drivers placed in the assigned risk pool would be charged rates "as closely as the commission approves as practicable" to the rates charged to similar drivers from the same area not in the facility.

Insurance Comm. James M. Stone, who lobbied extensively on behalf of the provision, said he was satisfied that it protected safe drivers in the assigned risk pool.

The second conference committee report was the subject of the lengthy discussion in the Senate.

Sen. Daniel J. Foley (D-Worcester), chairman of the Insurance Committee, made a strong pitch for both the merit rating system and competitive rates, but he argued against the amendment.

The original bill, he said, had "adequate protection for every driver in the commonwealth," including those in the assigned risk pool. But he hoped to pressure exerted by supporters of the amendment originally sponsored by Rep. Royal Bolling Jr. (D-Mattapan).

Sen. Joseph F. Timilty (D-Mattapan) objected to the continuation of geographical distinctions in setting rates "rigidly" on a flat rate for the entire state. DiCarlo agreed, noting that he had proposed a flat rate bill which was soundly defeated last month.

But DiCarlo also said: "The Tenant Status Review should every two years come and yearly for family."

"It can't happen here and it can't happen in the House, the votes aren't there." He urged his fellow senators to accept the compromise bill.

The Senate approved the report, 29-4, with four senators from Boston casting negative votes. They are Timothy, William M. Bulger, Bill Owens and Joseph B. Walsh, all Democrats.

The report was shipped to the House immediately, where it was approved on a voice vote. Enactment in both branches followed within a half hour.

Under the proposed merit rating system, unsafe drivers would be assessed surcharges that would go into a pool to be divided among the safe drivers in the form of rebates. Each geographic area would have a separate pool. Stone said, permitting safe drivers in high risk areas to receive larger rebates.

firm on Metco cuts

By Tom James
Globe Correspondent

The Framingham School Committee last night rejected by a vote of 6-1 a proposal by the Massachusetts Department of Education to restate two of the town's Metco staff members at a cost of \$13,000 and also refused to make any payments to Metco's central support office.

In the words of member Charles F. Rousseau, "services are not endangered by last night's vote. We are maintaining 144 students and we still have a coordinator to maintain ties to the families."

The vote, which came less than a month after the Newton School Committee cut \$81,000 from the voluntary housing program, will "endanger the validity of the program to youngsters," state Secretary of Education Paul Paris, who was at the meeting, said last night.

School Committee Chairman Joseph P. Conlon said the vote was the School Committee responding to its fiscal responsibilities.

"When the state cuts back money, the towns must also cut back," he said. "At stake in last night's decision was a request by the department of education that the town of Framingham modify its original reduction of the Metco staffing from ten to six and restore two of the eliminated positions."

Jean McGuire, executive director of the 23-member Metco central staff, which the School Committee refused to fund by last night's vote, said that if no compromise is reached, no services for the town of Framingham will be provided by the Metco central staff.

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Fig. 6.14 Layout of Fig. 6.12 Using Template T8

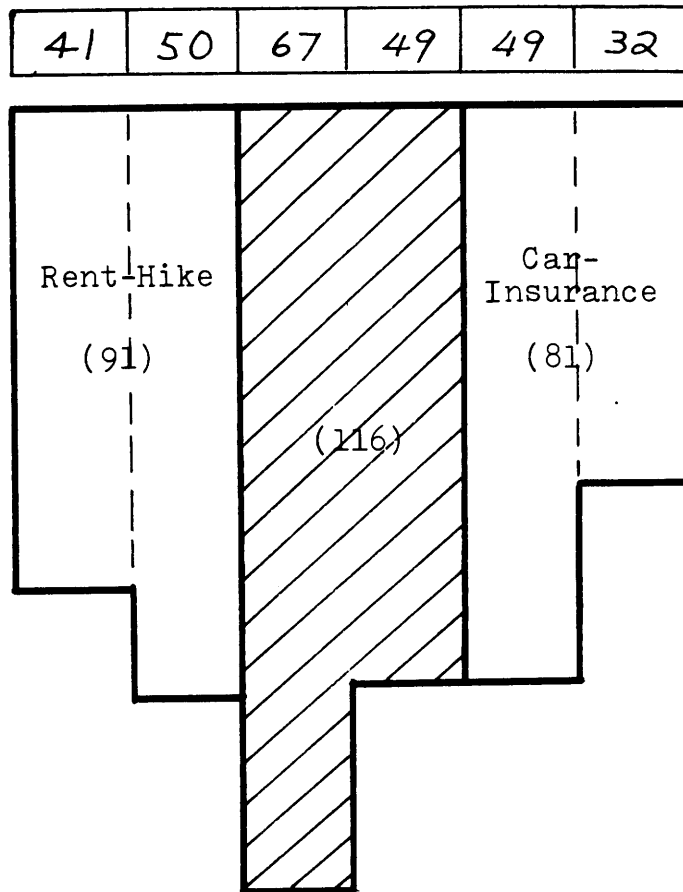


Fig. 6.15 Unsuccessful Layout Using Template T9

CHAPTER 7

TEMPLATES AND TEMPLATE-LIBRARY

Fundamental to a template-driven news-layout system is a computer-stored template-library. Through use of symbolic graphic language to describe only the desired relative positions of news items on a page, the number of templates required to cover a wide spectrum of layout possibilities can be held to a manageable number.

In this chapter, the issues related to an operational template-library and the symbolic templates stored in it are presented. After a discussion of some general template design considerations in section 7.1, the number of different layout structures that appear in a typical medium-size newspaper over a period of time is presented and analysed. Based on this observation, the number of templates required in an operational template-library can be estimated. Since a selected layout template does not always generate a successful layout result during the layout process, several templates may have to be tried for a given set of news items assigned to the page before an acceptable layout can be obtained. Therefore, templates must be retrieved from the library in a logical sequence. Section 7.3 describes one straight-forward

method of organizing the stored templates for achieving reasonable retrieval time.

In reading this chapter, the reader should bear in mind that this chapter is not intended to give a detailed analysis of the template-library size or to propose an optimal template-library organization. Instead, through use of examples and observations, it is shown that the template-library itself does not impose any realization problem in designing an operational template-driven news-layout system.

7.1 TEMPLATE DESIGN CONSIDERATIONS

The experimental results presented in Chapter 6 show that a particular layout template does not always generate a successful layout for a given set of news items. Some templates are more suitable than others for laying out one particular combination of story and picture sizes.

In general, pictures are the major bottleneck towards achievement of a successful layout. Unlike stories, which require only a news block of specified area without any further constraints on dimensions, pictures have fixed dimensions and cannot be adjusted during layout^{*}. Moreover, due to the

* This assumes that cropping of pictures during the news-layout process is not allowable. If cropping at layout time is permitted, the layout process becomes easier.

existence of fixed-dimension pictures on the page, the stories placed in areas adjacent to the pictures very often are less flexible in the formation of an appropriate news block. As a result, the more pictures on a page, the more difficult is the layout task.

As an example, template T3 of Fig. 6.1(c) requires a rectangular news block to be constructed at the bottom of the page. The news block consists of a stand-alone picture item (P5) on the left-hand side, and an unrelated story item (S6) on the right-hand side. Since the dimensions of the picture selected for P5 are fixed, the shape of the news block for S6 is restricted. Should none of the three stand-alone stories assigned to the page fit into this area, no acceptable layout results can be obtained with this template.

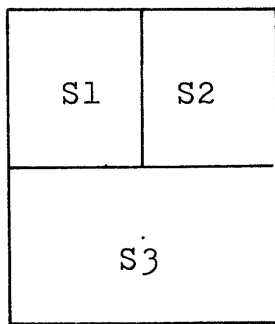
Some templates are better suited than others for a particular combination of story and picture sizes, even though template itself is independent of news-item sizes. Hence, in a design for layout templates for an operational template-library, an attempt should be made to include templates suitable for a broad spectrum of possible story- and picture-size combinations. For example, templates T1 and T2 in Fig. 6.1(a) and (b) are more suitable for laying out pages assigned with two smaller pictures (P1 and P2 in T1, and P1 and P3 in T2) associated with two relative larger story areas

(S1 and S2 in T1, and S1 and S3 in T2); while template T4 in Fig. 6.1(d) is better for pages with a story and an associated picture (S2 and P2) having approximately equal areas. If only templates suitable for a limited set of story- and picture-size combinations are stored in the library, a news-item size combination which does not belong to this set will fail to be laid out.

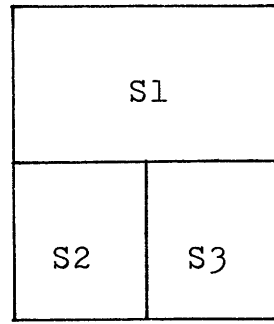
In the design of templates for pages with display-ads, special considerations are required for various ads-dummy styles. Since the news-holes of pages with ads have upside-down pyramid shapes, it is easier in general to place news items on the upper part of the page than the lower part where the ads impose tighter constraints. Therefore, templates with more items located in the top portion of the page than the lower portion are suitable for ads-page layout. Furthermore, for pages with right-pyramid ads-layout style (see Fig. 5.24(a)), there is more room in general in the left-hand side of the news-hole, and vice versa for left-pyramid ads-dummy (see Fig. 5.24(b)).

As an illustration, Figure 7.1 depicts four possible layout templates, each with three story items (S1, S2, and S3). Template D is less suitable for ads-page layout than template T; template R is preferred for left-pyramid-ads pages; and template L is preferred for right-pyramid-ads pages. The

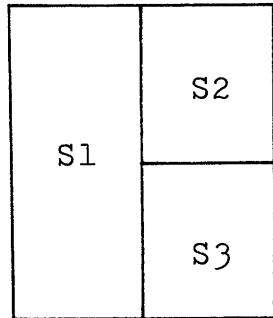
template-library should contain several templates which are suitable for each category of ads-layout styles used in the paper in order to increase the probability of successful layout.



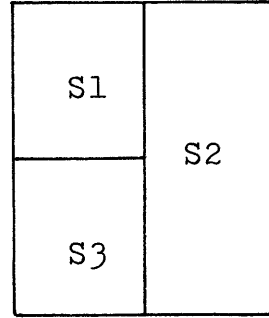
(a) Template T



(b) Template D



(c) Template R



(d) Template L

Fig. 7.1 Four Possible 3-Item Layout Templates

7.2 TEMPLATE-LIBRARY SIZE ESTIMATION

Through use of the news graphic language presented in Chapter 4, layout templates can be described symbolically by the relative position between news items rather than their fixed coordinates on the page. As a result, the number of templates required in symbolic template-library is several orders of magnitude less than the library which would result if precise locations had to be specified.

In order to support this claim and further to estimate the size of a template-library required in an operational news layout system, the different layout structures appearing in a local newspaper over a period of time were analysed. Specifically, the news-department of the 24 weekday issues of July, 1976 Boston Globe were surveyed. The daily Globe was chosen because that it is a medium-size newspaper with respect to the average number of pages published per day (approximately 45 pages); furthermore its layout styles, consisting of both 6-column and 8-column formats, are typical of many newspapers.

The layout samples totaled 356 pages from the news-department of 24 Globe editions (editorial pages are excluded). About three-fourth of the pages (267 pages) contain 4 news items or less. In this case a story and its associated

picture is counted as one news item. For example, page 3 of the July 22 and 27 issues shown in Fig. 6.3 and 6.8 respectively, are both considered as having 6 news items (5 stories, two of them with associated pictures, and one stand-alone picture).

A template was drawn for each sample page to match the layout structure on the page. For every issue of the paper, the constructed templates are grouped into two categories: templates which have not appeared before, and templates which have appeared in previous issues. The number of templates in each category for the 24 issues is shown in Fig. 7.2 where the new templates are represented by the shaded areas (both single- and double-shaded), and the previously used templates are denoted by the non-shaded white areas. The single-shaded and double-shaded areas in the figure represent those newly constructed page templates with either 1 to 4 news items or 5 to 7 items, respectively. Since there were no repeats found in the 24 issues for templates with 5 items or more, all the repetitive templates represented by the non-shaded areas in the figure contain less than 5 news items.

For example, as indicated in Fig. 7.2, the first issue had 3 pages (out of the 22 pages in the news-department) with 5 items or more. In the 13 pages of the second issue, there were 4 pages whose layout structures appeared in the first issue, and 9 pages (3 pages with 1 to 4 items, and 6 pages

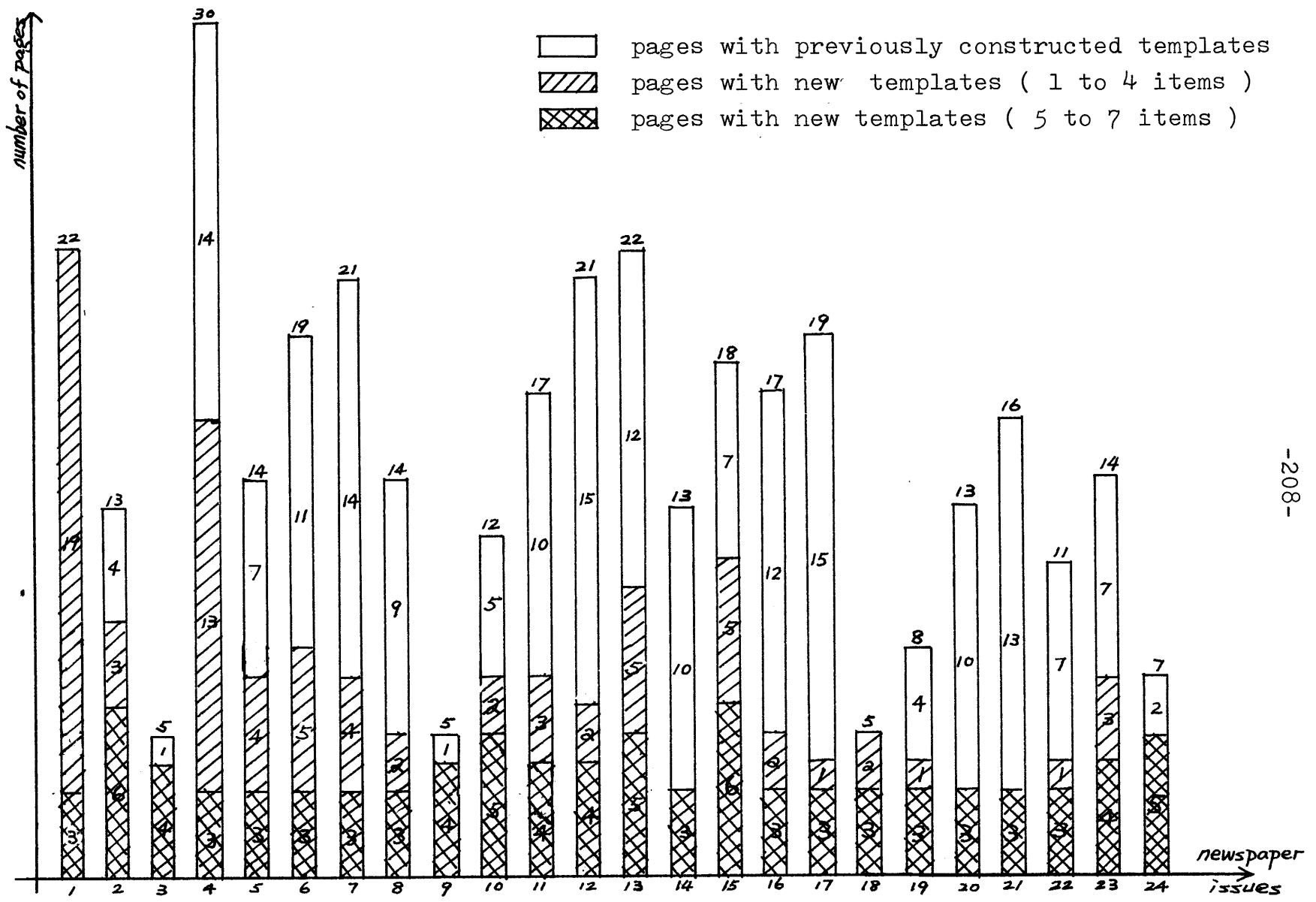


Fig. 7.2 Pages of July, 1976 Issues of the Globe

with 5 to 7 items) with new layout structures. It is important to note that as the sample grows, the proportion of newly constructed templates with 4 items or less (the single-shaded area of each issue) decreases, while the proportion of the repetitive templates (non-shaded area) increases.

Figure 7.3 illustrates how the number of templates with 1 to 4 items builds up as the sample size grows. The number of one-item templates is unchanged after the 4th issue; the number of 2-item templates is constant after the 16th issue; and the number of 3-item templates tends to level off around the 18th to 24th issues. More importantly, the figure indicates that the number of templates with 4 items or less tends to level off. By extrapolating the upper curve, it is estimated that the number of templates with 4 news items or less reaches a limit of approximately 110 to 120 templates. Since the survey of 24 issues contains insufficient data to provide a clear indication of how the templates with more than 4 items build up, analysis can be used to estimate the maximum number of those templates as shown below.

So far, templates have been grouped together according to their number of news items. However, templates with a fixed number of items can be further divided into sub-groups in accordance with their combinations of stories and pictures.

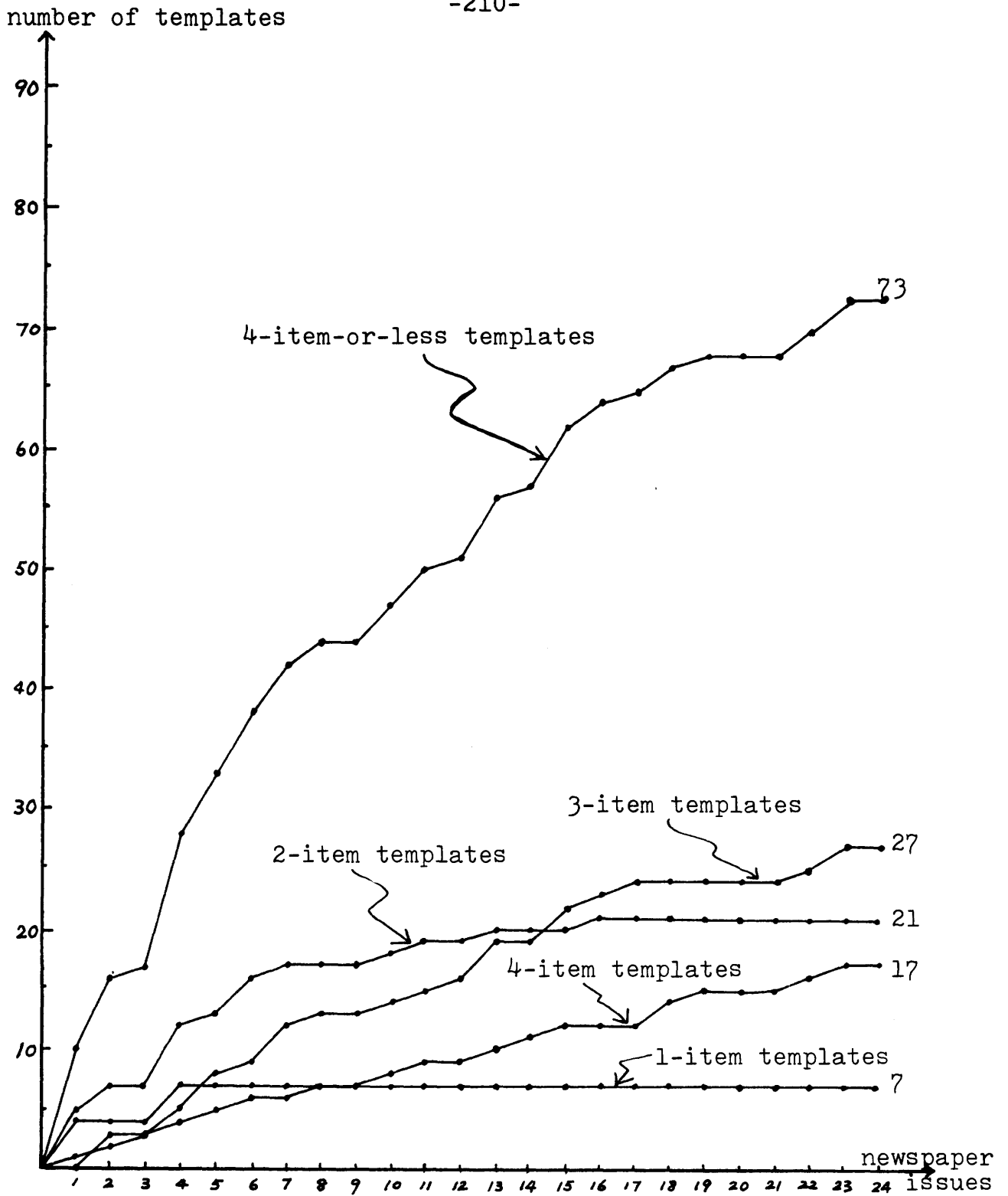


Fig. 7.3 Profile of the 24-Issue Template-Library

For example, a 2-item template could have the following six possible story- and picture- (S-P) combinations:

- two stories (2S),
- two stand-alone pictures (2P),
- two stories with associated pictures (2SP),
- one stand-alone picture and one story with an associated picture (1SP-1P),
- one story and one stand-alone picture (1S-1P), and
- one story and one story with an associated picture (1S-1SP).

A well-designed template-library should have several templates in each possible S-P combination in order to match the possible story- and picture- sets assigned to the page for layout.

The purpose of this analysis is to establish an average number of templates needed in each possible S-P combination using the survey data obtained for 4-items-or-less templates.

Assuming that stories contain no more than one associated picture, combinatorial mathematics can be used to derive the number of possible S-P combinations for templates with n news items, which is:

$$\frac{1}{2} (n + 1) (n + 2).$$

By substituting integers 1 to 7 for n in the above expression, Table 7.1 lists the possible number of S-P combinations obtained for $n \leq 7$, and Table 7.2 lists the accumulated number of S-P combinations.

Table 7.1 Number of Possible S-P Combinations for n-Item Templates

1-item	2-items	3-items	4-items	5-items	6-items	7-items
3	6	10	15	21	28	36

Table 7.2 Accumulated Number of Possible S-P Combinations

1-item	2-items or less	3-items or less	4-items or less	5-items or less	6-items or less	7-items or less
3	9	19	34	55	83	119

As stated previously, Fig. 7.3 indicates that the number of templates with 4 items or less tends to level off at approximately 110 to 120 templates. Since there are 24 possible S-P combinations for 4-items-or-less templates according to Table 7.2, it is suggested that on the average there are about 3 to 4 templates in each S-P-combination group. This claim is also supported by the data in Fig. 7.3 for templates with fewer items, which indicates that the numbers of templates with 1-item, 2-items, and 3-items level off at approximately 7 to 10, 21 to 25, and 30 templates

respectively. Hence, there also exists an approximately 3.5 : 1 ratio between these template numbers and the possible numbers of S-P combinations listed in Table 7.1. In other words, the data we have collected in the survey strongly suggests that on the average there are approximately 3 to 4 templates in each possible S-P combination.

For templates with larger numbers of news items, one might expect to encounter more layout structures for a particular S-P combination and thus increase the number of templates that have to be stored. For example, there are only five possible layout structures for templates with two stories, while a much greater number of possible layout varieties exists for templates with five stories. However, the survey also shows that pages with more than 4 items constitute only one-fourth of the total pages, and they are mostly front or early pages (pages 1 to 3). Since each newspaper tends to have its own layout style and preference for the front and early pages, only a subset of all possible templates in each S-P combination of these pages is required for a particular newspaper. Therefore, the templates with more than 4 items do not have to cover as much of the spectrum of all possible layout structures for each possible S-P combination as the templates with fewer number of news items do. As a result, it is believed that the average number of 3 or 4 templates

for each possible S-P-combination group is a good estimate for templates with larger as well as small numbers of items.

Therefore, the number of possible S-P combinations for templates with 7 items or less (119 possible combinations as listed in Table 7.2) is multiplied by 3.5 to estimate the total number of layout templates required. Thus, in an operational template-driven layout system for a medium-size paper, the template library is estimated to require in the order of 400 to 500 templates.

It should be emphasized that our estimate is based on a limited survey of 24 newspaper editions. The actual number of templates for a particular newspaper could depart from this figure, depending on the size of the paper and the frequency of those pages with larger numbers of news items. Our purpose here is to show that the size of the template-library is in a manageable order and imposes no realization problem in designing an operational template-driven news-layout system. Further analysis based on a more complete survey is needed.

7.3 TEMPLATE-LIBRARY ORGANIZATION

As a result of the story-and-picture-assignment process, a set of stories and pictures whose total area matches the available news-hole is assigned to a page for layout. A template with the same number of story and picture items as

the assignment is retrieved and used as a structure guide for the actual story and picture placement. In general, as described in section 7.2, several templates are defined in the template-library for a particular story and picture (S-P) combination, and hence they are retrieved at the same time as a group. After being retrieved, the template-selection rules then establish the priority among this subset of templates (see Chapter 3). The template with the highest priority is tried first, then the second-highest priority template, and so forth until a satisfactory layout is obtained or no more retrieved templates are available.

As the result of the way which templates are retrieved and used, one simple straight-forward method of organizing the templates in a library is to group templates according to the number of story and picture items they contain. Figure 7.4 depicts a tree structure representing such an organizational scheme. The templates with a particular S-P combination are grouped together and thus can be retrieved easily as a group.

Although it has been estimated in section 7.2 that on the average there are 3.5 templates in each possible S-P combination, the actual number could vary significantly from one S-P combination to another. Therefore, the maximum number of templates defined for a particular S-P combination is greater than the average, perhaps in the range of 15 to 20.

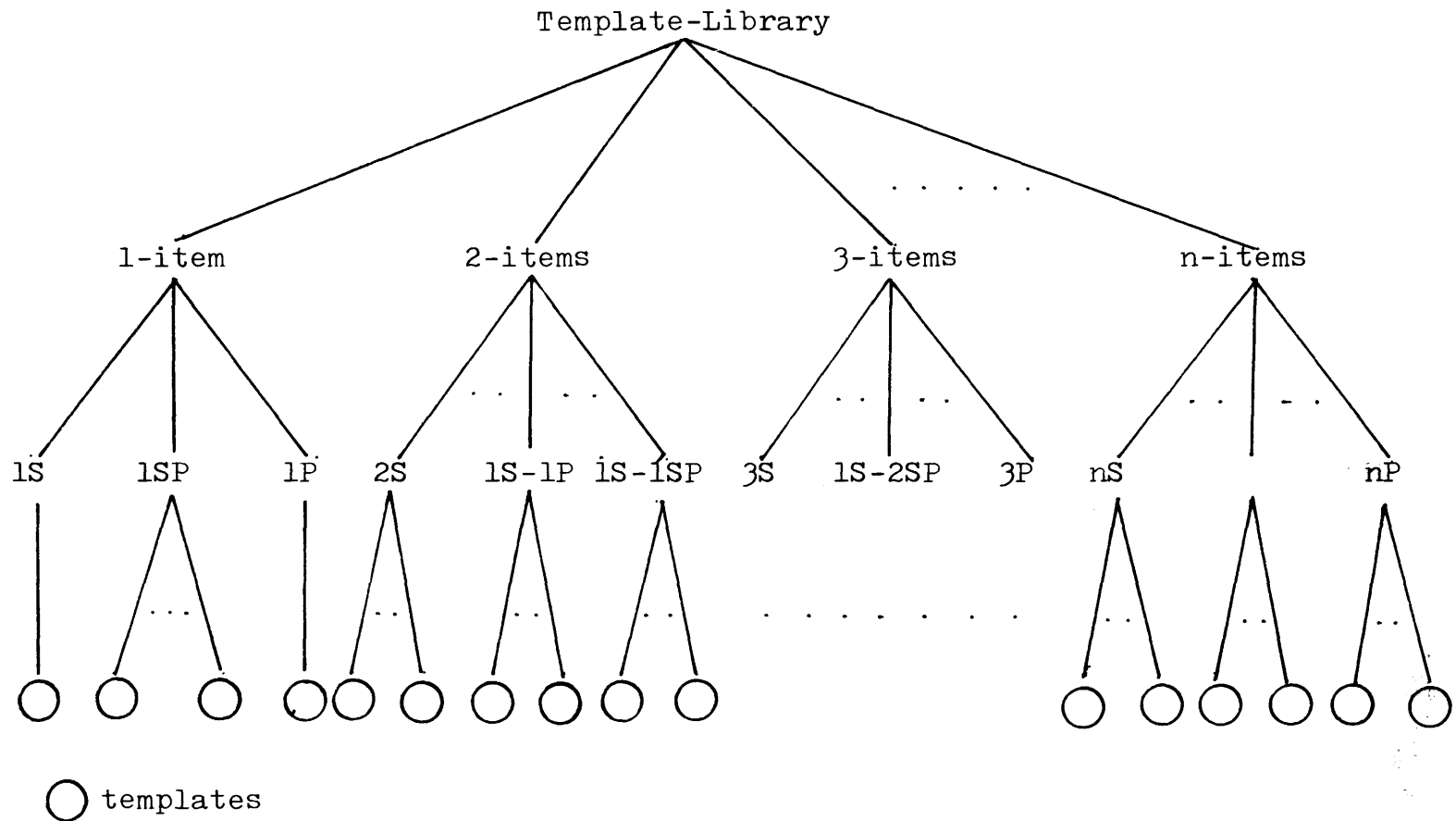


Fig. 7.4 Organization of Template-Library

As a result of the relative small number of templates in a S-P combination group, there is no real need to further index the templates within an S-P combination group. Therefore, for a newspaper with 500 to 1000 templates, the organization scheme shown in Fig. 7.4 is adequate to achieve reasonable template retrieval-time.

CHAPTER 8

CONCLUSIONS

8.1 TEMPLATE-DRIVEN NEWS LAYOUT

Our investigation of computer-assisted news layout has provided insights into the capabilities and limitations of computer algorithms for positioning news stories and pictures on newspaper pages. Our objective of a computerized news layout is to increase productivity in the news-layout process through use of modern computer-assisted technology. We have concentrated our efforts on a highly automated system in which the computer takes an active role in making layout decisions, although the system always allows for human approval of layout results and the possibility of manual override and modification.

In light of this objective, a template-driven news layout scheme has been chosen. In contrast to the one-story-at-time approach, the template-driven layout concept allows the user to specify satisfactory page-layout structures á priori. Then, the computer positioning of individual stories and pictures is guided effectively, and the probability of achieving successful layouts is increased. The layout templates, representing the user-specified layout structures,

are described symbolically by the relative positions between news items and therefore can be applied to the news-layout process without matching the actual story and picture sizes. The symbolic template approach reduces the total number of templates needed in a layout system from 10^5 — 10^6 for a precast-template system to less than 10^3 templates, while still retaining adequate information about the template structure. This large reduction in the size of the required template library makes the implementation of a template-driven system practicable.

In order to describe the layout templates symbolically, a news graphic language based on a set of thirteen relational operators is developed. The operators are used to describe the relative positions of news items on the page without any constraint on their sizes. Although the news graphic language is primarily defined for describing rectangular structures, it has been shown that the language is also capable of describing more complex structures as well (see Fig. 4.9). Although the graphic language is simple to use, it can express the structures of a wide spectrum of news layouts with very few limitations. Figure 8.1 depicts one news construction which can not be described by the news graphic language. There may be others. It is believed, however, that the set of layout structures that cannot be

described is sufficiently small and unimportant such that it does not seriously detract from the power of the layout process.

Techniques are presented for deriving the syntax tree of a template from its symbolic description. In the actual placement of stories and pictures, layout techniques based on traversing the syntax tree of the layout template are developed. Through use of the virtual-page-construction-and-assembly concepts, a recursive layout algorithm places the assigned stories and pictures according to the structure specified by the symbolic layout template. The algorithm is extended to lay out pages with display-ads as well. Experimental

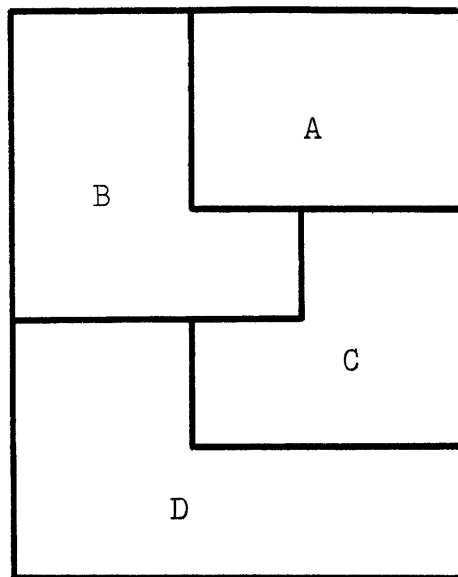


Fig. 8.1 Example of News Structure Incapable of Being Represented by the News Graphic Language

results of layouts taken from a typical newspaper show that the template-driven layout scheme is capable of producing layouts compatible with present manual layout standards, and indeed is a sound automated approach to the news layout problem.

8.2 STORAGE REQUIREMENT FOR A TEMPLATE-DRIVEN LAYOUT SYSTEM

Although it is beyond the scope of this report to present a detailed hardware- and software-system configuration for the proposed computerized template-driven news-layout system, it is felt that, in order to gain some idea about the system complexity, an estimation of the required storage for such a system is beneficial. The estimate is based upon the program and data storage requirements for an experimental layout system developed at M.I.T. on a general-purpose time-shared computer system (Multics) using PL/1 as a programming tool. The experimental system is developed solely for the purpose of testing our ideas and understanding the complexity and scope of the proposed layout system. Hence, no special effort is made to optimize the program design for an operational system.

The experimental layout system occupies approximately 125,000, 36-bit words of direct-access disk memory on Multics. This includes all the programs for story-assignment and

actual story/picture-placement algorithms and the necessary utility outlines for data or policy input/output. Also included are the required data and policy files for carrying out a complete layout process such as an 8-page display-ads-dummy file, a news data file for 60 stories and pictures, and a story-assignment and template-selection policy file. Table 8.1 gives a detailed listing of the storage occupied by various system components. The template library is not included in the experimental system but a typical newspaper template library is estimated to consist of 500 templates (see section 7.2) with an average of 30 computer words per template. This leads to a template-library size of 15,000, 36-bit computer words.

Table 8.1 Storage Requirement of Experimental News Layout System

<u>FILE</u>	<u>COMPUTER (36-BIT) STORAGE (WORDS)</u>
Ads-Dummy (8 pages)	1,000
News-Data (60 Stories and Pictures)	3,000
Policy File	1,000
Story-Assignment Algorithm	35,000
Page-Layout Algorithm	65,000
Input/Output Utility Programs	20,000

Total System Size(excluding template-library)	125,000

For a typical newspaper of approximately 50 pages, the ads-dummy and news-data files would occupy approximately 25,000 words. Several versions of the policy file might be stored to reflect different policies for different days of the week. In addition to those data files for the current edition, it may be necessary to provide storage space for ads-dummy and news-data files of future editions. Therefore, it is estimated that the total storage requirement for a complete news-layout system configured according to the overall structure depicted in Fig. 3.2 is of the order of 150,000 to 200,000 36-bit computer words, depending on the number of multiple ads, news, and policy files kept on-line. This is well within the storage capacity of a modern small-size moving-head disk-storage unit such as the DEC RK05-AA unit with 1,200,000 words (16-bit). It should be emphasized that this estimate is based upon the storage utilized in our experimental system; the actual requirement for an operational system depends heavily on the particular hardware and software implementation. However, the above data do suggest, that with the current technology on-line digital storage of the template-driven news layout system is indeed feasible.

8.3 FURTHER RELATED AREAS FOR RESEARCH

We have concentrated on the problem of laying out a news page with one set of news items and one layout template. However, in an operational template-driven layout system, several templates representing different layout structures with the same number of stories and pictures might be retrieved from the template-library. Hence, a priority must be established among this subset of templates so that they can be tried, one template at a time, in the layout process until a successful layout is obtained. Since some templates are more suitable than others for layout of certain size combinations of assigned stories and pictures, an optimal way to assign the priority of templates is needed in order to reduce the average number of templates that have to be tried before a successful layout is produced. Obviously, the priority of a template depends on the particular set of story and picture sizes, and hence it must be determined during layout. In other words, the priority of a template is dynamic in nature; it varies from one layout to another depending on the set of input news items. How to determine the optimal dynamic template priority needs further research.

One of the major advantages of an interactive computer-assisted news-layout system is the ability for user to review

the computer-generated layout results and make manual modifications if necessary. Therefore, a news-editing program for modifying the computer-generated layout dummies is essential in an integrated news-layout system. The editing system provides the user with the capability of manipulating the shapes and sizes of the stories and pictures as well as such integral parts as the headlines, text, and picture captions. Based on this notion, a set of general-purpose news-dummies editing commands for a conventional interactive layout system have been proposed⁽⁸⁾. The news editing commands relocate and/or re-size stories and pictures by specifying the desired exact locations of news items on the page. However, it is believed that with the availability of template layout techniques, the news graphic language can be applied also in the area of news editing. Then, a user could edit the layout results by specifying layout changes without the need to specify the exact news-item sizes and locations. Further research needs to be done to exploit the news graphic editing concept in the layout editing process.

In addition to the experimental results presented in Chapter 6, further complete evaluation of the template-driven layout process and the symbolic templates is also desirable. Ultimately, the evaluation should include real-time tests in an operating newspaper environment.

A related future research task is to merge the news-layout system with the display-ads-layout system that has already been developed⁽⁴⁾. Thus far, we have assumed no interaction between the ads and the news layout processes. The news-layout algorithm accepts the ads-dummy as is and positions the stories and pictures in the remaining news-hole. No attempt is made to alter ads locations to facilitate the news layout when the assigned stories and pictures can not be placed. By merging the two layout processes and allowing interaction between them, a complete automated newspaper layout system can be attained.

APPENDIX A

EXPERIMENTAL SEQUENTIAL NEWS LAYOUT SYSTEM

System Structure and Characterisitics

Figure A.1 shows the overall system structure and data bases for the experimental news layout system which places news items one at a time. The Display-Ads Dummy File contains the outlines of the location for each ad on the pages, as well as the structural information of the paper such as the number of department in the edition and the pages assigned to each department. The information about stories and pictures for the day, from both wire services and local editions, is stored in the News Data File. For each story, this information includes the slug, the relative importance ranking of the story specified by the editor, the estimated stroy length with maximum allowable tolerance for reduction or expansion, and the associated picture(s) if any.

An important design feature of the system is the separation of the news layout policies or rules from the layout process. In other words, the story assignment and page layout rules which influence the structure and placement of stories and pictures are no longer buried into the news layout algorithm. Instead, as shown in Fig. A.1, these policies are treated as files which can be designed by the

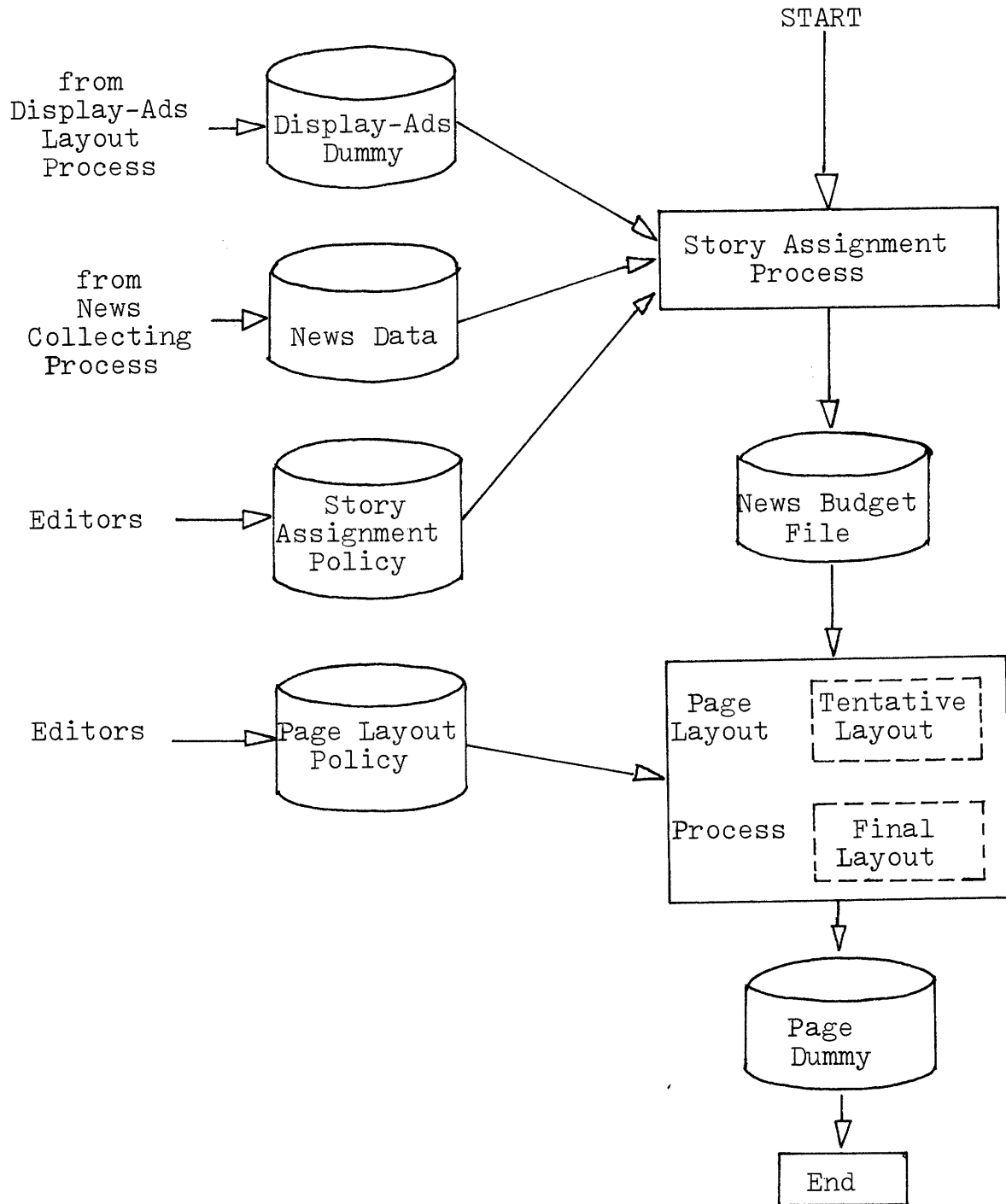


Fig. A.1 Overall Structure of the Automatic News Layout System

editors to suit their own style and may be modified any time later as needed. Some of the major story assignment policies are the desired ranges of number of stories and picture percentage on certain pages, the leading percentage, and those rules concerning the jumping of stories such as the specification of non-jump-from or non-jump-to pages, and the desirable jump-to pages.

The major two page layout policies to achieve variations in the layout styles are the story height-to-width ratios specified for each page and the page/story templates stored in the Page Layout Template Library. The height-to-width ratio is intended to control the layout style of news stories ranging from horizontally oriented, multi-column layouts, to vertically oriented, single-column layouts. Page and Story Templates are used as guides for achieving the preferred picture pattern on the pages and within the stories, respectively.

A brief review of story-assignment and page-layout algorithms used in the experimental system are presented in the following paragraphs.

Summary of Story Assignment Algorithm

In the story assignment process, a story and picture budget is prepared to fit exactly the available news hole on each page. It should be noted that in this process the stories and pictures are only selected and assigned to the

pages, but not yet positioned on the pages. The process starts from the front page and works toward the last page by selecting the more important stories and assigning them to pages closer to the front of the paper. A story or picture with the highest importance ranking in the unassigned story/picture pool will not be selected for the page if, after being assigned, total assigned story and picture area on that page exceeds the amount of available news hole or the specified maximum picture percentage, respectively. Then the next highest important story or picture will be tried until one is found to fit into the remaining news area. The news story area is the sum of the estimated story text area, the associated picture(s) area if any, and the headline area. For simplicity, the headline area is calculated as a fixed fraction, for example 20 percent, of the story text area.

In order to satisfy the policy requiring minimum number of stories on a particular page, sometimes a more important and longer story whose area does not go over the available news hole limit has to be replaced by one or more less important and shorter stories. But for those pages where jumping of the stories are allowed, the more important and longer stories can still be assigned to that page by taking whatever space is left on the page and jumping the rest of story text to another page. Similarly, two or more stories with higher importance ranking have to be replaced by

one shorter story with lower importance, if the number of stories assigned on the page exceeds the maximum number of stories specified in the story assignment policy file.

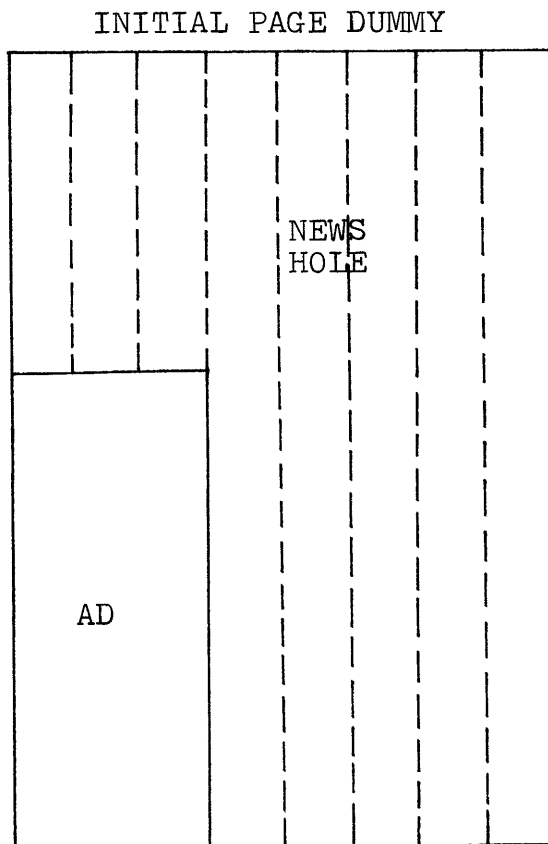
In this process of selecting the news stories or pictures for a particular page, it is obvious that the chances are very small of finding a set of stories and photos whose total area is exactly the same as the available news hole on the page. However, an exact fit may be achieved by either expanding or trimming the length of stories within the specified range of adjustment tolerance. Note that the story length adjustment is done solely for the purpose of assigning the required amount of news to the pages; it does not take into account whether that will help or damage the possibility of an adequate page layout later. Furthermore, once the story length adjustment is done, the story length cannot be changed later in the actual page layout even if the intended changes are still within the range of allowed adjustment range of that story.

Summary of Page Layout Algorithm

After the story assignment process, each page now has a set of news stories and photos which matches the available news-hole on the page and is ready for positioning according to the page layout algorithm. For each page, the page layout process is divided into two phases --- tentative layout and

final layout. The purpose of tentative layout is to establish preliminary positions for photos and stories with photos so that esthetically pleasing layouts are produced. The tentative placement of photos and stories with photos is guided by the page template selected from a computer-stored-template library, and the tentative story height-width dimensions are determined by the story size and the desirable height-width ratio specified for that page. It is worth noticing that the page layout process works on a page-by-page basis. As a result of the tentative layout phase, all photos and stories with photos assigned to that page are tentatively placed.

An example of photos and stories assigned to a page are depicted in Fig. A.2(a). In this example, the page includes a display ad on the lower-left corner as specified by the display-ads dummy. The area of story texts and headlines is indicated by the blocks A to E with the shaded areas representing the headlines. The total page size is divided into eight units horizontally and 100 units vertically. Two stories, A and B, each has an associated picture, are positioned first by the tentative layout algorithm. The height-to-width ratio specified by the policy in this example is 1 : 1 and this is used to determine the story shape in the tentative layout. The story positions are guided by a page template, which in this example, calls for one story with a picture in the upper-left corner and the other story with a picture in the middle



Ad Area = 180 square-units
 News Area = 620 square-units

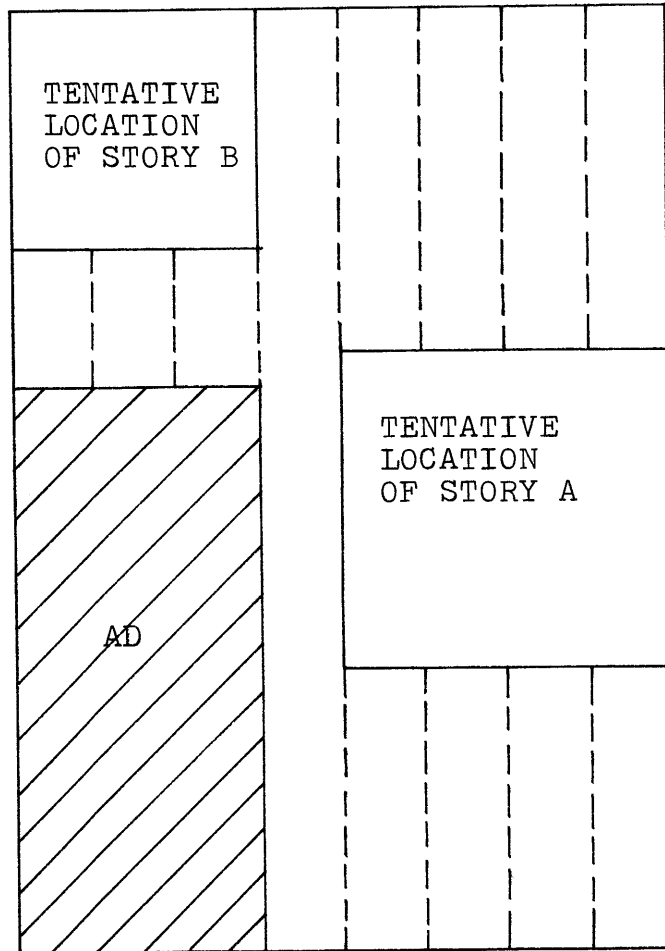
<u>story</u>	<u>text and headline</u>	<u>importance</u>	<u>picture</u>
A	71	3	2 X 32
B	75	2	1 X 20
C	120	5	no
D	100	2	no
E	170	1	no

1. The numbers in the boxes are the total areas of story text and headline in square-unit.
2. Story E is the most important story, and story C is the least important.

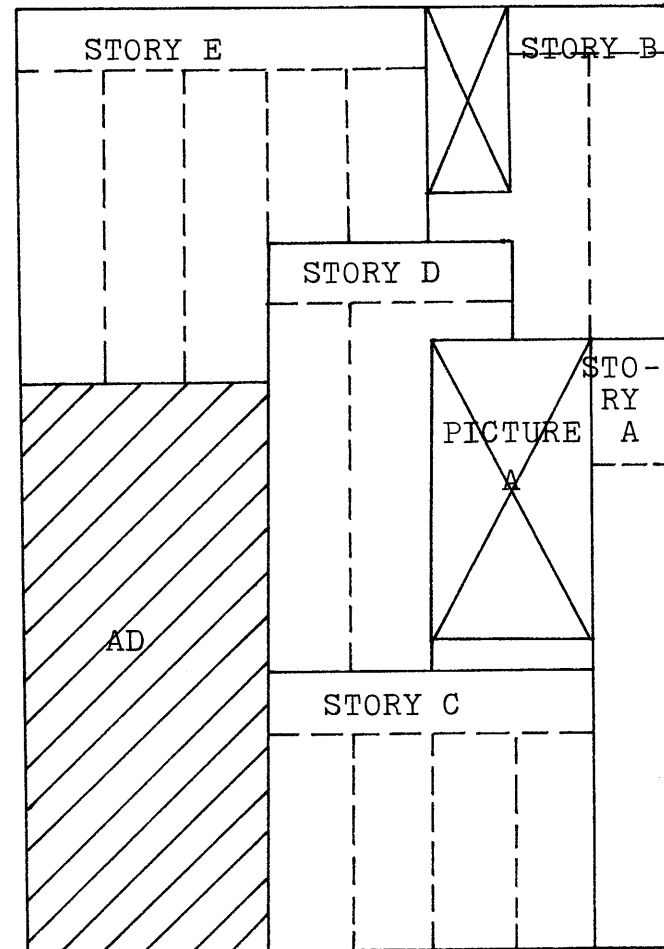
-233-

(a) Initial Page Dummy and the Stories and Pictures Assigned to the Page

Fig. A.2 Example of Stories and Pictures Assigned to a Page



(b) Tentative Layout



(c) Final Page Dummy

Fig. A.2 (Continued)

right-side of the page. The results are shown in Fig. A.2(b). The tentative layout serves only as a guide for the final page layout process, and the story/picture positions assigned during tentative layout can be altered during final layout.

During the final page layout process, the lowest importance story assigned to the page is positioned first, starting at the left-lowest corner of the news hole, followed by the next lowest importance story, and so forth. Selecting the lowest importance stories first ensures that more important stories are placed near the top of the page. Since stories with photos are already tentatively placed on the page, the stories selected in the above process are only those without associated pictures.

Whenever a tentative story or photo location is intersected during the bottom-to-top layout process, that story or photo is laid out next regardless of its importance in order to make the final location of photos and stories with photos as close to their tentative locations as possible. The final layout process for a page terminates when all the items assigned to the page are placed successfully, or an unrecoverable difficulty occurs in the process.

The final layout result of stories A, B, C, D, and E is depicted in Fig. A.2(c). Starting at the bottom of the page, the least important story C is placed first. Although

story D is the next least important story among those stories without photos, story A is laid out next because its tentative location on the page is disrupted during the placement of previous story C. Then, story D is positioned, followed by story E, and finally story B. The detail of how the envelope of each individual story is formed is discussed in the next paragraph.

Summary of Story/Picture Placement Algorithm

Given a story which may have associated pictures, an initial story envelope is formed as a rectangular with its size (width and height) being determined by the desired height-to-width ratio for the page, the allowable column widths, and the total story area including story text, headline, and picture(s). Adjustment to the envelope size is made to accommodate the associate picture dimensions.

Then the initial story envelope is aligned to the left-most column at the bottom of the news hole, and shifted if necessary to keep it within the page boundary. Next the size and shape of the envelope is modified if necessary to eliminate areas that overlap the display ads or previous placed items. That is, the boundaries of the story envelope will move up, left, or right depending upon the specified fashion. Again, the current envelope may be reshaped to provide an area for an associated picture without overlapping ads or previously

placed items.

Eventually, a story envelope with the correct enclosed area will be obtained, whose height-to-width ratio is as close to the desired policy as the selection of available column widths allows and in which any associated pictures can fit. When using the desired story template as a guide the associated picture is placed within the story envelope. Finally, the headline will occupy the area at the top part of the story envelope. As one can see from the previous description, the associated picture and headline of the story are not taken into consideration during the formation of the story envelope except to check that the picture will fit in the envelope without overlapping adjacent ads, stories or pictures.

Figure A.3 illustrates step-by-step how the envelope of story A in the previous example of Fig. A.2 is constructed and placed. Recall that story A is selected as the next story to be laid out due to the fact that its tentative layout location shown in Fig. A.3(a) is intersected by the placement story C during final layout. As the first step in placing story A, the initial story envelope is calculated according to the story size and the specified height-to-width ratio 1 : 1. It is then aligned, as shown in Fig. A.3(b), to the left-most column at the bottom of the remaining news hole. The envelope is shifted to the left by three columns and

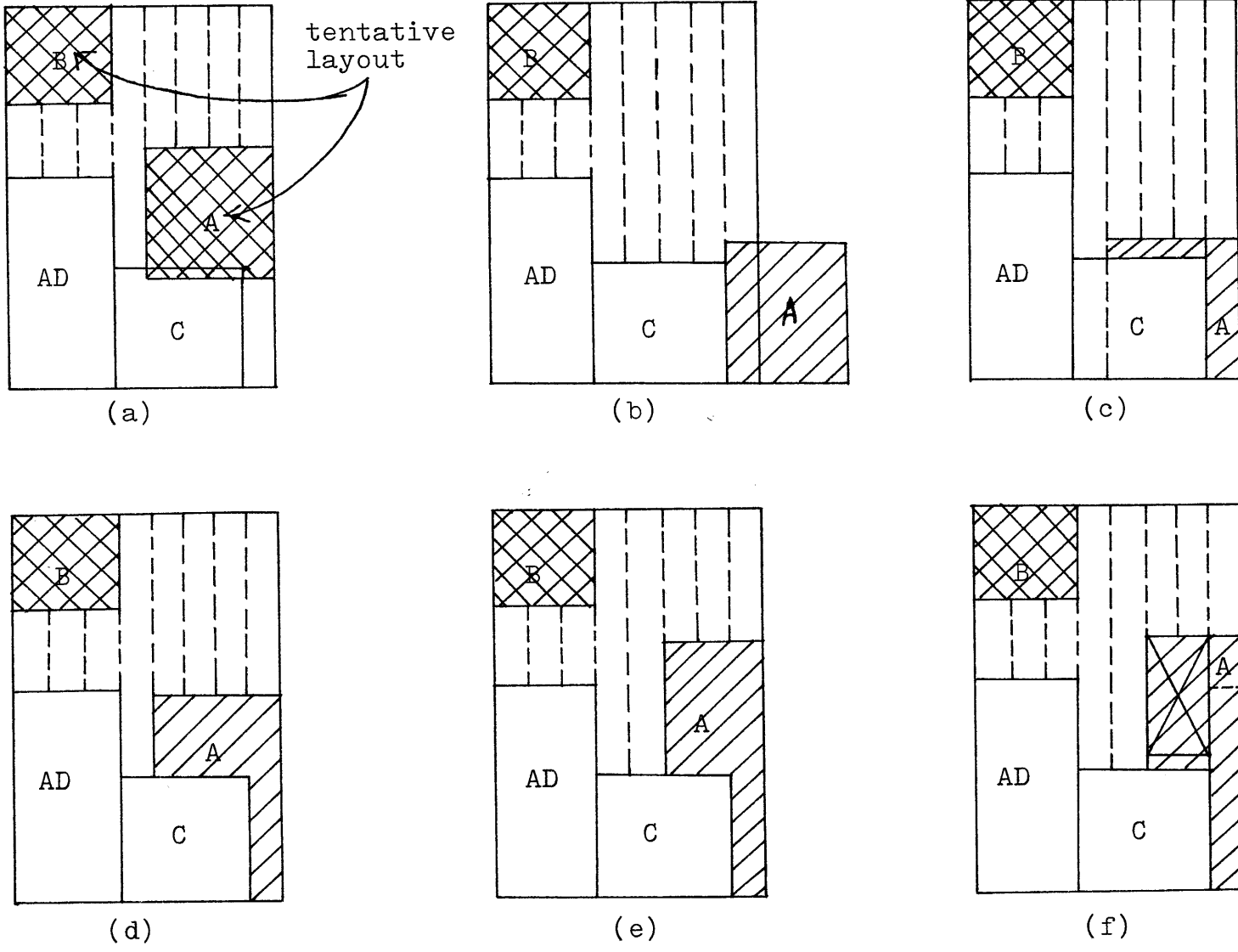


Fig. A.3 Example of Story Envelope Formation

the top boundary is moved up, because of the page boundary and the overlap with previously placed story C, respectively. The intermediate results of these two steps are depicted in Fig. A.3(c) and (d). Since the present story envelope is too short to accommodate the associated picture, it is then made narrower by one column and taller, keeping the envelope area constant. The resultant outline of the story envelope is shown in Fig. A.3(e). In the final step of Fig. A.3(f), the associated picture is positioned at the upper-left corner of the story envelope and the headline is designated at the top.

APPENDIX B

TESTING OF THE SEQUENTIAL NEWS LAYOUT ALGORITHM

In order to achieve a better understanding of the problem, the experimental sequential news-layout system was used to test the initial concepts of automated news layout. A set of test data from an eight-column newspaper has been generated and stored in the computer as inputs for the layout system. The data include a group of stories and pictures, policy specifications, and a display-ads dummy, as follows:

Data Bases for News-Layout Test

(1) News Stories

<u>Slug</u>	<u>Area*</u>	<u>Importance</u>	<u>Preassigned Page</u>	<u>Associated With</u>
Nixon	28	7		
bussing	41	6		Nixon
speech	25	6		bussing
hijacking	26	8		
background	38	1		
rebels	44	4		hijacking
egypt	26	1	1	
israel	22	3		
meyer	24	8		

* units in column-inch

<u>Slug</u>	<u>Area</u>	<u>Importance</u>	<u>Preassigned Page</u>	<u>Associated With</u>
russia	36	6		
spring-cleanup	25	3		
india	19	2		
ghandi	14	1		india
ireland	21	1		
garbage-collection	11	1		
tiger	20	3		
inflation	16	1		
china-trip	66	8		
British	29	5		ireland
pyramids	19	2		
canada	16	4		
trudeau	24	6		canada
roxbury	18	5		
local-spring	21	5		
french-wine	29	4		
import-law	14	1		french-wine
heroin-ring	22	7		
rising-crime	25	4	1	heroin-ring
renewed-boming	26	3	1	
hanoi-speech	43	2		renewed-bombing

(2) Photos

<u>Slug</u>	<u>Head Area</u>	<u>Cap. Area*</u>	<u>Importance</u>	<u>Size(s)**</u>	<u>Associated With</u>
nixon	0	4.5	6	22 30	china-trip
busses	0	4.5	4	22 32 32 41 32 35	bussing
pyramids	1.0	2.2	3	22 22	pyramids
pet	0	0	6	11 11 22 20 22 30	trudeau
needle	0	1	4	66 20 11 40	heroin-ring
bombers	0	2	5	22 22	renewed-bombing
airmen	0	1.75	4	22 22	" "
Santa	3	3	5	32 32	
voting	2	4	3	44 29	
flood	0	2.5	4	22 37	
hero	1	3	5	11 15	

* units in column-inch

** units in pica (= $\frac{1}{12}$ inch)

(3) Story Assignment Policy

Dept. names = news, editorial, sports, entertainment

Sections = a, b

Fixed items = Masthead (Page 1, news); (Page 1, editorial); (Page 1, sports)

Jumps from = (1) from all news pages; (2) no jumps from editorial pages

Jumps to = (1) preferred jumps from Page 1 news to last page of section 'a'; (2) jumps to back page of section 'a' restricted to columns 1 - 4

Picture percentage = (1) 4 - 10% all pages; (2) 8 - 15% page 3, news; (3) 0 - 5% editorial; (4) 10 - 18% pages 1 - 3, sports

Lead percentage = 4% all pages

Story adjustment = (1) reduction 10%, expansion 5%, all pages; (2) reduction 5%, expansion 10%, pages 2 - 3, news; (3) reduction 20%, expansion 10%, editorial

Desired number of stories = 5 - 8, page 1, news

(4) Page Layout Policy


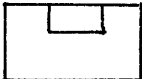
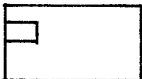

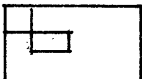
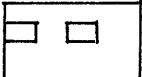
Height/width ratios = (1) height/width = 1/2, pages 1 - 3, news
(2) height/width = 1/3, rest of news

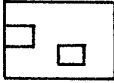
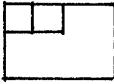
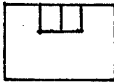
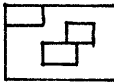
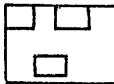
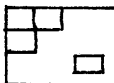
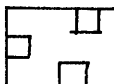
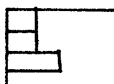
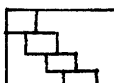
Page template weighting = (1) importance wt = 5, area wt = 3, page 1, news;
(2) importance wt = 3, area wt = 5, pages 2 - 3, news;
(3) importance wt = 4, area wt = 1, rest of news

Story templates = selection by area, selection group = tl-tr, all pages

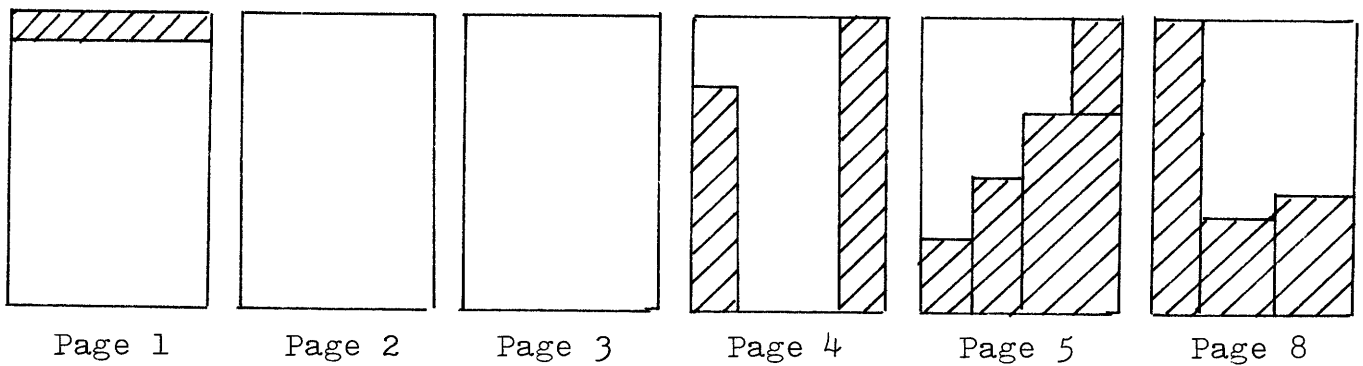
Story template weighting = importance wt = 2, area wt = 1, all pages

Page templates = selection by pictures, selection group pa-po (see below), all pages

<u>template</u>	<u>no. of photos</u>	
pa	1	
pb	1	
pc	1	
pd	?	
pe	2	
pf	2	

<u>template</u>	<u>no. of photos</u>	
pg	2	
ph	2	
pi	2	
pj	3	
pk	3	
pl	4	
pm	3	
pn	3	
po	4	

(5) Ads Dummy



Story Assignment Test

Utilizing the display-ads dummy and news data, the story assignment task has been tested. The output of this story assignment process is a news budget for each page (in this case, pages 1-5 and 8 of the News Department) and the results are summarized as follows:

Story Assignment Results

(1) Assigned Stories and Photos

	<u>Stories</u>	<u>Jumped</u>	<u>Pictures</u>
<u>Page 1</u>	rising-crime		
	renewed-bombing	to page 8	bombing
	egypt	to page 8	
	china-trip	to page 8	nixon
	hijacking		
<u>Page 2</u>	names & faces (feature)		
	heroin-ring		needle
	meyer		
	Nixon	to page 3	
	speech	to page 3	
	bussing	to page 3	busses
<u>Page 3</u>	trudeau		pet
	bussing	from page 2	

	<u>Stories</u>	<u>Jumped</u>	<u>Pictures</u>
<u>Page 3</u>	Nixon	from page 2	
	speech	from page 2	
	russia	to page 4	
	British	to page 4	
			Santa
			hero
<u>Page 4</u>	pyramids		pyramids
	russia	from page 3	
	British	from page 3	
	local-spring		
	roxbury		
<u>Page 5</u>	rebels	to ?	
	french-wine		
<u>Page 8</u>	china-trip	from page 1	
	renewed-bombing	from page 1	airmen
	egypt	from page 1	

(2) Unassigned Stories and Photos

<u>Unassigned Stories</u>	<u>Unassigned Photos</u>
spring-cleanup	voting
israel	flood
hanoi-speech	
india	
background	
ireland	
inflation	
ghandi	
import-laws	
garbage-collection	

The only deficiency in the present algorithm concerns the jumping of stories near the end of the department. Note that the story 'REBEL' on page 5 jumps to an unspecified page. This can easily be corrected by modifying the present story jumping decision to allow a check on the space left in the department to ensure enough room to accommodate the jumped portion of the story before it actually does it. Otherwise, the results are acceptable and judging from this example, there seems to be no fundamental difficulty in the story assignment process.

Tentative Layout Test

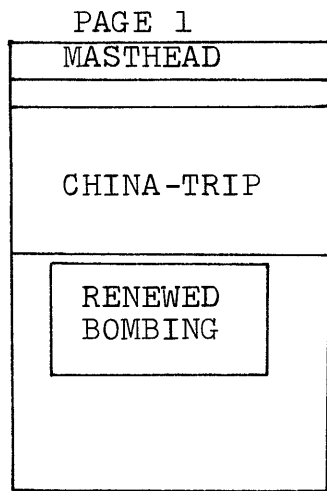
With the display-ads dummy and the news budget produced by the story assignment process, the tentative layout algorithm

has been tested by laying out the six pages (pages 1 to 5 and 8) of the News Department. Tentative layout is performed on five out of these six pages (pages 1 to 4 and 8) because of the existence of pictures or stories with pictures assigned to these pages. The story height-width ratio specified for this test is 1 : 2 for pages 1 to 3 and 1 : 3 for pages 4, 5, and 8. The results are shown in Fig. B.1 and appear satisfactory. For each page, the template selected from the template library in the page layout file is also indicated below the corresponding page dummy.

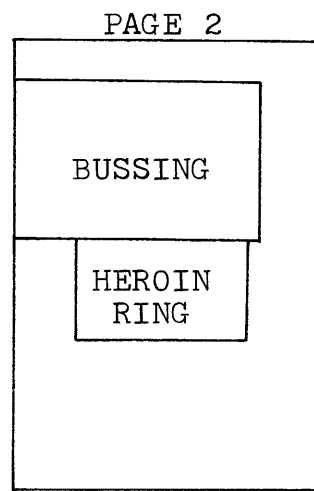
Final Page Layout Tests

Following the tentative layout for pages with pictures, the final layout algorithm was tested by laying out all six pages of the News Department. That is, the stories and pictures assigned to each page were actually positioned in accordance with the story/picture placement algorithm described in Appendix A. The final page dummies, which show the outlines of stories and pictures on the pages, are depicted in Fig. B.2 where pictures are represented by cross-marked boxes and the areas occupied by story slugs are headline areas.

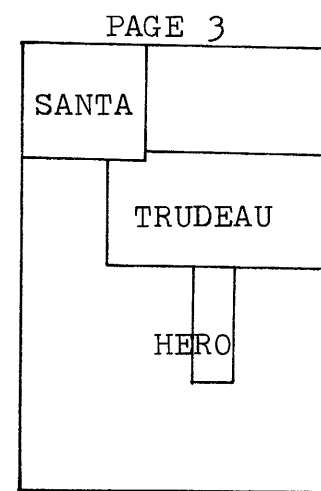
As one can see from the page dummies, most of the stories tend to be wide and short because the Height/Width ratios are specified as 1 : 2 or 1 : 3. Also note that the



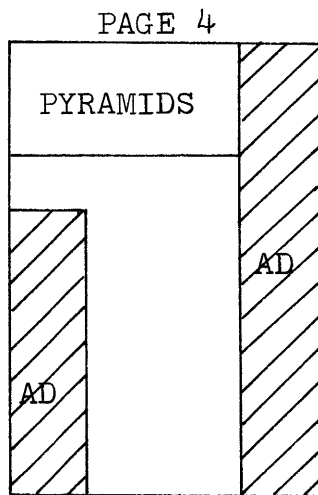
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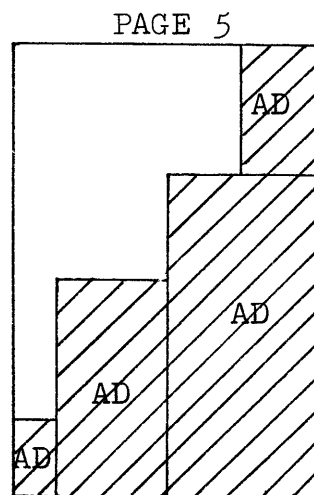
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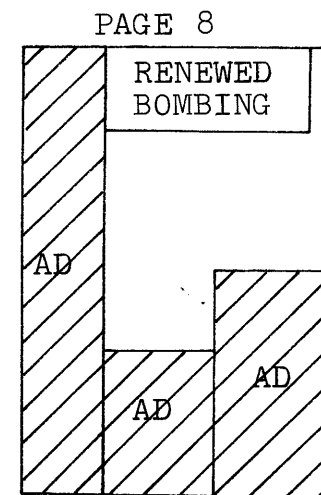
template=pj



template=pa



no tentative layout



template=pa

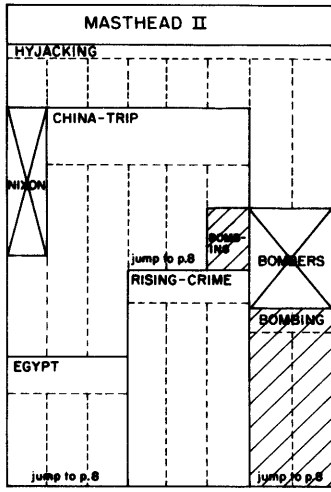
-250-

Fig. B.1 Tentative Layout Results of News Department

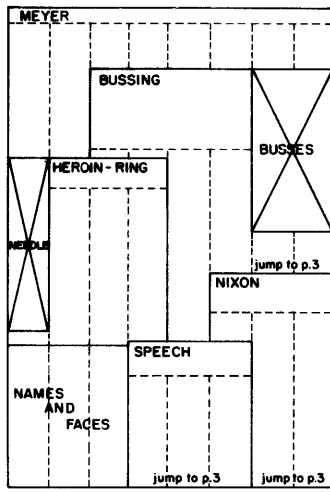
layout of page 3 is incomplete since the independent picture 'SANTA' does not fit into the remaining news hole (an independent picture is one not associated with any story). Furthermore, there seems to exist some fundamental problems such as the splitting of the news story 'RENEWED-BOMBING' on page 1 from its associated picture 'BOMBERS'.

Another layout utilizing exactly the same story assignment result but with different Height/Width ratios 2 : 1 for the first three pages and 3 : 1 for the rest of the pages, was carried out in order to get more feel for the scope of the problems. The final page dummies are depicted in Fig. B.3. Notice that page 3 is laid out completely this time but stories 'RUSSIA' and 'NIXON' are split by the independent picture 'SANTA'.

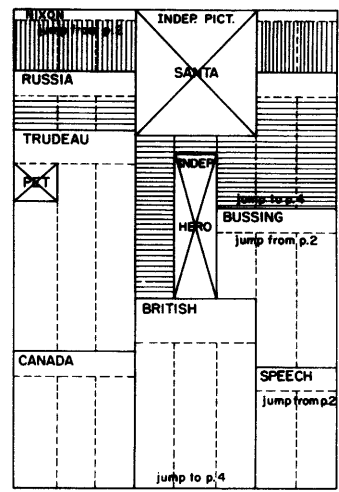
In the previous two example layouts, all the stories and pictures on the pages are laid out with a bottom-up scheme. That is, the placing of stories and pictures starts at the bottom of the news hole and works up toward the top of the page, with the least important story being laid out first. In order to evaluate the results of a top-to-bottom scheme, the algorithm was modified and another layout was performed. In this test the layout order was reversed, starting from the top of the page with the most important



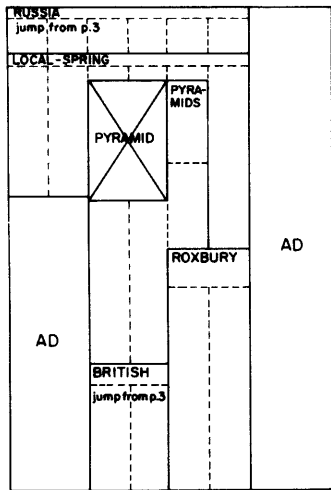
PAGE 1



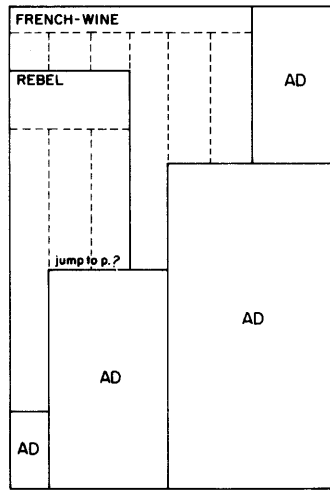
PAGE 2



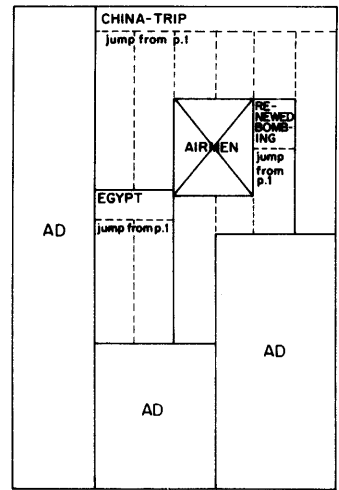
PAGE 3



PAGE 4



PAGE 5



PAGE 8

Fig. B.3 Final Layout Result of Bottom-Up Scheme with H/W Ratio 2:1 & 3:1

story being placed first, and a news layout dummy with height-to-width ratios 1 : 2 and 1 : 3 was obtained. The results are shown in Fig. B.4 and appear to share the same deficiency with the previous two examples.

In general, as we can see from the three test examples, there exists the same classes of fundamental problems in the present news layout algorithm no matter what the Height/Width ratio is or where the layout starts on the page. In Appendix C, several classes of deficiencies uncountered in a sequential news layout system are discussed.

APPENDIX C

DEFICIENCIES OF THE EXPERIMENTAL LAYOUT SYSTEM

In the previous appendix, we have presented three test results of the experimental sequential news-layout system using the same set of news data, but various height-to-width ratios and two different layout schemes, namely, top-down and bottom-up. As the result, several classes of fundamental problems are found to be critical to the one-item-at-a-time approach, and they are discussed as follows:

Final Photo Location Not Guided by Selected Page-Template

In the experimental layout system described in Appendix A, a page template together with the tentative layout process is used to produce an acceptable picture pattern on the page. Items assigned to the page are divided into two categories, --- stories with photos, and stories without photos. The former are placed tentatively first, and during layout, are selected as the next item to be laid out whenever its tentative location is disrupted by the placement of an item. Unfortunately, this relative simple-minded algorithm for story selection and placement fails to accomplish its original design goal which is to keep the picture location as close to the selected

page template as possible. In fact, in some cases, it does not even achieve a balanced picture spread over the page. For example, in Fig. A.2(c), both the story A and B are placed close together on the right-side of the page despite the fact that the tentative layout calls for one photo on the upper-left corner and the other in the middle right-side of the page (see Fig. A.2(b)). The failure to follow the selected page template in laying out photos is also well illustrated by comparing the final test results depicted in Figs B.2-B.4 with the tentative layout result in Fig. B.1. These results illustrate that the page template serves only as a very loose guide for the final photo placement.

Non-Uniform Page Appearance

Another major problem associated with the present order of placing stories/pictures is the non-uniform appearance of the final page layout. As illustrated in Figs. B.2-B.4, the shapes of story envelopes near the place where the layout starts tend to be more rectangular than those placed afterwards. Without any consideration of the resultant news-hole during story/picture placement, the less news-hole left, the more irregular the next story envelope is likely to be.

Unsatisfactory Headline and Associated Picture Location
Within the Story Envelope

As described in Appendix A, after a story is selected as the next item to be placed, its envelope is constructed with the correct total area allowing for the specified height-to-width ratio and the dimensions of any associated picture, and avoiding any overlapped area with previous placed items. Once the resultant envelope is formed and placed, the headline and associated picture area are then designated using the selected story-picture template as a guide.

This two-step approach to the placement of story and picture has serious drawbacks. Without consideration of the picture and headline in the story envelope construction, the resultant envelope may offer little chance to locate the headline and associated picture satisfactorily. For example, in the layout results depicted in Fig. B.2, the story text area of 'RENEWED-BOMBING' on page 1 is split into two non-contiguous segments as the result of placing its associated picture 'BOMBERS'. On page 5, the headline of 'REBEL' extends over the top of a display ad, and has a shorter area over the ad.

Non-Contiguous News Hole

In order not to confuse the reader, the story texts are required to flow continuously on the page. However, since no special efforts are made to keep a monolithic unoccupied news area in the experimental layout system, stories are often separated from each other. For example, in Fig. B.4, the jumped portion of story 'EGYPT' on page 8 is cut off by the story 'RENEWED-BOMBING'. In the layout results presented in Appendix B (Fig. B.2-B.4), all the split story sections are marked as shaded areas. This segmentation of news story problem is regarded as one of the most fundamental issues in a sequential news layout system.

Figure C.1 illustrates an example of two non-adjacent segments of news-holes, A and B, split by story C. To avoid this condition during layout, it is important that placement of a story does not create two or more isolated segments in the remaining news-hole. If separate news-hole segments are created, non-contiguous stories can be prevented only if an exact fit from the remaining news items assigned to the page can be found for each news-hole segment.

Preventing the present story from creating a non-contiguous news-hole is relatively straight-forward, but that is not enough. Determining the damage to the connectivity of the

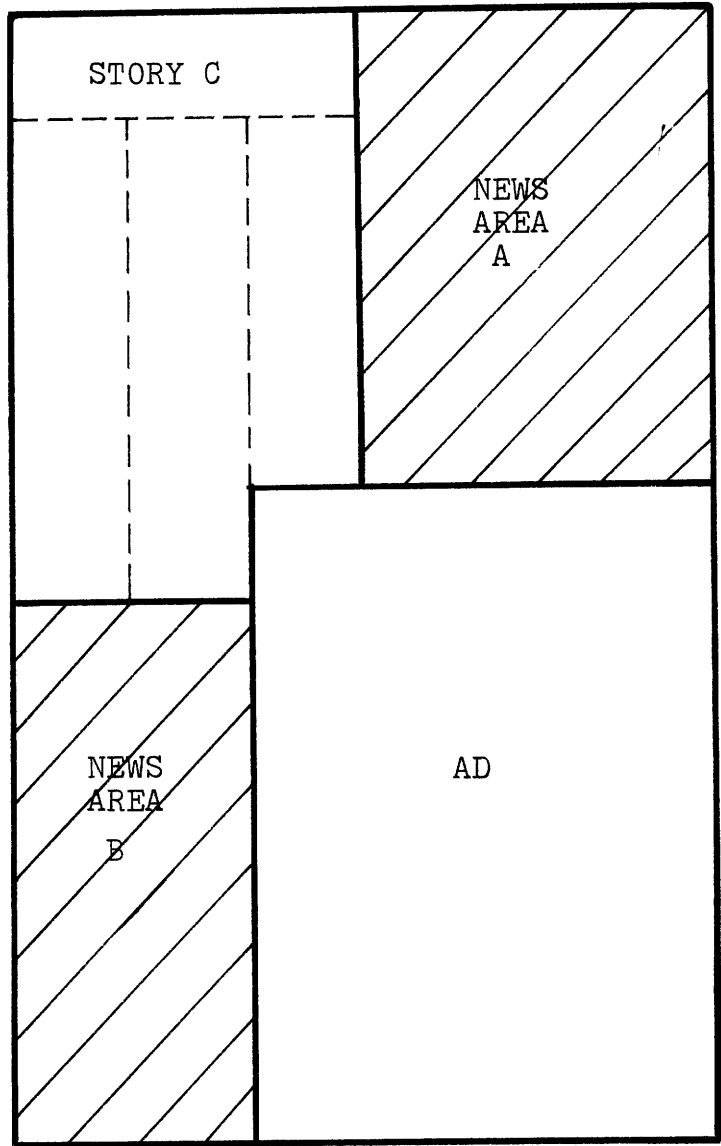


Fig. C.1 Illustration of Non-Contiguous Unoccupied News Area

news-hole, which makes layout of the remaining stories more difficult, further complicates the problem. For example, as a result of the two non-adjacent news areas created in Fig. C.1, story C is then reshaped by reducing its height-width-ratio as close to its initial specified ratio as possible and also keeping a contiguous unoccupied news area. The resultant envelope is shown in Fig. C.2. Although the remaining news-hole is still contiguous in essence, the narrow news strip between the story and the ad definitely makes the layout for remaining stories more difficult, if not impossible.

In general, the non-contiguous news-hole can happen no matter where the story placement starts. But with the pyramid style of the ads layout, the remaining news-hole frequently contains narrow wells of one or two columns at the bottom, which can be easily cut off from other unoccupied news area if a top-down layout algorithm is used. By starting from the bottom, these wells are filled first, and thus reduce (but not eliminate) the probability of creating a non-contiguous news area. Figure C.3 illustrates a layout where the remaining news-hole is separated using a bottom-up placement scheme. In the figure the encircled numbers within the story envelopes indicate the order in which they are placed. Therefore, for a page with display ads, it is better in dealing with the non-contiguous news-hole problem

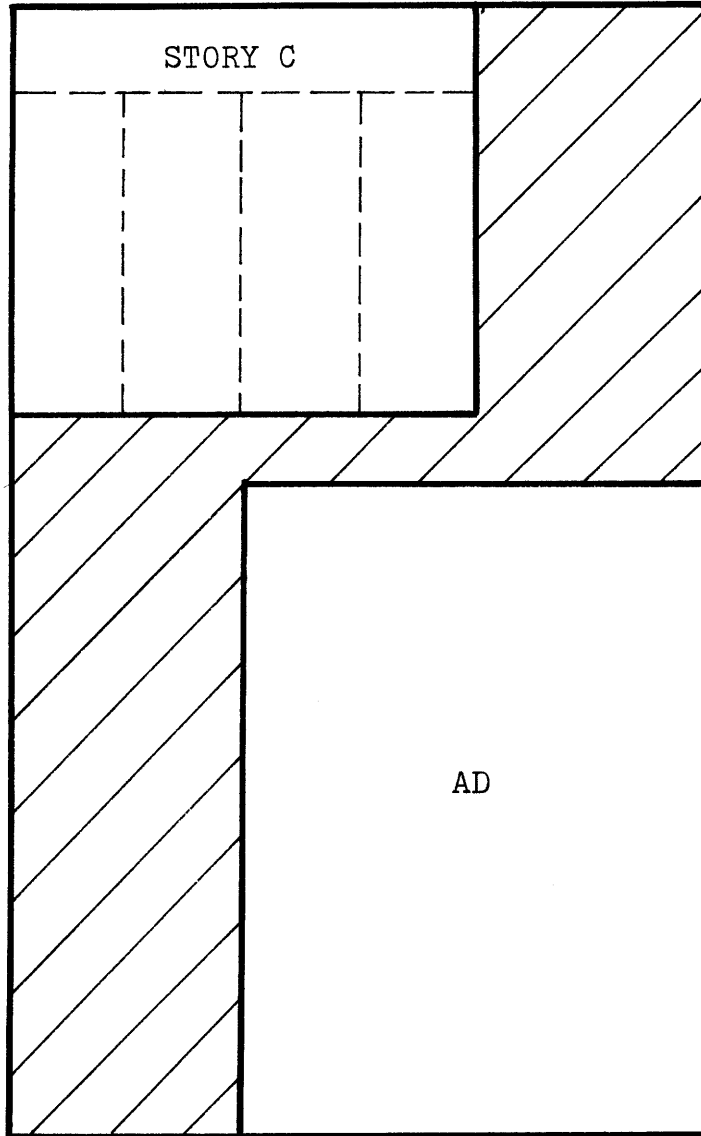


Fig. C.2 Reshaping of Story Envelope to Create a Contiguous Unoccupied News Area

Remaining Non-Contiguous News-Hole

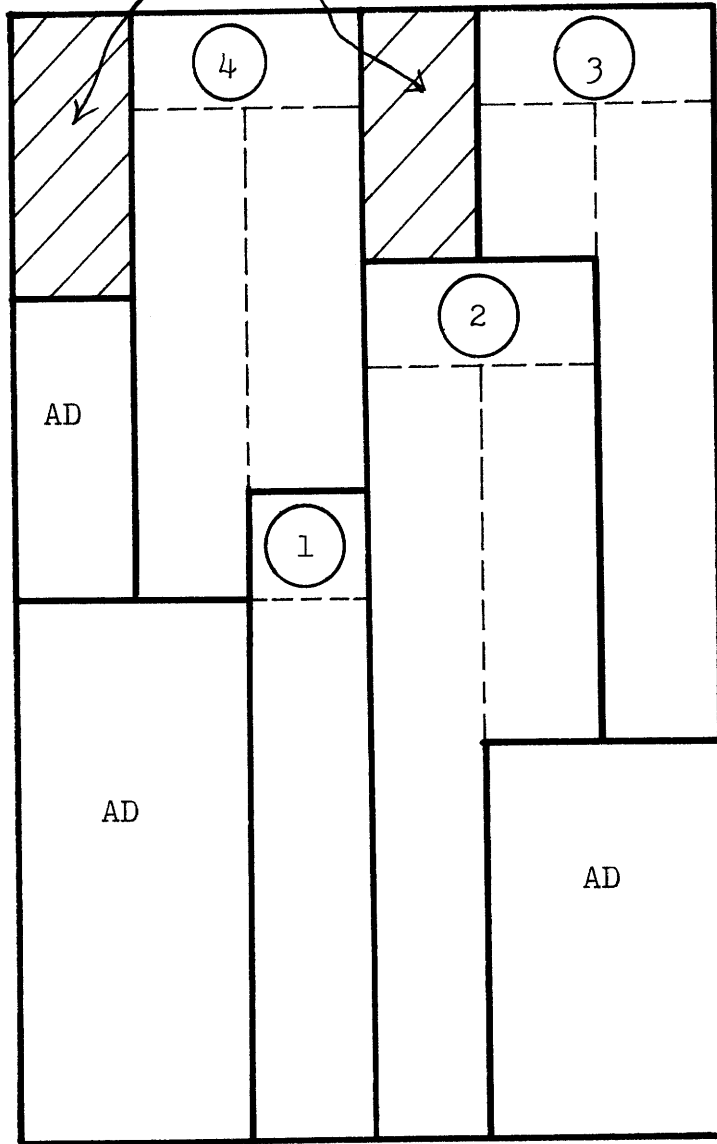


Fig. C.3 Possible Occurrence of Non-Contiguous News-hole Using Bottom-Up Story Placement Scheme

if a bottom-up story placement scheme is chosen.

Generally speaking, for bottom-up layout, a story envelope with a much higher top line than those of adjacent items could potentially damage the connectivity of the remaining news-hole. Similarly, for top-down layout, the bottom line of a story envelope has to be kept as close to those of adjacent items as possible to prevent possible news-area cutoff. This implies that the occurrence of non-contiguous news-hole is less likely on pages with relatively low specified height-width ratio. Therefore, one possible solution to the non-contiguous news-hole problem is to reduce the height of the story envelope, if possible, whenever a potential news-hole cutoff is detected. Of course, this strategy weakens the control of height-width ratio over the layout style. Besides, for stories with associated pictures, the height of story envelope may not always be reduced because of the fixed dimensions of pictures.

In addition, the problem of non-contiguous news areas is further complicated for pages with independent pictures assigned to them. Since the dimensions of these pictures are fixed, and no story texts are associated with them, we can no longer solve the problem by reducing the story/picture envelope height. Instead, the pictures can only be moved around to achieve a contiguous unoccupied news area. For

example, in the layout result depicted in Fig. B.3, the picture 'SANTA' can be shifted to the right by two columns to eliminate the separated news area. Although the resultant remaining area is contiguous by such a move, the narrow distance between the pictures 'SANTA' and 'HERO' still tends to separate the news-hole into two segments making the follow-on layout more difficult, as mentioned previously. In this case, it is best to move the picture further down to the top of the story 'BUSSING'.

From the previous discussion, we conclude that keeping the news-hole as a contiguous area for layout is not a simple task. One has to consider several layout parameters at the same time such as the specified height-width ratio, the ads shapes, the starting layout location, and the characteristics of the item to be placed.

APPENDIX D

THE BACKUS NORMAL FORM DEFINITION OF A LANGUAGE

Backus-Normal-Form (BNF) is a notation of writing grammar that is commonly used to specify the syntax of languages. In BNF, intermediate-language constructs are written as names enclosed in corner brackets "< >". The production (or re-write) rules are string-transformation rules with the symbol ::= (read "is replaced by") separating the left-hand and right-hand side. The rules are used to describe how language constructs can be formed or produced. The string on the left-hand side of the rule represents a particular language construct to be transformed, and the right-hand side string indicates a replacement for the construct on the left-hand side. Alternative ways of rewriting a given language construct are separated by a vertical bar, |, (read as "or").

Taking English syntax for example, assume that the language construct "sentence" can be defined as a "noun phrase" followed by a "verb phrase"; also assume "noun phrase" is an "article" followed by a "noun", and that "verb phrase" is a "verb" followed by an "adverb". In the BNF notation, these grammar rules about English syntax can be expressed by the following production rules:

- < sentence > ::= < noun phrase > < verb phrase > (1)
- < verb phrase > ::= < verb > < adverb > (2)
- < noun phrase > ::= < article > < noun > (3)

For the purpose of illustration, let us further assume that the only article we have in the English vocabulary is the word "The", the only noun is "student", the only verb is "studies", and that the adverbs are the words "hard" and "slowly". Then, in BNF notation, these rules can be written as the following productions:

- < article > ::= The (4)
- < noun > ::= student (5)
- < verb > ::= studies (6)
- < adverb > ::= hard | slowly (7)

To generate a string in the English, one can take a particular language construct from the left-hand side of rules (1) through (7) and replace it by the string on the right-hand side to form a new string. This process is repeated until all the symbols in the string are the words in the vocabulary. For example, to generate a noun phrase in the English, first apply rule (3) to replace < noun phrase > by < article > < noun >, then use rules (4) and (5) to produce a noun phrase "The student". As a more complex example, the English sentence

"The student studies hard"

can be derived by a sequence of applications of the rewrite rules (1) to (7) as shown in the tree structure of Fig. D.1

where the numbers in circles indicate the production rules to be applied at each stage of the generation process.

According to our English syntax specified by the BNF production rules listed above, the only other allowable sentence of the language is

"The student studies slowly"

Any other combinations of the words in the vocabulary are considered illegal sentences. Thus, by having a formal specification of language syntax such as the BNF notation, one can define the language syntax rigorously and then express precisely what are the legal sentences of a language.

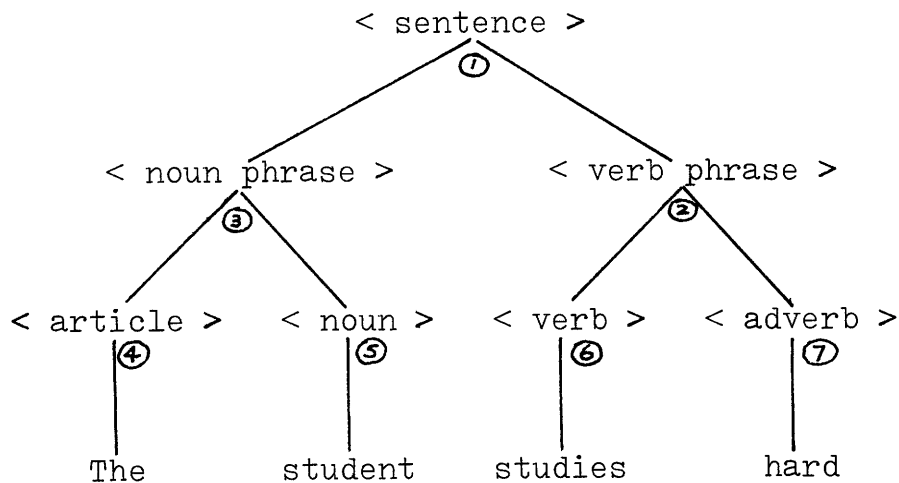


Fig. D.1 Generating of an English Sentence

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