

# Dynamic Collage

## An Interface for Digital Stories

by

Natalia Tsarkova

B.A. Social Studies, Harvard College (1993)

Submitted to the Program in Media Arts and Sciences,  
School of Architecture and Planning,  
in partial fulfillment of the requirements for the degree of  
Master of Science in Media Technology

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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### Abstract

This thesis describes dynamic collage — a tool for organizing interactive visual experiences and browsing through banks of visual data. I initially developed dynamic collages to guide and preview users choices in an interactive movie. Later, the tool turned out to be useful for a variety of World Wide Web presentations, such as on-line shopping catalogs and interactive newscasts.

In the following pages I will

- describe my journey from non-fiction film to interactive cinema;
- present dynamic collage as an organizing principle for an interactive movie ;
- describe in detail the dynamic collage mechanism, from its conception to its implementation in Java;
- describe two experiments that use dynamic collages as their interface: *The North End Chronicles* (an interactive documentary), and *J.C.Penney Arcade* (an on-line catalogue);
- present collage as an efficient solution for dynamic information design on the WWW;
- point out possible ways to improve and extend the dynamic collage tool.

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This research was sponsored by the News in the Future Consortium.

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Seymour Papert and Glorianna Davenport brought me to the Media Lab before I even knew what "digital" meant. Glorianna let me become a filmmaker and a designer: I owe to her every skill I have. At the point when I was most stuck and discouraged, she sent me to Siberia to shoot with Ricky Leacock. I came back strong enough to learn Java and write this thesis.

In June '94 I knew nothing about hardware or software. My thanks to those who helped me learn: David Tames, Gilberte Houbart, Brian Bradley, Kevin Brooks, Michael Murtaugh, Lee Morgenroth, David Kung, Tinsley Galeyan, Freedom Baird, Richard Lachman, Phillip Tiongson.

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I did not come up with dynamic collages on my own. My co-authors in the North End are Billy Di Marco, Josephine, Kenny, David, Jerry, Giacomo, Salvatore, Rosario, my landlord Mr. Suzi and his family.

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Finally, my parents taught me that problems are there to be solved -- in math, and real life. With this belief I jumped into the muddy waters of computers and cinema. I knew they would be happy to know there is *some* math in what I do.

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## ***Introduction***

### **My Interactive Journal**

Ideas in this thesis belong to a field that is relatively new and without a widely accepted definition. Research in interactive cinema deals with a larger question: how to tell interactive stories?

Traditional storytelling provides a model for interactive stories. I do not mean composing a story in solitude, but, rather, a process of constructing a story in front of an audience. We may call the result yarns -- stories that were born when Charles Dodgson sat in a boat with Alice Liddell, Baron Munchausen shared campfire with hunters, or when my Romanian nanny couldn't get me to sleep. Applied to such storytelling, the word "interactive" may be superfluous. It is much like a stand-up act: listening to the audience, changing pace and making up characters, remembering jokes you never thought you knew — all of that to make the guy up-front stop yawning.

Could one capture story-teller's craft in a program? The best raconteur I know has never told the same story twice. Sometimes I wish he would— just to know how much of those he makes up. But his "database" is so huge, he need not worry about repeating himself. Similarly, the more ele-

ments there are in a non-linear presentation, the more interesting the experience can be for the user, the more capable of matching her mood, or getting attention. And, clearly, these elements cannot be put in linear or branching sequences in advance — they should remain flexible, available just when needed, fading out of memory when irrelevant. To accomplish this we need a fairly sophisticated mechanism of data retrieval. We call it a story-engine.

What we research, then, is digital storytelling — how to structure a bank of digital data into a compelling dynamic presentation. In Interactive Cinema, we work with banks of digital movies (often combined with other media materials).

Most research at the Interactive Cinema group focuses on story-engines, on what goes on "behind the scenes" of an interactive presentation. In the next chapter I will mention a few recent projects in this direction.

There is no doubt that, in the long run, story-engines will change the way we approach information retrieval. Still, one cannot deny that today a well-crafted branching story might be much more enticing than one built by a complicated retrieval algorithm. A movie audience doesn't care



what technical details make the show happen.

The only time I remember really wondering who's running the projector, was at a screening of Polanski's *A Knife In The Water*, when the third reel was by mistake shown before the second one. Surprisingly, it worked quite well for an American audience -- as a friend of mine put it, " At least I knew *something* was going to happen, eventually...."

The audience cares that the presentation is beautiful, the story interesting. In an interactive experience, it will care about the interface. Users will notice if interaction breaks the spell of the movie. They will be disappointed if a button gave away a surprise. They will be frustrated, if choices make no sense.

A movie is structured in editing. In the early days of cinema Russian filmmaker Kuleshov developed an experiment to show the power of montage. He took a close-up of an actor's expressive face and cut a bowl of soup after it. The audience thought the man was hungry. The same face was followed by a shot of a coffin. The audience thought the man was mourning a death. And so on. Now take an interactive movie, where audience is given some control over the narrative progress.

Do you show the same actor and a row of buttons saying "food", "death", etc.? By the time we click on one, the man's face will be long forgotten, montage having lost its meaning.

However farfetched, this example presents a real design problem: what form should the interaction take in a non-linear film? On the one hand, we want the audience to know its options. On the other, we don't want to give away the story. The viewer shouldn't feel lost (only true "hackers" like poking around, I believe — the rest of us just give up), but we also want to keep the surprises for the right moment. On a deeper level, we want the audience to feel in control, while the intentions of the author prevail.

These issues slowly emerged for me, while, over the span of almost two years, I documented street-life in the North End, Boston's Italian neighborhood. I wanted to build an interactive non-fiction story, possibly on the Web. Not knowing what shape the movie would take, I did what they teach you in a documentary film class — cut sequences. Having seen how tough it is to get an audience to react to a quarter-screen digital movie, I made sure that edited clips were quite short (about a minute on the average), and to the point.

I cut each clip as a miniature story. It had to stand on its own, and, at the same time, fit in longer sequences with other short episodes. For centuries, haiku have been written this way: they are bits of meaning which can be strung together to create some new beautiful sensation. (Not that my Italian characters bring to mind the fragile transparent Japanese poetry.)

Clips were annotated — described, in terms of characters, places and various story themes. Eventually, a story-engine would use audience input and clip annotations to decide what to play next. Now I had to decide on the interface. In what guise should the choices appear?

It was clear to me, that text buttons would not do. Indeed, what would the text say: character names? I did not expect my audience to remember most of those names. Story themes? Words like “love”, “Sal’s breakfast” or “Billy’s cancer” would either mean nothing, or give the story away. Besides, I wanted to recreate the rich visual world of the North End streets -- word buttons would break this visual flow.

A fascinating thing about documentary filmmaking is that material itself often dictates the final shape of the movie. While a fiction film is highly structured before the shooting even begins, non-

fiction narratives emerge in the editing room, from what's available, what works in the overall context — and what the creators have learned while looking at the footage over and over again. (I do not mean stereotypical TV documentaries, with voice-overs written in advance and reality forced into the Procrustean bed of "master shots" and "cutaways".)

It can only be appropriate for an interactive non-fiction, that both material and early audience determine the shape of the movie. In fact, it was the audience — mostly the wonderfully responsive Media Labbers who would look at my clips and in different ways express the same thought: "You must be having lots of fun shooting this movie!" ("while I am stuck here writing code..." some would add). Well, I thought, this is close enough to saying, "*I* am having lots of fun watching this". All I had to do was to make my experience theirs — make the interface reflect my interaction with the neighborhood.

Documentary filmmakers “interact” by picking what to shoot. How did I make my choices?

Often, I would get to the North End with nothing in mind, and hang out the way my protagonists do ("Still filming? that's a lot of stuff you've got there! " "Hey, leave her alone, there's no film in *that* camera!"). Walking down the street, I had to choose from a constantly moving collage — lay-

ers of faces, words, emotions surrounding me at every step:

There's Billy smoking his cigar — shall I talk to him? But he will be there for hours, and Josephine's shift in Caffe Vittoria might end. And there's Rosario and Sal *in a limo*?! — "Natali, I finally made it!" Got to get that...

This is how I came to the notion of collage as an interface for The North End Chronicles. Which, of course, doesn't sound like anything original. Just about every interactive product uses collage in its interface. What I wanted to do, however, was to build collages dynamically, grouping multiple images into a preview — an expression of possibilities: there's Billy's face, and Caffe Vittoria, and perhaps it would be followed by this funny-looking guy you haven't seen yet. On the other hand, there's Sal in a limo, next to Angelo eating, and if you stay on this path, you will meet this girl. The goal was to combine images "on the fly", with everything that makes a collage work: blending, a right amount of layers and overlap.



**My first North End collages, built in Photoshop**



I was not sure at first, if a computer program could make collages. I remember getting particularly disillusioned after watching an industrial designer make beautiful photomontages in Photo-

shop. This process was very complex: picking out images, deciding what picture to crop, what color to add, what filter to use on what layer. The end result was a subtle message. How could a computer ever merit this creative bricolage? The designer and I got in an argument.

On the other hand, a program did not have to replace the artist, just as a word processor does not replace the writer. What if a designer could create a template, and supply images that this template would use? The result may not be Magritte, but as an interface it could, perhaps, work.

I developed a template in Photoshop and spent some time “simulating” a computer. The algorithm worked. It made decent-looking photomontages of random images. I turned to Java for the actual implementation of the collage tool — a choice that had significant implications for this research. It brought it to the World Wide Web.

Frankly, at the time I couldn't stand the Web. You could attribute this to a "childhood" trauma.

Having just started at MIT, I signed up for a seminar on interactive story design. Our first assignment was to make a story on the Web (in 1994 WWW was just about to become all the hype).

Now, looking back, I find it ironic that in a class full of aspiring photographers, writers, musicians

we started off by endorsing the Web as hypertext. There was this new medium, that had yet to be shaped, and could very well become a stage for our creative ambitions — and we just sat down and wrote hyper stories. Inevitably, they became branching stories, broomstick stories. I believe the intention of our professors was to show how frustrating hypertext and static design are. I couldn't agree more and, unable to even deal with hyper-authoring, dropped the class.

Of course, one could argue that no tools were available at the time to make pages dynamic. However, even in our thinking we somehow equated the Web with hypertext, jumping from one discrete page to another. For creative ideas often flow from what has been done by others in that medium, what's available in the creative discourse.

I still cannot create or enjoy hypertext. It seems to me an aimless journey, it defies dramatic action, it defies closure. This is a personal view, though I suspect I am not the only one who feels that way.

Ironically, my interest to the Web was reawakened by Java (it was meant to be the other way around). It just happens, I thought, that my programming language plays collages in this browser

window — but wait, I can actually demo my tool on another computer? in another room? in another state? I became a Web fan overnight. It turned out to be an amazing distribution vehicle, a window to speak creatively to the world. The most important realization was that the Web did not have to be hypertext. In fact, it is best suited for open database structure (it *is* an open database) of the kind we study in IC. In *The North End Chronicles* every movie is an HTML page, and dynamic collages represent a local topology, a limited view into the future. A similar paradigm could be applied to most Web experiences. There is no limit to the number or variety of pages one can connect that way, or to the kinds of dynamic maps one could make.

This is how, having started with an interface for an interactive movie, I came to suggesting a cheap and efficient tool for visual navigation on the Web. No matter how small this input actually is, I believe it still makes a case that if technology often defines the content of art, artistic thinking may at times foster technology. And this is no small matter for a culture where growing technology gets all the money, while budding art gets none.



## **Breakdown**

### **Chapter I**

#### ***Theory***

Ideas and projects that influenced me at the Media Lab.

Theory of art form developed by Russian Formalists. Its application to photomontage and cinema.

### **Chapter II**

#### ***Practice***

The problem: an interface for an interactive movie.

The hypothesis: Dynamic Collage.

Template for Dynamic Collage is designed and debugged in Photoshop and Director.

Dynamic Collage is implemented in Java.

Dynamic Collage is attached to a database of the North End footage.

### **Chapter III**

#### ***The Web***

Collage is an efficient dynamic menu. It is well suited for a variety of WWW presentations.

Dynamic Collage as an interface to *J.C.Penney* on-line catalog.

Why WWW needs dynamic maps.

Collage as an example of a dynamic map.

## **Chapter IV**

### ***Future Work***

Rules and limitations for extending Dynamic Collage.

Phonontage. Souvenirs.

New content: Museum walk. Interactive Newscast.

## **Chapter V**

### ***Conclusion***

Statements you can argue with:

On interactive movies.

On the World Wide Web.

# I FOUNDATIONS: A Collage of Ideas.

My understanding of interactive storytelling was conditioned by research in the Interactive Cinema group at the MIT Media Lab. A great deal of this chapter is about concepts and tools on which my research is based.

My interpretation of these ideas was heavily colored by Russian formalist thought and its application to Constructivist art and cinema. At the end of this chapter I will discuss Formalist approach to art.

## **Interactive Cinema, or Digital Stories**

"I forget who the man of taste was who, when he was asked what event in his life had grieved him most, replied: 'The death of Lucien de Rubempré in *Splendeurs et Misères*.'"

Marcel Proust, *Remembrance of Things Past*

All great art is interactive — in a subtle, personal way. We spend hours in front of a painting, or read a poem over and over again, until it is fixed in our memory. Our response to these objects

may be so active, we stop paying attention to the world around us.

However, we do not change the painting, or rewrite the poem. Some of us might go home and try to make something like it, but most will be satisfied with the powerful sensation this object provoked.

Today a new form of creative expression — digital storytelling — tries to incorporate constructive input of the audience in order to enhance the impact of a story. As art this new form may, or may not create anything as powerful as *Inferno* or *Mona Lisa*. But it will represent a great advance in education, entertainment, news and advertising, because, next to a work of genius, there is nothing more transforming than constructive participation and learning. All of the fields above want to influence their “audience”— make you smarter, make you laugh, make you vote, make you buy a shirt. None of them can afford to count on something as capricious and chancy as genius.

Interactive storytelling is possible today, because most of the raw materials of our cultural discourse are, or will soon be, digital. Turned into computer data, meaningful combinations of

words, images and sounds can be stored in large media banks and used in a multiplicity of ways. Consequently, a major challenge is to build powerful retrieval systems that could, in no time, extract from this immense well of knowledge a few good bits — an image or a sentence that will communicate the right message to the user.

Still, the most powerful retrieval system, or story engine, is not enough. To get the audience to participate in a digital story, we have to build an effective interface. When we build an interface, we structure interaction. In my research I attempted to understand how such design enables interactivity.

Computers have changed dramatically the ways in which we handle information. I don't need to point out the obvious effects of word or image processing on our creative output. The effect is even more interesting in traditionally time-constrained media. In 1960's Levi-Strauss spoke of cinema as an art defined by linear progress. One can choose to spend hours in front of a sculpture, to flip a book ten pages back, or skip a boring paragraph— in movies, however, one has to follow a continuous flow that won't stop or slow down until the end. Digital video challenges this assumption.

### *Collage of Streams*

Eddie Elliott's research at the Interactive Cinema group (Elliott, 93) used collage structure to develop a tool for thinking about video. He designed Streamer — a three-dimensional representation of a motion picture, and an adjacent story-board interface where users could arrange parts of the video stream.

Elliott's goal was to "take advantage of multi-stream possibilities to support thinking about the relations among a collection of images plucked from a stream. ...Collage has been intended as a place to hold thoughts and mull them over while watching a source stream. I am more interested in how the process of collecting and organizing clips might affect viewing than I am in any particular configuration, linear or non-linear, resulting from the collage".

Eddie's "collage" interface looks like a bulletin-board on which one can "pin" quicktime clips. It creates collage in a psychological, rather than visual sense. The user's mind would connect clips not in a linear but in a spatial way.

Streamer and Collage were my first encounters with digital video. I was impressed by the idea that short clips placed "next to each other", not in time but in space, could create a new psycho-

logical reality and somehow enhance our understanding of the material. At the time, this tool seemed to be relevant to the editor's experience only. (Today, digital editing systems, such as Avid and Lightworks, use similar story-boarding technique extensively — and it does enhance immensely the editing process.)

Later I realized that the implications of this work went beyond editing. It showed that a spatial arrangement of video clips can create a certain vocabulary, a language better suited to comprehending video, than textual descriptions and linear storyboards. If an editor can use this language to express potential playouts, a viewer may read a spatial arrangement as a preview of what's to come. Perhaps, I thought, a computer might be taught this language of positioning clips on the screen? Perhaps, this language could be enhanced beyond a storyboard look, made to represent a more complex order?

### *Magic*

I knew I would like it at the Media Lab when I saw a student, during a presentation, pull out a stack of cards and start performing tricks. Ishante Lokuge of the Visual Language Workshop based his research on magic — an interface that has worked for centuries. His card tricks made

the point perfectly: the same sleight-of-hand worked or did not work depending on what the other hand did. The trick was not so much in pushing the card up the sleeve as in making the audience look away from this sleeve at that very moment.

Ishante reminded us that interaction is only satisfying when the spectators believe their choices matter — that they are, in fact, breaking the deck or picking a card at random. As we design an interface, we should think carefully about users' focus at every stage of the experience.

At the same time tricks are far more enjoyable when they succeed. Deep down we might even prefer to be fooled. Similarly in an interactive experience the author may be in full control — the presentation may be designed so that, no matter what the audience choice, it is to our advantage.

### ***Guiding in Time***

Tinsley Galeyan's doctoral thesis is about narrative guidance of interactivity. To showcase this principle, Tinsley created *Dogmatic* — a virtual reality experience which is also, in the most traditional sense of the word, a story.

One can hardly find an interface that offers users more freedom than a headmounted display. The audience of *Dogmatic* really is “in a driver's seat,” choosing where to look or go. Meanwhile, the



story engine and intelligent characters stir users' actions towards one inescapable finale. (*Dogmatic* stars a semi-intelligent computer dog, developed at the Media Lab by Bruce Blumberg).

Tinsley draws inspirations from older art forms. In his thesis he quotes the late director Andrei Tarkovsky: "What is the essence of director's work? We could define it as sculpting in time." For Tarkovsky filmmaking was a process of carving one perfect progression through the cinematic material. He believed in sculpting with the camera and expressed himself in well-crafted shots rather than montage. The famous ending of *Sacrifice* is a striking example of such cinematic carving. This 15 minutes long sequence — an exquisitely shot and acted climax of the film — does not contain a single cut. They had to burn two houses to get it right.

Tinsley's thesis discusses in detail ways to incorporate shot transitions in virtual reality. He also makes it clear that in virtual reality cutting is a tricky issue. By putting on a headmounted display, a user steps, literally, behind the camera. Authors cannot, therefore, make montage the driving force of dramatic action. It is not surprising then, that Tinsley was inspired by Tarkovsky's method of orchestrating individual shots. In a similar fashion a virtual reality program may orchestrate events in order to guide the audience in the direction of dramatic action. The story-

engine takes members of the audience through stages of the narrative, giving them full freedom to explore each stage. Interactive movie, then, is *guiding* in time.

The idea of narrative guidance is, to me, one of the axioms of interactive storytelling.

### *Seeing in Context*

*Dogmatic* was a fiction experiment. The story came first, and it determined the nature of digital “props” and autonomous characters. In documentaries, material comes first, before the story. Hours of footage may pile up before there is even an inkling of a plot. Can guiding in time be applied to a non-fiction database?

For years, Glorianna Davenport has researched ways to navigate a bank of data through context. Recently, Michael Murtaugh has embedded these ideas in an interface, which is at once computational and intuitive. *Boston : Renewed Vistas* is a documentary database that users can explore by context. The story operates on top of a potentially limitless bank of media data. Multiple authors can submit elements to this database. The author annotates a new element with any number of descriptors. During the presentation, the story-engine uses these descriptors to decide what other

elements of the media archive may be relevant (contextually similar) to the one that is currently playing.

The payout is coherent, since a clip that plays next is bound to have something in common with its predecessor. The achievement of this system is that it is capable of constructing a continuous presentation out of independently described elements. The story itself reminds me a bit of my "rambling" uncle: he used to start telling one anecdote, then shift to another — and go on endlessly, always picking on some thread and going off in that direction. The fact is, that good stories are usually driven not by a progression of similar events, but, rather, by an emotionally powerful action.

Still, the strength of contextual browsing lies in its ability to suggest, and it is far more intelligent and visually powerful than any query mechanism I know.

*Jerome B. Wiesner: A Random Walk Through the Twentieth Century* [JBW] is an application of contextual browsing to the web. Elements of the media bank in JBW are independent HTML pages. Half of the interface is always occupied by a dynamic quilt that represents users' paths

through the story and offers a number of potential directions. All materials in the database are about Jerome Wiesner, and his powerful personality sculpts the narrative, no matter what the payout. The "rambling" effect disappears, and contextual browsing becomes, in fact, the perfect way to tell this story.

Although today it plays entirely on the Web, JBW started as a hybrid application — a combination of web presentation and a CD-ROM. This arrangement is immensely attractive to interactive developers, since it allows them to make high-bandwidth presentations, without having to "lock in" the design. For instance, when Java came along, Murtaugh was able to rebuild the entire experience, while it would still play off the old CD.

## **Russian Formalists and Two Forms of Montage**

### ***Constructivists***

Ideas, once familiar in childhood, turn up unexpectedly in our adult lives. It is at times annoying to realize, that everything I can come up with has been already thought of in the beginning of the century Russia. (Still, this is a reassuring example of how cultures sur-

vive.) In the Soviet equivalent of Junior High, I was fond of the Russian poet Mayakovsky, who moved from Abstract to Futurist to plain "revolutionary" art, arriving at the grim reality of Socialist Realism and eventually shooting himself point-blank in the head. His poems, especially the ones that didn't mention the Party, were full of striking images that stood out by themselves, but created sense only in collision. Shortly after building my first dynamic collage, I discovered these illustrations to Mayakovsky's poem *About This*. Created by Rodchenko, they marked the birth of photomontage in Russia.

At the time another master of collage, Lissitsky commented: "...artists make montages, that is to say, with photographs and the inscriptions that belong to them they piece together whole pages which are then photographically reproduced for printing. In this way there develops a technique of *simple effectiveness* which appears to be very *easy to operate* and for that reason can easily develop into dull *routine*, but which in powerful hands turns out to be the most successful method of achieving visual poetry." (Ades, 85; italics mine)

Let's look closely at the language of this paragraph. Clearly, Lissitsky felt that "technique", "routine" and "easy to operate" were notions that threatened acceptance of photomontage as an art



Rodchenko, illustration for *About This*

form. Still, so obvious were these features, they had to be admitted up-front, so one could vindicate the new art in spite of them. I was glad to find this recognition, since it supported my hunch that collages could be made by a computer program. .

Another remarkable thing about this text is that instead of art-evoking collage, artists chose montage, reminiscent of machines and workman's routine. (Some went as far as to wear factory overalls to express their affinity with the world of machines.) Montage was the name of experiments in another emerging art-form."

## Cinema

An emerging art needs a methodology and a system of distinctions. In the 1920's, Russian filmmakers Pudovkin, Eisenstein and Kuleshov developed an almost scientific theory of cinema.

As much of the Russian artworld, they were greatly influenced by a circle of intellectuals who called themselves Formalists. An art-form, Formalists claimed, should be defined in terms of what makes it unique. They loved to mention that Tolstoy, when asked by journalists what the message of *Anna Karenina* was, responded: "If you could say it in your article, I wouldn't have to write a



Rodchenko,  
illustration for *About This*, 1923



Boris Prusakov  
*I hurry to see the Khaz Push*, 1927

book".

The indigenous quality that differentiates a type of creative expression from all others is the *form* of that art. Inseparable from the concept of form is the creative *material* that is shaped into it. Once the art form is defined in these terms, we can set up theoretical constructs that will allow us to appreciate and judge instances of artistic work.



Gustav Klutsis  
*The World being built anew 1920*

This theory is compelling because (and theories seldom do) it can actually assist creative practice — especially when the art form in question is an emerging one. For once, it offers a simple vocabulary. But, more importantly, this vocabulary implies a system of distinctions, a way of thinking that guards against equating cinema with staged plays, or photography with realistic painting. No wonder this new language was eagerly picked up by filmmakers, who needed a way to justify their choices in the new art.

Kuleshov, whose montage experiments I mentioned earlier, provided a simple framework: "every art form has two technological elements: the material itself and the methods of organizing that material'. (Ades, 87)

At the time when film was used to photograph and play back theater productions in real time, Pudovkin argued vehemently that "to show something as everyone sees it is to have accomplished nothing." He stressed that editing is essential to the film form : "The expression that film is 'shot' is entirely false, and should disappear from the language. The film is not *shot*, but *built*, built up from the separate strips of celluloid that are its raw material." (Pudovkin, 24).

Eisenstein agreed with Pudovkin's basic assumption: "Shot and montage are the basic elements of cinema. To determine the nature of montage is to solve the specific problem of cinema."(Eisenstein, 48) However, he insisted that the notion of shots as "building blocks" is " a completely false concept" (ibid.)

"According to this definition, shared even by Pudovkin..., montage is the means of unrolling an idea with the help of single shots: the "epic" principle. In my opinion, however, montage is an idea that arises from the collision of independent shots — shots even opposite to one another: the "dramatic" principle."



Eisenstein developed this thought to show that "from the superimposition of two elements of the same dimension always arises a new, higher dimension." This idea brings out a similar quality in edited movies and static collage. The difference is that in film "we have, temporally, what we see arising spatially on a graphic or painted plane."

"What comprises the *dynamic effect* of a painting? The eye follows the direction of an element in the painting. It retains a visual impression, which then collides with the impression derived from following the direction of a second element. The conflict of these directions forms the dynamic effect in *apprehending the whole*." (italics mine)

We do not have to take sides in a theoretical argument. Whether the film is "built", or made of colliding shots, montage became an organizing principle for cinema. Developing in parallel, Constructivists put cut-out images into a form of visual poetry, photomontage. These art forms had a similar feature: they created a higher expressive dimension by superimposing individual images in a temporal (film), or spatial(collage) way.

Today, we need to define an organizing principle for a new art form, which for lack of a better

name we call interactive cinema. Research mentioned above and experiments described later in this thesis led me to believe that this organizing principle might be dynamic collage. But just as montage is only a tool that is nothing without a gifted editor, dynamic collage principle will only succeed when used by a smart story-teller — digital or human.

## II Practice

Let us apply Kuleshov's criteria to interactive cinema. What is the organizing principle of this form?

We have defined Interactive Cinema as a presentation created dynamically in response to user's input from independent elements of a media bank. For now, let's limit our database to digital video clips.

Our material is, therefore, a set of clips and interaction. We organize a set of clips — the movie database — when we annotate individual elements and design a retrieval mechanism. Each clip is an individual linear movie. It is organized in editing. The last bit of artistic material to account for is interaction. I propose to organize it with dynamic collage. ["Interface" in this work stands for the "organizing principle for interaction"].

## **The Problem**

The organizing principle — interface— has to ensure that:

1. the representation of choices is comprehensive:

is easy to grasp;

is extensive enough to give a satisfying preview of user's options.

2. interaction is intuitive:

choosing is easy;

the system's response to our choice satisfies our expectations.

3. interaction is immersive:

does not break the flow of the story,

the representation of choices is an integral part of the experience (as much a part of the

creative message as the movies themselves);

#### 4. interaction matters :

audience is convinced that its choices do make a difference (we want to be sure we *are* cutting the deck in a card trick);

#### 5. interaction is guided by narrative :

while the audience feels free to choose, the story engine knows how to incorporate these choices into a global story. The best metaphor I know for this kind of freedom comes from my grade school Marxism-Leninism class. There are two kinds of freedom, the textbook explained: the one you have in the middle of a dark forest, free to go wherever you like, and the one with you in the same forest, a compass in your hand, and knowledge that home is North. You may *seem* more free in the first case [read "capitalist West"], since you have more choice. True freedom, however, comes from being able to make a sensible choice, a choice that makes you feel in control. The second best metaphor is that of floating down the river. We are free to look around, while the stream is taking us forward. [see Galeyan,p. 68]

## **Coming to a Hypothesis.**

Collage may be a way to introduce order into complex visual data. This notion came to me from the ideas described in the previous chapter:

photomontage is a way to communicate complex messages by juxtaposing still images;

montage in film builds meaning from individual shots, by ordering them in time;

digital video clips can be put next to each other in space, as well as in time .

My experience with quarter-screen digital movies prompted me to think of interface as a setting, a background.

In literature, such settings are created by imagery:

"Imagery may be defined as the evocation, by means of words, of something that is meant to appeal to the reader's sense of color, or sense of outline, or sense of sound, or sense of movement, or any other sense of perception, in such a way as to impress upon his mind a picture of fictitious life that becomes to him as living as any personal recollection."

(Nabokov, 199)

I believe that collage may play a similar role in movies. It leaves shadowy shapes in our memory, that later, when they "come to life" as moving images, seem familiar — something from our personal experience, something that connects us to the world on the screen.

I envisioned dynamic collage as a continuous, changing blend of images — it would reflect the way our perception works. One might argue that precisely because we perceive the world as a complex unstructured collage, there is a psychological need to order the confusion around us.

However, dynamic collage would be not an artful arrangement of independent pictures but, rather, a carefully crafted representation of image-sets. Blending would make each set appear as *one unit* — preceding, or even making redundant, a conscious effort to "figure out the order".

Dynamic collage would offer a way to order information intuitively : grouping images together, without having to define in words, why or how they are related.

## **The Hypothesis**

- 1) a computer program can create a collage out of two or more independent still images;
- 2) this technique can be used to represent [in an intuitive, immersive and comprehensive fashion] a linear playout of a sequence of clips;
- 3) collage can be animated to create transitions between these clips;
- 4) a collection of collages can represent on the screen a set of potential playouts;
- 5) if, in response to a user's choice, a story engine dynamically constructs a set of potential playouts (each playout — a sequence of linear elements), a graphical component of this engine can make an intuitive, immersive, and comprehensive representation of user choices as a dynamic collage tree.

The following pages will describe in detail steps in building the dynamic collage tool .

### **Climbing the steps.**

1. I started with building a few collage representations and creating an abstract template for this



process. This template defined steps in making a collage, and set rules for visually annotating elements of the database.

2. A simple Director program tested the concept, proving that dynamic collage interface could

- provide a preview;
- make interaction an inalienable part of the visual experience;
- create meaningful transition from menu to a digital movie.

3. A Java implementation proved that the template from Step 1 works. I could finally test the algorithm on a large selection of images: collages built by the tool were comparable to the ones made manually in Photoshop.

4. The next step was to experiment with different layouts and animated transitions.

5. Finally, I connected the collage interface to a story engine.

When the tool was finished, I focused on generalizing the dynamic collage tool for the WWW.

## Step 1

To build anything we need a template — a mold of the process. We need to determine at the very outset, what in this process can be automated, and what should be done in "preproduction". Preproduction takes place when we organize the database. To be represented in collages, elements have to be annotated visually.



The author selects a still frame to represent a movie clip and decides what processing may be required for the collages to look right. Our goal, of course, is to minimize the manual annotation process, making it an optional feature, which authors would use only to achieve a certain look. Nevertheless, I believe that authors will always want a certain look, and manual annotation may be the most efficient way to communicate individual touch.



Three images to group in a collage

## *Preproduction*

To begin with, let's say we have three still images. We want to write a computer program that would combine these images in a collage. What aspects of collage-making process can be relegated to a computer? Let's look at two basic techniques for making collages: cutting out

[decoupage] and blending.

Decoupage was the essence of the original photomontages. The whole point of this art form was to re-use someone else's work, to process unrelated images in order to create some new meaning. By cutting out parts of images, artists built pieces of a puzzle, to combine them later into one visual statement.

Decoupage, then, is extraction of a specific meaning from a picture. This task cannot (yet) be relegated to a computer. Computer vision tools today can hardly separate foreground from background in a frame. This task, effortless for a human eye, requires hours of processing on the most powerful machine. In the future, computers will, perhaps, not only abstract visual properties of frames but recognize themes and find semantic connections between shots. For now I leave "cutting out" among the chores of manual annotation.

Blending is a method that original photomontages did not (could not, in fact) use. Today, thanks to programs like Photoshop, this method is used extensively in industrial design. While decoupage



**Collage made with cut-out images**



**Collage made by blending images**

involves precision and intent that even the most powerful computers cannot offer, a standard PC can easily perform image blending.

A simple graphical application can set the alpha value of pixels to a particular number. The lower this number, the more transparent the pixel will appear. I will describe later how this process was implemented in Java. For the first stage, however, it was sufficient to know that blending could be done by a computer.

***Visual annotation of clips. Two Meanings of Decoupage.***

Traditionally, *photomonteurs* "recycled" images, cutting out parts of pictures made by other artists for other purposes. Their goal was to create units of meaning that could be later combined into a message.

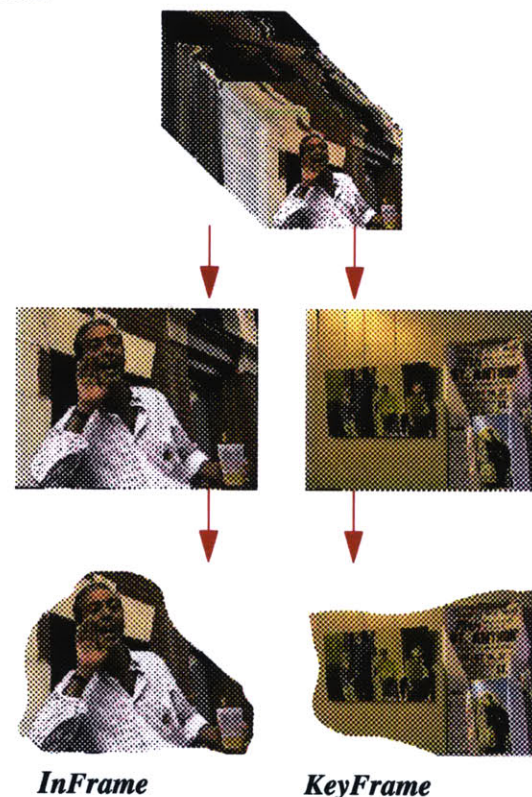
When I select a single frame to represent a video clip, I engage in a kind of decoupage. I am "cutting out" a frame that can best fit the purpose of dynamic collage. This purpose is to create a preview for a particular playout. I suggest that the frame

- has to be a "teaser" — a sharp, fun image;
- has to represent the content of the clip.

Annotating clips visually is a much more sensible and satisfying task than annotating them with text. Many of the clips in my North End database have a meaning that would be lost in words. How would I describe a clip in which Sal and Danny are shopping for sunglasses? I could, of course, use the previous sentence — and lose everything that really matters in the clip: two thirty-something guys showing off for each other, cigarette smoke reflecting in the counter, a sense of emptiness, of nothing to do but hang out in some store in the middle of a weekday afternoon.

By the same token, a still picture cannot serve as a summary of a movie. However, as a preview it need not [should not, in fact] do more than hint at the story in this clip.

I had no trouble annotating NEC vignettes visually: each sequence is cut tightly to tell one short story, and just about any clear frame would do. At first, I picked out manually the sharpest, cleanest frame in each clip. It turned out later, that, in order to have smooth transitions, collage tool had to have access to the initial frame of every clip. This is how each movie-element ended up with two visual annotations - I called them *InFrame* and *KeyFrame*.



I still had to deal with decoupage in its traditional sense. When I picked a still image to annotate a clip, I cut out the rectangular edges, making the central event of the frame more prominent. Generally, images used with dynamic collage don't have to be cut out.

The decision rests with the artist. Certainly, cut-out frames may add originality, a personal touch to the presentation. In *The North End Chronicles*, they also helped me to distinguish still frames from movie clips. And, finally they added variety to the interface: now each new combination of images produced new shapes on the screen.

Eventually, to annotate each clip I had to:

select a keyframe, save it in PICT format;

save the initial frame of the clip in PICT format;

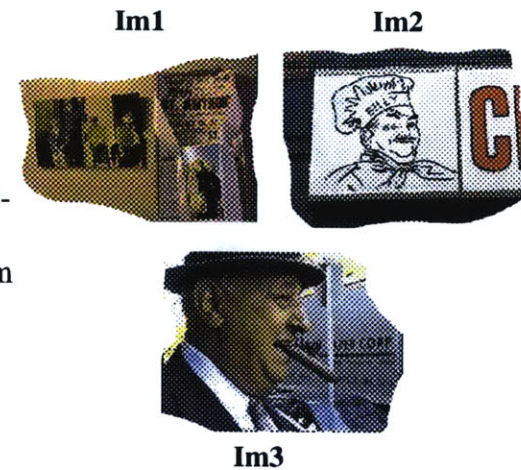
cut out edges of the keyframe, save the result in transparent GIF format;

cut out edges of the initial frame, save the result in transparent GIF format.

Ironically, I would have saved little time, had I decided against cutting out edges. In either case, images had to be open in one format and saved in another. An additional step in this process made little difference.

If the author didn't have to select keyframes manually, this kind of annotation could be easily done by a batch program. It is unfortunate that sophisticated tools like Photoshop do not allow artists to create a template and let the machine run it any number of times.

Rules for visual annotation will vary for different applications of this tool. Such preprocessing can make each implementation of dynamic collage look radically different from the others.



## Step 2

### *Photoshop: Debugging a Template*

First algorithm:

- place each image in its own layer;
- position images so that they overlap by x%,
- set transparency level of top layers to a%.

A bug!!!



What went wrong in the process? Only the overlapping parts of the top images have to be transparent. Otherwise, the background color will show through the rest of the image.

## Solutions

### Solution 1.

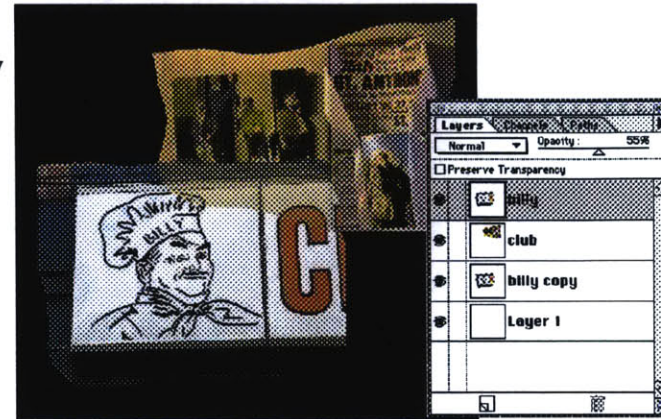
Display the top images twice: once as an opaque layer below and then as a semi-transparent layer above *Im1*.

This is an expensive solution: now we have to draw five, instead of three layers. But it is general enough to work on any background.

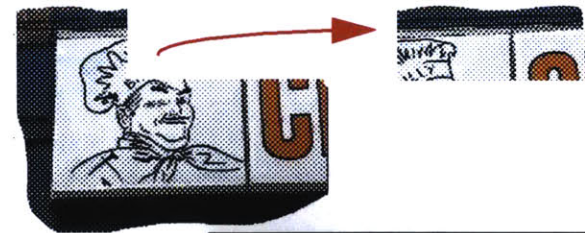
### Solution 2.

Write a graphics program to crop the section of an image that overlaps others. Then this small image can be made semi-transparent, while the bigger one would be left opaque. In this case we would still have five layers, but the loading time for images would be shorter.

Bug!!! The black background still shows at the border of the smaller image. The



**Solution 1: too much graphics to display**



**Solution 2: reducing amount of graphics**



reason: Im1 has cut-out borders, while the computer sees it as a rectangle.

This is why the black background shows through around the cut-out borders of *Im1*.

On the next try, I displayed the entire *Im2* first, then *Im1*, then the cropped part of *Im2*.

It worked!

### Final template:

Goal: To build collage from *Im1*, *Im2*, *Im3*, blending the images in areas where they overlap.

place each image in its own layer, with Im1 at the bottom, and Im3 on top.

position images so that they overlap,

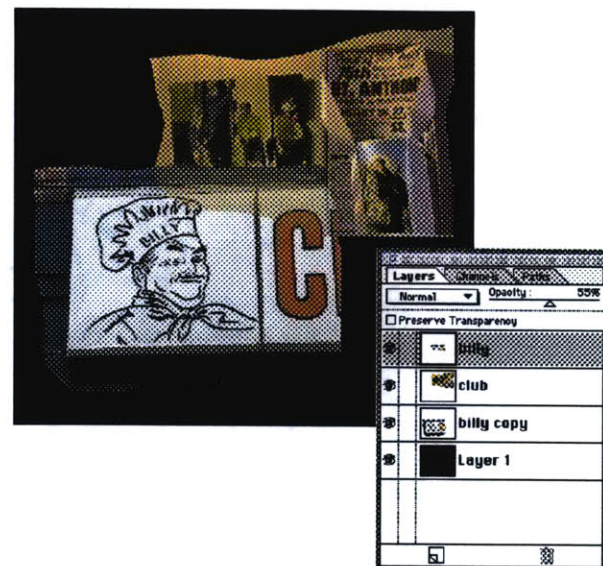
For *Im1* and *Im2*:

select the section of the image that overlays others;

copy the selection into a new image ;

display the new (cropped) image in its own layer above Im3;

set transparency of cropped image to a.



Now we have a collage that can be built by a computer program. However, this collage looks static, frozen, "premade".

Instead, it has to appear dynamic, to manifest its composite nature, to draw user's attention. It has to be choreographed.

### Step 3

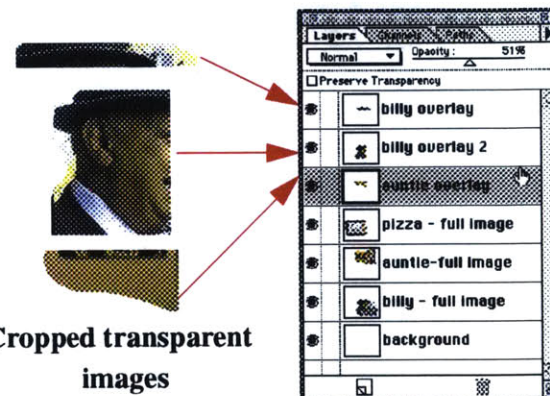
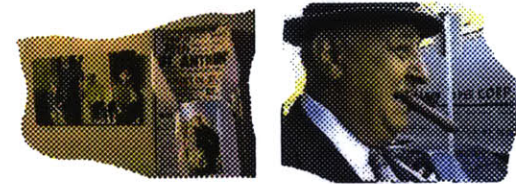
Let's define collage behavior: what happens when we choose a collage? How do we connect this still preview with the movie that will play next?

I have used Director to create a simple mock up of collage behavior. Director offers little in terms of image processing, but it is good for testing interactive ideas.

### *Animated Transitions*

I think of transitions in the North End interface as interactive cut. During such cut users' focus moves from one kind of presentation (collage) to another (digital movie). Let us step back to some lessons learned in the theory chapter.

### Final Template for Making Collages



Magic taught us that, to perform a trick well, you need to guide the attention of your audience.

Kuleshov's experiments in montage taught us that cut is a kind of a trick, a way to conjure meaning through montage.

Back to interactive transitions. What visual trick would make the experience work? I wanted to create an intuitive connection between the collage tree and movies. I had to make navigation rules clear. Finally (another lesson picked up from magicians) I had to convince my audience that their input does matter. To that end, I had to make the dynamic nature of collages transparent. Transitions had to show that

each collage is made from three independent pictures,

each picture represents a movie,

each collage represents a path,

when you select a path:

you see a short movie;

the story reacts to your choice by suggesting other paths you may take

you may stay on the current path or choose an alternative one.

### Transition 1:

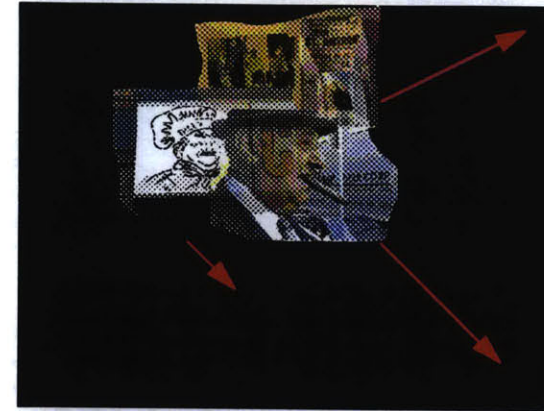
Trigger collage (either click or roll-over) —> it breaks down into three images  
—> two images move off the screen, while the last one moves to the center and becomes a movie.

There were two problems with this transition:

#### Problem 1

Key-frame, that represented the next movie was different from the first frame of the movie. This made psychological connection difficult, even though the cut-out moved to occupy the exact space where the movie would play. I decided to try using the first frame of the movie to represent it. This worked better: the cut-out would naturally "grow" into the opening shot.

I decided to annotate each clip with two still frames: one picked manually (better for a "teaser"); and the first frame of the clip (better for transitions).



A new rule for making collages in NEC database:

each clip  $X$  is represented in the database by two images: its first frame — $X_{in}$  and the frame picked in annotation — $X_{key}$ . If 3 images make up a collage, and Clip1 is the next one to play, it should be represented by Clip1\_in. The other images in the collage would be Clip2\_key, and Clip3\_key.



*KeyFrame*



*In Frame*

## **Problem 2**

Each collage is a preview of one playout, a "button" that lets you see three steps ahead. It is a single unit, even though it consists of three images. No matter what part of the collage you click on, only one image will turn into a movie, while two others will become a part of a new collage. This design confused the audience: they would click on Billy's face and see a movie about Kenny.

I needed to make this reasoning explicit, to show that the two keyframes in the collage refer to clips that would play second and third, respectively [if you choose to stay on this path]. Was there a conceptual bug in my reasoning I assumed that the users will know they are selecting a path.

In fact, for all they know, they are clicking on a collage.

Transitions had also to make clear that?

when you select a collage:

the first movie on the path plays,

the path becomes active.

### Transition 2:

each collage is made out of three independent pictures,  
each picture represents a movie,  
each collage represents a path,  
when you select a path:

you see a short movie;

you may stay on the current path  
or choose an alternative one;

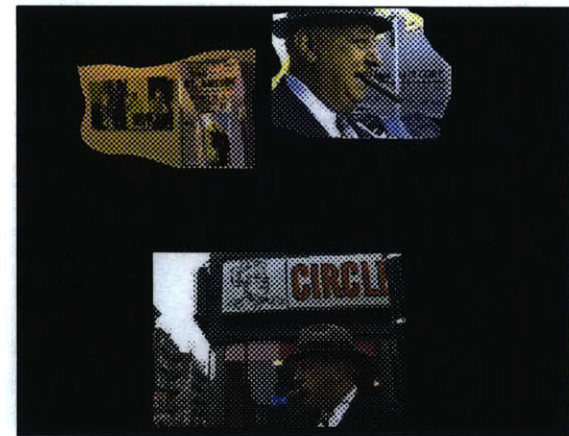
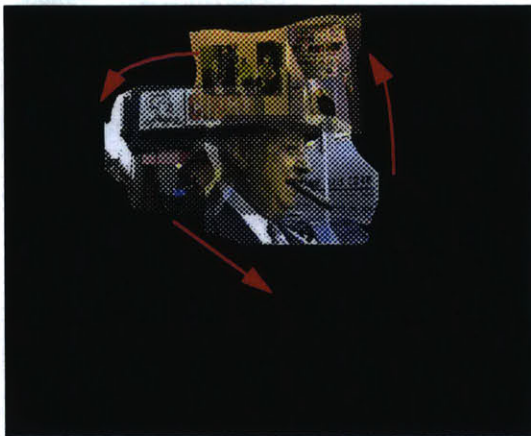
the story reacts to your choice  
by suggesting other paths

### Why doesn't this work?

Trigger collage (either click or roll-over) —> it breaks down into three images —> two images

move to the top of the screen and position themselves where their collage will appear, while the

last one moves to the center and becomes a movie.



While animated transitions were pretty much defined at this stage, I could only guess how many collages to put on the screen and where to position the movie. To decide this I had to know:

- a. how much processing does one collage require?
- b. where can the movie be placed? (This is not a small matter. Many programming environments cannot display movies and complex graphics together. For instance, an Inventor program built collages beautifully, but could not display a digital movie. To play a clip, I had to call an external application Movieplayer. Having done that, I could not tell Movieplayer: " Place the movie next to this image", since the graphics and video were controlled by two separate programs.)

These two questions could only be answered through building the dynamic program. Which meant it was time to choose a programming environment.

## *Choosing a Language*

Why couldn't I just use Director to design the entire experience?

Lingo (Director specific programming language) is not capable of sophisticated image processing . For once, collage tool requires a programming language that can build a new image by cropping a section of another one dynamically.

I wanted to create a flexible tool. The design should not be set in stone. The number of collages and their behavior has to be easy to change. An object-oriented language would be best for this task, since it would let me create a Collage class and then experiment with the number of objects on screen and their behavior.

Finally, I wanted North End Chronicles to play on multiple platforms. At the time everyone was talking about a new object-oriented programming language that could create sophisticated graphical interfaces on virtually all platforms. Moreover, it was best suited for building interactive experiences on the World Wide Web. No wonder I jumped in.



## Step 4. JAVA

### *Java 1: Collage class*

I created a class called Collage in Java, which would take names of 3 image files from the main program (or applet ) and implement the template from Step 2. That was a relatively straightforward task.

Visually, I had to experiment with two variables:

- how much should the images overlap?
- how transparent should the top image be?

It was remarkably easy to tweak these parameters in Java: I could pass various values in the HTML file, without having to recompile the program.

It seemed reasonable to make the size of the intersection proportionate to images. For instance, I could pass 1/3 as a value of the overlay, and the program would do the rest of calculations (how to position images, how to crop them, etc.). As a designer, I didn't have to deal with pixels and

screen coordinates. This made "tweaking" more natural and intuitive. When at first the system didn't seem to get the proportions right, I had to get back into programming gear and untangle the geometry that was to make my life as a designer easier. I know now what's it's like to have a split personality.

The following description may be helpful. It shows how cropped images were created based on the value of the overlay parameter.

### ***Blending Geometry***

Collage class receives **n** images (  $Im[n]$ ), and parameters to calculate overlap and transparency.

#### **Parameters passed and calculations:**

**n=3:**

$Im[3]$ . Each image is defined by x,y(absolute coordinates),width, height.

$Im[j] \sim (Im[j].x, Im[j].y, Im[j].w, Im[j].h)$ .

depth (%) — how much of  $Im[1]$  overlaps  $Im[0]$ :

**over** = (over.x, over.y) = (im[1].w\*depth/100, im[1].h\*deph/100)sh (%)

shift(%) —  $Im[2]$  relative to  $Im[1]$ :

**shift**=(shift.x, shift.y) =(over.x\*sh/100, over.y\*sh/100)

**alpha** - amount of transparency for overlapping areas.

Coordinates of Im[1], Im[2] relative to that of

Im[0]  
 $Im[1].x = Im[0].x + Im[0].w - over.x,$

$Im[1].y = Im[0].y + over.y - Im[1].h$

$Im[2].x = Im[1].x - shift.x,$

$Im[2].y = Im[2].y + Im[1].h - shift.y$

1. Crop C1 area of Im[1] and C2 & C3 areas of Im[2].

(Java **CropImageFilter** has to be passed coordinates C1,2 &3 relative to the image that is cropped.)

$C1 = \text{new Rectangle}(0, Im[1].h, over.x, (over.y - shift.y));$

$C2 = \text{new Rectangle}(0, 0, Im[2].w, shift.y);$

$C3 = \text{new Rectangle}(0, shift.y, (shift.x - over.x), (Im[0].h - over.y)).$

2. **CropImageFilter** creates cropped images.

3. Transparency Filter (an extension of Java **RGBImageFilter**)

sets transparency of cropped images to *alpha*.

4. Calculate absolute coordinates of cropped images:

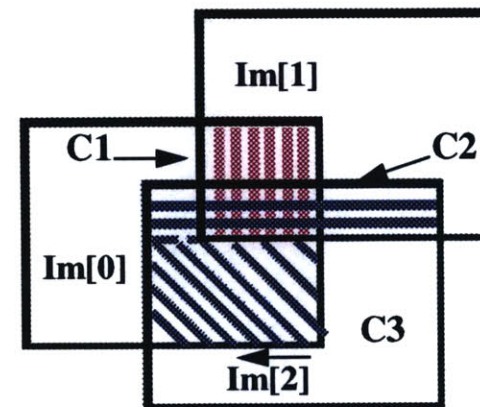
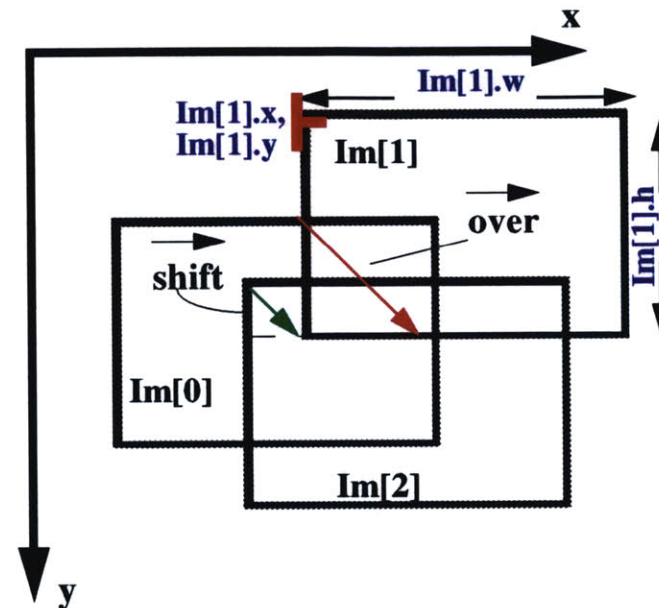
C1: Im[1].x, Im[0].y

C2: Im[2].x, Im[2].y

C3: Im[2].x, (Im[1].x + Im[1].h)

Display in following order: Im[0], Im[1], Im[2], C1, C2, C3.

### Blending Geometry



## ***Java 2: Collage Tree***

Collage Tree is a representation of user choices. The story engine generates a number of potential playouts, then lets the user decide between  $n$  playouts that are best (for the story).  $n$  is a number of collages, or branches on a collage tree, each branch a representation of one linear sequence of clips.

In *The North End Chronicles*, Collage Tree has three branches . My reasoning was that two collages would not give the user enough choices, while four occupied too much of the screen. With a 320x240 pix movie screen, three collages had just enough space to appear in the background, without overlapping each other.

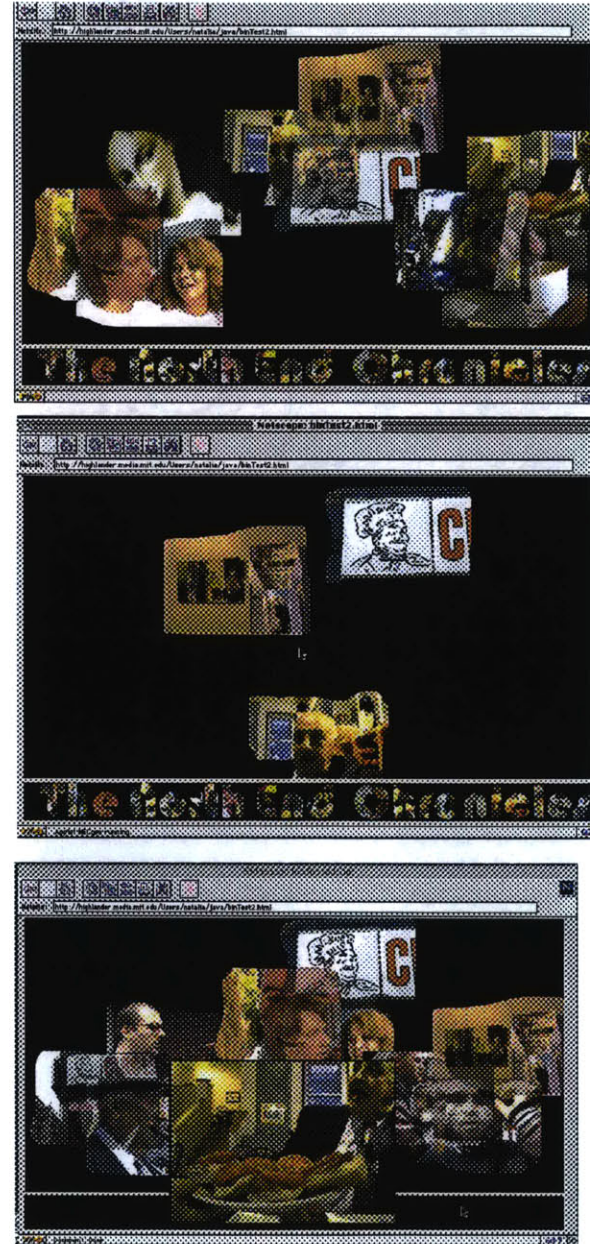
Of course, one could shrink images to make more collages fit the screen. However, I felt that, with images reduced to "thumbnails", dynamic collages would not have the impact I was looking for in *The North End Chronicles*. Collages had to add content to the movie, to enhance its effect on the viewer. Three collages formed a triangle, drawing attention to the center, where the movie would play.

Collage tool is designed so that the number of branches can be passed as a parameter in an HTML file.

### ***Java 3: Incorporating movies, animating transitions***

Only a few months ago, when Java was relatively new, it seemed that someone just had to come out with a way to play digital movies in an applet window. Three months into my project, I've given up all hope and chose to use a Netscape plug-in to play my movies. This fortunate decision led me to apply collage to other WWW presentations.

At first, using a plug-in seemed against the initial design. The plug-in required that I break the screen into two frames: one for collages, another for the movie. Since frames cannot be displayed on top of each other, I had to cut out a section of the screen 240 pixels high — half of an average screen, and more than a third of a rather large 800x600 monitor.



Luckily, Michael Murtaugh had developed a Netscape plug-in for Macintosh that positions the movie not inside but relative to the frame. The frame itself can be reduced to the minimum (size of a CD icon), while quicktime movie opens to the side, or above the frame.

### **Collage and the Story Engine**

I now had a tool that makes collages, and a method to transition between a movie clip and collage menu. In short, I had developed an organizing principle for an interactive experience. Now I had to connect this interface to a story engine.

In chapter I we defined a story engine as a "smart" database retrieval mechanism, that in response to user input creates a meaningful, story-like presentation using elements of a media bank.

Dynamic collage is only suitable for a particular kind of story engine — one that dynamically creates a tree of possible playouts and lets the user decide which direction to follow.

In the North End Chronicles, this engine is made up by three story filters. Each filter represents a narrative rule. The three rules are: to relate, to situate and to move the story forward. Each clip in

the database is described accordingly — themes relate one clip to others, bins focus on a particular character/situation, beats outline stages of the narrative.

### *Clip Annotations*

#### **Beats**

Beats represent the global story — a breakdown of dramatic action.

In the NEC beats are :

1. Enter the Italian neighborhood. It is full of stereotypes.
2. Meet some characters — they seem bigoted and strange.
3. Get a glimpse of the family life (strength of family values is to me the most striking and attractive feature of the North End).
4. Get someone's personal story — a conflict.
5. Get a more personal, sympathetic view of the same characters — they are tough and loyal, and very human.
6. On this note, leave the place (a bit of nostalgia).

Now, this is the kind of story I would be making if it was a linear movie. Does this imply that I am not taking a full advantage of the interactive form? Not at all. The North End story is special because it can be expressed in a multiplicity of ways. The richness of my experience would have been lost in a linear documentary. I would only use one story-line, probably Billy's, to communicate the action. The open form of a non-linear presentation allowed me capture the complexity of the neighborhood, where people on the street not only know each other but have most likely grown up on this very street, and chose not to move against the grain of our throwaway culture.

Currently, the beat filter allows three clips for most beats (introduction and conclusion need only one). This number may change in later tests. For now this means that the story should play out in 14 clips. The filter acts as a sieve, which gets rid of all clips that do not belong in the current beat.

## **Bins**

Each clip belongs to a number of bins. A bin groups all clips that are about a particular character or situation. The bin filter makes sure that if you have picked a particular character or place, you can follow their story. This filter keeps track of the bins you have activated, marking them as



prominent. Bins shift in prominence. If you picked *Josie's bin*, she is likely to appear in the next collage tree. However, if you do not pick her again, her bin will "fade away", while your new choices will activate, for instance, *Circle Pizza*.

The action of the NEC will not work if you do not get emotionally attached to some person or place. The goal of bin filter is to situate the story, to make sure you remain in the company of familiar characters. From clips that can play next, it takes only the ones that belong to a prominent bin. But we do not want one bin to generate all three playouts. The system adds variety by:

- a. making *Billy's bin* always active (the rule is, "when in doubt, use Billy");
- b. making a **bin "sandwich"**: in a collage, placing a clip from a new bin between two clips from the prominent bin.

This "sandwich", or bridging technique, uses the theme filter.

## Themes

Themes are abstract, usually one-word concepts associated with each clip. For instance, "nostalgia" or "tomatoes" are themes that appear in a few clips. North End dialect adds some variety to these annotations. For instance, "tomatoes" in one clip refers to women, while in the other they

are on Billy's sandwich.

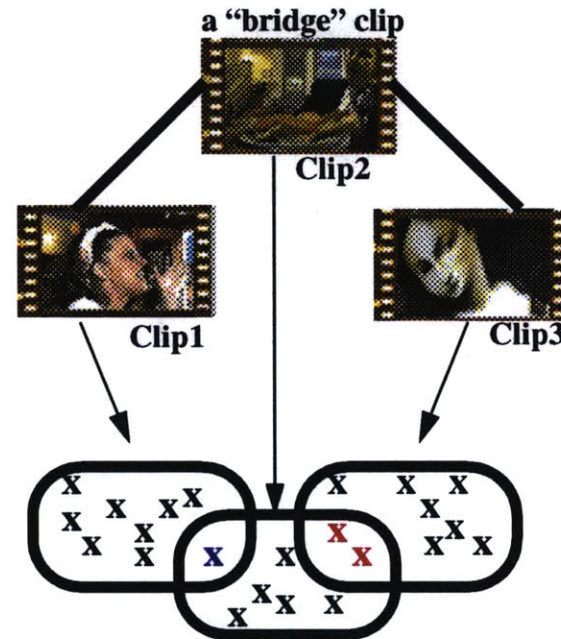
In the Foundations chapter I have described the *Elastic Boston* project, in which the story engine uses themes to create a continuous playout. This is a very elegant idea, but it would not do in a story that requires closure. (Mike finds closure boring. I think "rambling" stories are boring. Some say tomato...)

However, in documentary editing a thematic connection often saves the story.

This is something I can only claim from personal experience. In a short I made a few years ago, there was just no way to go from a telephone conversation to a soccer game, except that on the phone my character talked about his dog. And in the soccer field footage I found a completely irrelevant shot of children playing with a puppy. This turned out to be a strong transition.

I chose to use themes to push the story forward. In the alternative collages, the first and third clip are found by beat and bin filters. Then the theme filter looks for a "bridge" clip — one that can make a transition from clip 1 to clip 3. It searches for a clip that would have at least one theme in common with both Clip 1 and 3. This rules works in the North End moviebase, because people's lives in it are truly intertwined. And, if no clip can serve as a bridge, the system defaults to using a movie from Billy's bin that belongs to the current beat.

This particular story engine is still in development. The hybrid form of the NEC allows me to experiment without taking it "off-line". It is important to realize that this is merely a way I chose to structure this story. My hope is that other authors will shape their interactive stories in radically different form — and might still find dynamic collage an effective interface.



**themes associated with clips**

**X- themes Clip 2 & 3  
have in common**

**X- themes Clip 2 & 1  
have in common**

## III THE WEB

Finally, I could show *The Chronicles* by typing in a URL in Netscape. The first reactions surprised me. A typical response was: "Good to see something different on the Web." I did not, at first, recognize, that dynamic collage may be especially suited for the internet. WWW for me was just a way to distribute the movie. Then I realized that my early audience (many web-designers themselves) reacted to dynamic collage as a *tool*. From that perspective, it was applied to the right environment. In the world of sophisticated computer graphics, 3D visualizations offer mind-blowing ways to navigate through data. Collage had little to offer there. On the democratic Web, however, it presented a feasible alternative to lists and imagemaps.

One business-minded user cut short my talk about "seamless transitions" and "narrative guidance" by pointing to collages on the screen: "So basically, this is a menu?"— "Well, yes... it is a way to condense and preview movie-pages that you can see next..."—"It's a *menu*," the sponsor repeated, then paused: "I like it."

I would roughly divide menus on the Web into two categories: effective and enticing. The most

effective menu I know is a dynamic list generated by a search engine. These menus are created “on the fly” -- and, therefore, can accommodate the most uncommon query . They are effective because:

designers don't have to foresee every possible version of such menu;

users take part in building a menu, and, therefore, feel comfortable using it.

By enticing menus I mean imagemaps that may take hours to design (and slightly less to download). An initial encounter with such beautiful pages is exhilarating. Ensuing interaction is usually frustrating. It is not clear where to click, and what for. Besides, since designing such pages is a very arduous task, designers can only create a limited number of beautiful maps. We can't expect these page to reflect our unique experience on the web site.

As a menu, collages offer both efficiency and an attractive look. The mechanism can organize visually and build dynamic previews for any number of HTML pages. The only condition is that these pages contain, or may be represented by, images.

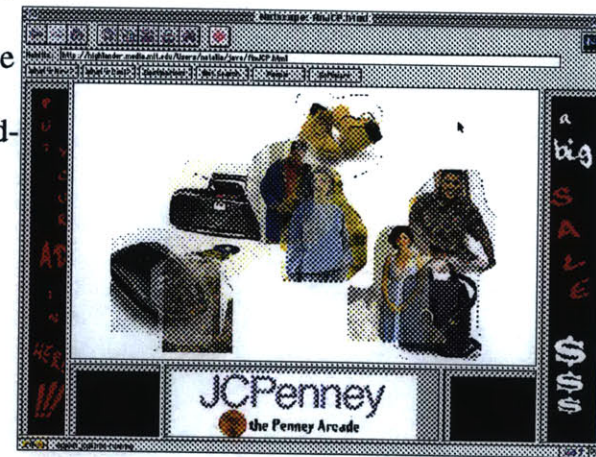
Here is an example of such application — an on-line catalog.

## ***"Just Browsing"***

J.C.Penney sells everything from laptops to underwear. In the real world, it is represented by huge department stores, that dwarf the rest of the mall. In the virtual world, it could turn into any number of personal stores — students in September, newlyweds on honeymoon, yuppies on the move. J.C.Penney spends millions on customer profiles and marketing. No matter how good this data is, it's lost on traditional mail-order shopping: one could not print and send out a special catalog for every customer type. On-line publishing, however, is ideal for such a purpose.

Shopping on-line at J.C.Penney requires a lot of imagination. You go through a number of levels: from the most general ("pick a department") to the most specific ("what size polo shirt?"). Towards the end, you get a glimpse of what you might be choosing — thumbnail images of merchandise. The final page, one for each product, contains a larger picture and ordering information.

This is a mock-up of the same catalogue using dynamic collage:



The retrieval mechanism here mimics that of J.C.Penney on-line: from most general (e.g. Housewares/Outdoors/Clothing) to more specific (Clothing breaks down into Men's/Women's/Kid's, etc.).

There is nothing remarkable about this branching approach: it is inflexible and impersonal. Still, even this dry presentation comes to life, when turned into a visual experience — the interface reminds one of window-shopping or browsing in a store.

Buttons and lists demand choices. They make us eager to move to the next level, to get to the point. Choosing pictures is a less conscious process— an image lingers in your memory, a model's face makes you pause, a combination of colors strikes you as something your mother might like. Why are you here in the first place? Oh yes, that shirt! but look at the brown bag — is it really on sale?...

I believe that in consumer advertising such visual browsing is universally better than branching lists:

- if you are in a rush, and know exactly what kind and size of shirt you want, going down the

directory tree is an ultimate waste of time. You should be able to type in your request and get out of there.

- if you are looking for something less specific, word-based lists will get you nowhere. Shopping in this case should be a kind of bricolage, a creative process of shuffling options in mind, imagining the way something would look on, picking colors and shapes.

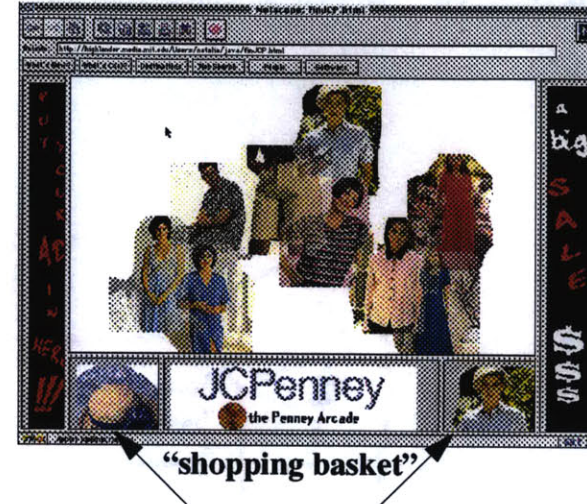
Visual interface offers a language for such bricolage. However, without a good retrieval mechanism this experience will soon become boring or frustrating. Instead of simulating the real store, with its generic breakdown into numerous departments, virtual shopping should be personal. The interface should turn into a brilliant sales clerk, who is using every bit of information “to figure out” his customer and make sure she doesn’t leave without a purchase. Even in the world of sneakers and ties, retrieval mechanism has to make a compelling "story".

### ***Shopping Basket***

The collage tree in J.C.Penney is structured in triplets, just like the North End interface. There is, however, one important addition: a shopping basket. A separate frame at the bottom of the screen stores information about a shopper's progress.



While going through various selections, a customer may "drop" a specific image into the basket (clicking does the trick). From the basket one can go directly into the price page (or, perhaps, a virtual dressing room). The shopping basket is only a place holder. It suggests a space to be filled out later by a specific advertising approach.



## WWW and Menus

Every day some new technology becomes available to web developers. But, no matter how different it looked only a year ago, the Web is still predominantly a vehicle for hypertext publishing.

Technologies are rarely used at first to their full potential. At the outset, film was seen as a way to record plays, and TV shows imitated variety. It is hardly surprising then, that on the Web today we look for *Slate* only to print it out and take it to a coffee shop.

The irony lies in the fact that the internet is touted today as a journey, a *landscape* to cross, a

world to *explore*. I base this chapter on an assumption that this is what we want — a world that may be crossed in any number of ways, but also has rules, history, organization, and is capable of presenting more than just a random combination of data. Traveling in such world should be like crossing a continuous landscape, not jumping from stone to stone in a dangerous stream.

“A world” may seem too heavy a metaphor. We could think of the Web as an interface to an infinitely large database. The argument remains the same — we need topology, an overview, a look-ahead, a way to conceptualize the experience. I prefer “world,” because this term is true to the spontaneous way in which pages become part of the WWW, to the diverse nature of these pages and to reasons why people choose to access this database.

But there are benefits to thinking about WWW as a database. For once, it lets us define the problem in familiar terms: a database needs a story engine and an interface to organize user interaction.

Let us look briefly at how this database is organized:

- Each cluster of pages is designed as an individual directory, and it is rarely connected to the

rest of the Web.

- Most of these fiefdoms are structured as static hierarchies. They offer either a set of independent, equally relevant pages, or several directory levels (a tree). Hypertext invites branching— and on the Web it still seems at times the only option beyond linear authoring.
- Users' entire experience is never presented in a coherent meaningful way. It's as if there are no resting points to contemplate the past and the future, no top-of-the-mountain view of the crossed distance. Frankly, if it was a real journey, I don't see any compelling reason for leaving the house. Obvious things that a smart traveler would bring along — maps, cameras, journals, a picnic basket — have no substitutes in Web travel. It is hardly surprising, then, that for most of us the internet is one big library, an extensive database to query in a most straightforward way.

There cannot be a quick solution to this problem — the Island of Manhattan cannot acquire the numbered transparency of New York blocks overnight. However, we can improve the web experience today by doing what pioneers usually do — make maps.

One could argue that there are plenty of maps already. Many individual sites boast a very elabo-

rate representation of their structure. But these Tables of Content are *premade*, they are examples of static design. Web journey is inherently personal, and it should be represented in a personal way. User responses should trigger a dynamic design mechanism that would immediately provide a new personalized preview of what's to come and update the history of one's journey.

Once again we could apply the formalist criteria: what is the unique feature that sets Web travel apart from other explorations? Information here structures itself in response to our input, so that at every step the world around us reconfigures itself. This dynamic nature is the essence of the Web, its *material*. So what we need, once again, is a way to organize it.

I have already mentioned search engines as an example of effective menus. They are probably the most popular feature of the internet. Much loathed for their inability to produce a concise "intelligent" response to a simple query, they are still the first stop on most netscapades. These engines are way ahead of the Web, and not only because *they do make money*. The true strength of these pages is that they are a powerful example of dynamic design on the Web. This design, of course, is nothing but primitive: a YAHOO-generated screen is hardly more attractive or readable than your average library search.

What's so remarkable about a search engine?

- it allows users to interact dynamically with the Web as one bank of data
- it builds dynamically a preview of potentially interesting sites
- it creates a map to which one can return for directions

I suggest that an organizing principle for interaction with the WWW should incorporate dynamic previews and interactive maps.

### ***Tools for Now: Frames and Java***

Dynamic mapping became possible when frames were introduced in Netscape. Frames allow to structure user's experience: for instance, a menu bar can be made into a separate page, which would stay on the screen while we explore the web site. Since frames can communicate with each other, a selection in one window will load a new document in the other. This simple technology makes dynamic mapping possible, but it is still very expensive from a design point of view. In fact, the only way to change the menu window would be to load a new HTML page designed in advance. This means that every interactive possibility needs a corresponding HTML page!

It was only with the advent of Java, that dynamic mapping became (in theory at least) an easy and efficient approach to web design. Now, when a "table of contents" frame receives an update from the "main" window, it does not have to load a new HTML page to reflect the status of the experience. Instead, the applet in the TOC frame will change the representation dynamically, without having to go to another page, or reload another graphic. This makes it relatively easy to create dynamic representations of an individual directory structure or to overview one's entire web experience.

I have not yet seen many dynamic maps on the web. Certainly, Java is still very new and not very predictable. Developers complain about security issues and instability of Beta browsers. The benefit of being a multi-platform language often turns into a disappointment: every platform seems to have its own bugs in the way it implements Java. Still, it is clear that we now have a simple infrastructure to build dynamic guidance mechanisms for the Web. It is time for "content providers" to come up with original ways to use this opportunity.

## *Mapping the Web*

Dynamic collage is an efficient mechanism to create dynamic overviews of a WWW experience.

By efficient I mean that this tool

- is relatively cheap for developers:

They only have to design the initial page layout , which would also determine how images get accessed, and what, if any, preprocessing should be done on them. The bottom line is that any images can be blended without any modifications. This is a particularly important issue for open databases. For instance, a search engine could use a thumbnail image of each page to represent query results as a collage tree. Provided the pages are visual, this would be a far better preview than excerpts of text, which search engines currently use.

- is relatively cheap for users:

Collages do not use any complex 3D effects, or elaborate animation. Of course, an average modem may still take a long time to download images, and an average computer may take some time to blend them. But the result is a look-ahead several levels

deep —and this prevents users from downloading a series of pages they have no interest in seeing.

- deals well with delay:

Collage works in the background of the "main" presentation. For instance, when the choice is made in the "preview" frame, the main window absorbs user attention, while the new images are loading up. Users don't have to stare at the blank screen until the new collage tree appears — rather, they watch clips or look at articles in the main frame.



## **IV** FUTURE WORK

*The North End Chronicles* interface is meant to evoke a sense of walking down the street — a melange of faces and storefronts, voices and honking cars. In J.C.Penney catalog, collages remind one of browsing in a store, picking and dropping and trying on. In both cases collage refers to a familiar experience, while offering an extensible, re-configurable reality of its own.

I feel very strongly that this interface idea works only when it can trigger in users a feeling of vague recognition and in this way lure them into the story. This experience is about discovering through images and associations, defining in a process. It is somewhat similar to bricolage — a term that since Levi-Strauss came to define a particular kind of creative thinking.

### **Limitations**

I would not suggest using collages for any direct search — looking for a specific article or quote, trying to find out the weather in Boston, etc. And even though collages may be built with type, I believe that other design decisions work better with text-based presentations. Collage was designed as an organizing principle for a visual exploration -- and it should stay (for now) in the

realm of intuitive, image-based browsing, where the process of choosing may be as valuable as the result itself.

It may seem that I am drawing a sharp divide between quick, direct search and visual, relaxed browsing. I have made this distinction before, in the J.C. Penney catalog, and now repeat it in a more general form: dynamic collages are not for fast database search. Could it be that dynamic collages are useless for most data retrieval problems? But isn't "a picture worth a thousand words"?

In an ideal world, I would side with the proverb. Unfortunately, my research is audience and time specific. I am interested in an efficient tool, that may improve tomorrow but has to work today. Dynamic collages may become very useful in quick browsing, once the bandwidth restrictions fall off and images can travel momentarily over the internet. For now however, they are not for the impatient.

## **In The Near Future**

Now that we know our limits, let us turn to the countless data banks that would welcome visual browsing. Here are some ways to improve and extend collage interface, so it is more intuitive, and more fun.

## **Enhancing Collages**

### *Phonomontage*

Sound can contribute immensely to the immersive quality of an interactive presentation. Audio does not require much memory and can be accessed momentarily. There are two ways in which dynamic collages may be enhanced with sound:

a number of audio clips may be associated with transitions between elements. For instance, I would like to link a short (ca. 5-7 sec) audio introduction to every clip in the NEC database. When you pick a clip, this introduction would play first, while new collages are loading. The North End interface could also use a few "neighborhood" sounds: the afternoon din at a café, knives being sharpened at a meat market, crowds at a feast...

These sounds would play when no clips are active — which is at least one-third of the overall play time (more, if users take long to make their choices).

audio clips can merge in a montage of their own. The Speech Interfaces group at the Media Lab has developed a technique for blending sound bytes dynamically. This method could be easily combined with the dynamic collage tool to create an audio-visual preview of user options. I have not yet tried using the two kinds of collages together. My fear is that such phono/photo-montage may create a total cacophony, a confusion of sound and image. It seemed that at this initial stage of implementation, collage would rather benefit from something clear, easily understood. Still, undoubtedly, in the hands of a good designer these tools should complement each other and create a powerful immersive experience.

### *Souvenirs*

In the J.C.Penney experiment I have added a "shopping-basket" feature to the collage interface. Shoppers would "drop" images of interest into the basket, while collages take them further into the catalog. You could click on individual images in the basket to get the price or wait till later to

"try them on", or even print out the "wish list".

The concept of the basket is important: it makes collages less ephemeral, allowing direct access to important elements, a quick review of favorite choices. In its essence, the shopping basket is a visual memento of your experience, a souvenir from your journey.

There are many ways to develop this idea. In some applications the basket could turn into a toolbox for future bricolage. Or, if users wish to be more passive, a collage of their favorite images could arrive as a virtual postcard. This souvenir device offers a multitude of ways to make one's experience more tangible and personal.

The two additional features described above emerged in the context of concrete projects: North End interface begs for sound, while shopping at J.C. Penney seems silly without an ability to store what you like. Both improvements may become permanent features of the collage tool, but they had to be inspired by a specific subject matter. There should be many more ways to enhance collages. They will emerge when the tool is applied to new content.

## **New Content**

In the near future, I hope to implement dynamic collage interface for

- a virtual museum;
- an interactive newscast.

### ***Museum Walk***

Dynamic collage may be a perfect tool for browsing through a fine arts database. Most of the virtual museums seem to focus on individual elements in a collection. They may offer a variety of ways to arrive at a painting, or to connect it to others. Still, designers assume that you want to contemplate a painting or a sculpture on its own screen. In addition, the screen may have pointers to other artwork, tiny thumbnails of what you may see next. Looking at such presentation, I miss the reverie of a museum walk: images blending into each other, mind growing numb, oversated — and still somehow able to follow a particular brush stroke, to zoom in on a striking face. You may not know half of the artists names and miss a whole lot of other valuable data -- but you will grasp the intuitive connection between Monet and Seurat, Cezanne and Van Gogh.

As a child, I was always dumbfounded by Kandinski's work. The fact was, I have only seen a few of his paintings, always hanging alone in a huge space, and entitled *Composition 10* or some other number. My perception of this artist has changed completely when I went to an exhibit of his work, where, in one room, you could see his first almost naive paintings, next to the complex abstraction of his later days. Having gone through this gallery, I would not remember a single title or date of a painting. Still, much more was accomplished -- I have become really attached to the artist. This is, I believe, the best result any museum may hope for.

Understandably, most "virtual galleries" have taken a rational encyclopedic approach — and lost something that makes trips to real galleries a truly inspiring, unique experience.

Collage interface may bring back this reverie and still take the full advantage of the magic that random access gives to a digital gallery. From an educational standpoint, a walk approach to a fine arts database has to be highly effective. Imagine a family going on a tour of the Louvre: a girl who adores *The Three Musketeers*, her grown up brother, who is reading Foucault at college, and parents who loved *The Name of the Rose*. Based on this scant information, our story engine creates a number of interweaving dynamic paths —making them overlap at times, just as we lose and

then run into our companions on a museum tour. By the end of this adventure, our family should have some attachment to the Louvre, and perhaps a common interest in Western art. They may even get a poster as a *souvenir* — a melange of all their favorite paintings in one large collage.

### ***Interactive Newscast***

I pick up the Sunday *Times* and look quickly through pictures and headlines, to get a sense of what's important today. Having flipped through an issue once, I remember it as a medley of stories and facts. I have not read the articles yet — but already have a sense of current affairs.

Why not appeal to this experience in a browser? Let you "flip" through collage, marking an article for later reading, or diving into it right away?

Headlines and images could make a transition into a number of media elements. — text, sound, movies. You could build your own collage by marking articles of interest — and use this "bookmark" later, when you have time to read the stories. You could send the "clipping" to a friend— a visual agenda for your next discussion, or simply a reminder to read the paper.



A news browser may suggest a way to incorporate text into collage interface. So far, I have heard conflicting views on the subject. Some users find text-free interface more intuitive, while others feel lost without words. My guess is that database content should determine whether collages would benefit from text.

There are many ways to improve dynamic collage. The tool was designed so that other authors would alter and extend it.

## ***CONCLUSION***

As far as Dynamic Collage is concerned, the Future Work chapter would be a better ending. I have only built a tool. Now is the time to apply and extend it.

In the process of building this tool I have developed some opinions. The challenge now is to apply them to the *real* world.

### **Opinions**

#### ***on Interactive Movies***

Just like any other traditional form of expression, interactive presentation requires an author. The author of an interactive movie is not only a filmmaker, but a *designer* of interaction. Crafting interaction requires as much creative thought as editing the footage. An interactive author should structure interaction in a way that writers hone sentences, or sculptors carve stone.

#### ***on the Web***

The World Wide Web needs dynamic maps. Kinematograph added a sense of time to still pictures. The result was cinema. Dynamic maps will add a sense of time and space to the Web, and turn it into something else. Whatever the result, this may be the next step in our exploration of internet's potential.

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