Artificial Intelligence Project—SRI and MIT Computation Center

Memo 57--

某种指示和建议

by Timothy P. Huet

October 23, 1963
MACRO Definitions for LISP

by Timothy F. Hart

In LISP 1.5 special forms are used for three logically separate purposes: a) to reach the alist, b) to allow functions to have an indefinite number of arguments, and c) to keep arguments from being evaluated.

New LISP interpreters can easily satisfy need (a) by making the alist a SPECIAL-type or APVAL-type entity. Uses (b) and (c) can be replaced by incorporating a MACRO instruction expander in define. I am proposing such an expander.

1. The property list of a macro instruction will have the indicator MACRO followed by a function of one argument, a form beginning with the macro's name, and whose value will replace the original form in all function definitions.


3. define will be modified to make macro expansions.

Examples:

1. The existing FIXPR csetq may be replaced by the macro definition:

MACRO ((
(CSETQ (LAMBDA (FORM) (LIST (QUOTE CSET) (LIST (QUOTE QUOTE) (CADR FORM)))
(CADDR FORM)))))

))
2. A new macro `stash` will generate the form found frequently in `PROG's:

```lisp
x := cons(form;x)
```

using the macro `stash`, one might write instead of the above:

```
(STASH FORM X).
```

`stash` may be defined by:

```
MACRO ((
 (STASH (LAMBDA (FORM))(LIST (QUOTE SETQ))(CADAR FORM))(LIST (CONS (CADR FORM)
 (CADAR FORM)))) ))
)
```

3. New macros may be defined in terms of old. `enter` is a macro for adding a new entry to the table (dotted pairs) stored as the value of a program variable.

```lisp
enter[form] MACRO = (LIST-STASH;LIST-CONE;CADR[form];CADDR[form]);

CADDR[form])
```

Incidentally, use of macros will alleviate the present difficulty resulting from the 90 LISP compiler's only knowing about those `fexpr` in existence at its birth.

The macro defining function `macro[1]` is easily defined:

```lisp
macro[1] MACRO deflist[1;MACRO]
```

The new `define` is a little harder:

```lisp
define[1] deflist[mdef[1];EXPR]
mdef[1] = [
  atom[1] => 1;
  eq[car[1];QUOTE] => 1;
  member[car[1];(LAMBDA LABEL PROG)] =>
  cons[car[1];cons[cadr[1];mdef[caddr[1]]]);
```
get(car[1]; MACRO) \rightarrow \text{ndef}[get(car[1]; MACRO)]

[1]].

T \rightarrow \text{mbplst}[1; \lambda[[j]; \text{ndef}[car[j]]]]

4. The macro for \text{select} illustrates the use of macros as a means
of allowing functions of an arbitrary number of arguments:

\text{select}:[\text{form}; \text{MACRO}; \text{null}];
\text{list}[[\text{list}[\lambda]; \text{mbplst}]; \text{cons}[\text{COND};
\text{mbplst}[[\text{cdr}[\text{form}]; \text{null}];
[\text{null}; \text{cdr}[1]] \rightarrow \text{list}[T; \text{car}[1]];
T \rightarrow \text{list}[[\text{EQ}; \lambda; \text{car}[1]; \text{cdr}[1]]]]]]]
]]]; \text{cdr}[\text{form}]]; \text{gensym}[]]
CS-TR Scanning Project
Document Control Form

Report # 1M - 57

Each of the following should be identified by a checkmark:
Originating Department:
☑ Artificial Intelligence Laboratory (AI)
☐ Laboratory for Computer Science (LCS)

Document Type:
☐ Technical Report (TR) ☑ Technical Memo (TM)
☐ Other: ______________________

Document Information

Number of pages: \(4(8-\text{images})\)
Not to include DOD forms, printer instructions, etc... original pages only.

Intended to be printed as:
☑ Single-sided or
☐ Double-sided

Originals are:
☑ Single-sided or
☐ Double-sided

Print type:
☐ Typewriter ☐ Offset Press ☐ Laser Print
☑ InkJet Printer ☐ Unknown ☑ Other: Poor copy of mimeograph

Check each if included with document:
☐ DOD Form ☐ Funding Agent Form ☐ Cover Page
☐ Spine ☐ Printers Notes ☐ Photo negatives
☐ Other: ______________________

Page Data:

Blank Pages (by page number): ______________________

Photographs/Tonal Material (by page number): ______________________

Other (note description/page number):

<table>
<thead>
<tr>
<th>Description</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image Map! (1-4)</td>
<td>UN# 85</td>
</tr>
<tr>
<td>(5-8) Scan Control</td>
<td>1195-195</td>
</tr>
</tbody>
</table>

Scanning Agent Signoff:

Date Received: 11/30/95 Date Scanned: 12/1/95 Date Returned: 1/7/95

Scanning Agent Signature: Michael J. Cook

Rev 9/94 DSA/CS Document Control Form cat#form_v00d
Scanning Agent Identification Target

Scanning of this document was supported in part by the Corporation for National Research Initiatives, using funds from the Advanced Research Projects Agency of the United States Government under Grant: MDA972-92-J1029.

The scanning agent for this project was the Document Services department of the M.I.T Libraries. Technical support for this project was also provided by the M.I.T. Laboratory for Computer Sciences.