VISION FLASH 44

A PACKAGE OF LISP FUNCTIONS FOR MAKING MOVIES AND DEMOS

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Abstract

A collection of functions have been written to allow LISP users to record display calls in a disk file. This file can be UREAD into a small LISP to reproduce the display effects of the program without doing the required computations. Such a file can be regarded as a 'movie' or 'demo' file and can easily be used with the KODAK movie camera to produce a hard copy.

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Vision flashes are informal papers intended for internal use.

This memo is located in TJ6-able form on file VIS;VF44 >.

1.0 GENERAL DESCRIPTION

The file MMOVIE > DSK: VIS; contains a collection of LISP functions that are useful for producing 'movie' or 'demo' files. This memo assumes the reader is familiar with the programming language LISP.

A movie file is a sequence of S-expressions that is UREAD into a fresh LISP and duplicates the display effects generated by some program without actually doing the computations that generated the display. Each movie file begins with four special S-expressions. The first turns off the console teletype while the movie file is being read and executed. The second S-expression supplies a default value for the movie speed, if the user has not already given one (See Section 9.0). The third S-expression supplies a default value for the movie switch, if the user has not already given one (See Section 10.0). The fourth S-expression defines a function MWAIT that is used internally in the movie file to insert pauses or expose frames of film in the computer-controlled movie camera (see AI Memo 194).

In order to produce a movie file, it is necessary to replace all of the relevant display functions in LISP with new FEXPRs that do the following:

1) Write a copy of the display function with its arguments evaluated onto a previously opened disk file

2) Apply the normal display function to the arguments and return to the user its value.

The display functions altered by the movie package are: DISAPOINT, LISBLINK, DISCHANGE, DISCOPY, DISCREATE, DISCUSS, DISFRAME, DISFLUSH, DISGOBBLE, DISGORGE, DISINI, DISLOCATE, DISMARK, DISMOTION, DISPLAY, DISET.

The functions DISLIST and DISCRIBE are not changed by the movie package since they obtain data about the state of the display and cannot affect what appears on the screen.

The user's program cannot distinguish the altered display functions from the 'old' functions. A record of calls to each display functions is automatically compiled on a disk file. The old functions can be restored when the movie file is completed.

If the user desires, the movie package can also keep track of the amount of compute time spent between display calls. If this amount of time exceeds a threshold, *MCUTOFF, then a SLEEP command having the following form will be inserted in the movie file:

(SLEEP (TIMES *MSPEED elapsed-time))

where elapsed-time is the amount of cpu time in seconds.

*MSPEED is a global variable that can be defined by the user before the movie file is read in. It should be set equal to a number that represents the scaling of the time axis. If the user does not define *MSPEED, the movie file will set it to a default value of 1.0 Setting *MSPEED to zero will cause the movie file to be executed without any pauses. The SLEEPS are still in

the file, however, and take up space. To produce a file without any SLEEPs, one can disable the timing feature of the movie package by setting *MCUTOFF to a very large value, e.g. 1.0E6. Unless changed, *MCUTOFF is normally set to .1 which yields good results for most applications. Setting *MCUTOFF to smaller values will tend to clutter the movie file with unnecessary SLEEPs. In the worst case, there will be one SLEEP S-expressions for each display function call.

WARNING: Movie files can become very long if the user program generates many small vectors (as in circles for instance). The function DISFUN has been included in the movie package to attempt to alleviate this problem. DISFUN allows the user to define some of his functions as 'display functions'. This will cause their definition to be inserted in the movie file, and any subsequent calls to those functions will be inserted in the movie file, just as with LISP's display functions. Any display functions that occur inside them will be executed without adding anything to the movie file. The only danger is this: The user must be sure that any functions called by his DISFUNed functions are included in the movie file, or in the version of LISP into which the movie file is read. There is no checking done by DISFUN to make sure this condition is satisified.

The functions contained in the movie package are:

MUWRITE

MUFILE

*MEDIT

*MPAUSE

DISFUN

UN-DISFUN

REM-MOVIE

Some relevant variables used by the movie package are:

*MSPEED

*MCUTOFF

MOVIE-SWITCH

The rest of this memo will describe these functions in detail.

2.0 (MUWRITE name1 name2)

This function will enable the movie feature by doing the following:

1) A movie file is opened on device 'name1' in the directory given by 'name2'. If name1 and name2 ares omitted, the movie file will be opened on LISP's current output device i.e., the device last referenced by a UREAD or UWRITE, or set by evaluating (CRUNIT device user). The arguments to MUWRITE are handled similarly to the arguments to a normal UWRITE.

2) All the relevant display functions will be replaced by FEXPRs that write out a copy of the function with its arguments onto the opened file. All arguments will be evaluated. If the function is an FEXPR or an FSUBR, then the arguments will be quoted before being written into the movie file.

3) The atom READY will be returned when all of the above have been completed.

For example,

(MUWRITE DSK JBL)

will open a movie file on JBL's disk directory and replace LISP's display functions with the proper new FEXPRs.

Each movie file is begun with 4 standard S-expressions. They are:

(IOC W) ;turn off teletype

```
(SETQ *MSPEED ;set *MSPEED to 1.0, if undefined
  (COND ((ERRSET *MSPEED NIL) *MSPEED)
        (T 1.0)))
(SETQ MOVIE-SWITCH ;set MOVIE-SWITCH to NIL, if
undefined
  (COND ((ERRSET MOVIE-SWITCH NIL) MOVIE-SWITCH)
        (T NIL)))
(DEFUN MWAIT (MTIME)
       (COND (MOVIE-SWITCH (DISFRAME (FIX (+$ 0.5
(TIMES *MSPEED MTIME 24.0)))))
             (T (SLEEP (TIMES *MSPEED MTIME)))))
```

3.0 (MUFILE name1 name2)

This function will close a previously opened movie file and give it the name specified by 'name1 name2'. If the file names are omitted, the movie file will be closed as 'MOVIE >. The last S-expression inserted into the movie file will be (IOC V) to turn the teletype back on.

In addition, all of LISP's display functions will be restored to their normal condition. The function will return the atom CANNED to signify that the movie file has been terminated.

4.0 (*MEDIT expression)

The function *MEDIT is a FEXPR which allows a user to insert arbitrary S-expressions into the currently open movie file.

Some examples:

(*MEDIT (COMMENT THIS IS THE CIRCLE ROUTINE))

will insert a comment into the movie file. This is often useful if a long movie file is going to be examined at some later time.

(*MEDIT (SLEEP 10.0))

will insert a sleep command into the movie file, causing the display to 'freeze' for 10. seconds. After inserting the S-expression in the movie file, *MEDIT will return the atom 'PROCEED'.

5.0 (*MPAUSE time)

Essentially, this function is a special form of *MEDIT. It inserts a function into the movie file that will cause either a pause of 'time' seconds (if MOVIE-SWITCH is NIL) or an exposure of 'time' seconds of movie film (if MOVIE-SWITCH is T). The frame rate is assumed to be 24. frames per second.

6.0 (DISFUN (funlist))

This function is used to tell the movie package to treat

one of the user's functions as if it were a LISP display primitive. Its argument should be a list of functions, e.g.

(DISFUN (DCIRCLE DCROSS))

Two operations will be performed for each function:

1) A copy of the function's definition will be inserted into the movie file.

2) The function will be replaced by a FEXPR that evaluates the arguments and writes a copy of the function call into the movie file. Any LISP display primitives inside the DISFUNed function are unchanged.

It is the user's responsibility to ensure that DISFUNed functions do not call other user functions that may not be included in the movie file. No checking is done for this condition, so beware. It may be necessary to insert various utility function definitions into the movie file via *MEDIT.

7.0 (UNDISFUN (funlist))

This function undoes the effects of DISFUN. Its argument is a list of functions to be removed from special treatment by the movie package. The definitions of these functions will be restored to their original state. If the movie file is closed by issuing a MUFILE command, any functions that have been DISFUNed will automatically be restored to their original condition. Thus, UNDISFUN is only necessary if the user changes his mind about a

function in the middle of creating a movie file.

8.0 (REM-MOVIE)

This function will cause all traces of the movie package to disappear from LISP. It takes no arguments.

9.0 The variables *MCUTOFF and *MSPEED

*MCUTOFF is a variable defined inside the movie package that judges whether the amount of time between display calls is long enough to be worthy of inserting a call to MWAIT into the movie file. If the amount of compute time exceeds *MCUTOFF seconds, then a call to MWAIT is inserted. *MCUTOFF is set to .1 seconds unless changed by the user.

If *MCUTOFF is set to a very large value, then no calls to MWAIT will ever be added to the movie file.

*MSPEED is a variable that is used when the movie file is 'played' by LISP. If it has a value when the movie file is read into LISP, then that value is used to stretch or dilate the time scale of the movie. If no value exists for *MSPEED, then the movie file will set it to 1.0

10.0 The variable MOVIE-SWITCH

MOVIE-SWITCH is a variable that can be set to T or NIL. When MOVIE-SWITCH is NIL, the movie file will execute the function MWAIT as a SLEEP. When MOVIE-SWITCH is T, the function MWAIT will expose a number of frames of movie film equal in time-duration to the length of the SLEEP. This means that a movie file that is run with MOVIE-SWITCH set to NIL will be an accurate representation of how the exposed record on film will appear. When a movie file is read into LISP, MOVIE-SWITCH is given the value NIL unless the user SETQs it to T before loading the movie file.

11.0 SOME EXAMPLES

The following is a sample LISP dialogue and the resulting movie file. The lines typed by the user are preceded by a '>>'.

```
:LISP

LISP229CG
ALLOC? N

>> (UREAD MMOVIE > DSK VIS)
(DSK VIS)
>> ^W ^Q (IOC V) ;read in MMOVIE package
T

>> (MUWRITE DSK JBL)  ;open a movie file on my
                       ;disk directory
READY
>> (DISINI)
PDP6 SLAVE GRABBED

0.
>> (*MEDIT  (COMMENT THIS IS A TEST))
PROCEED
>> (SETQ ITEM (DISCREATE 512. 512.))
1.
```

```
>> (DISALINE ITEM 512. 512.)
T
>> (*MPAUSE 3.0) ;WAIT FOR 3 SECONDS
PROCEED
>> (DISMOTION ITEM -1 -1 0)  ;move item via space
                             ;war console
(143. 178.)
>> (DISLIST)
(1.)
>> (MUFILE MOVIE TEST)
CANNED
```

Here is the movie file that was produced. Note that all function arguments have been evaluated.

```
(IOC W)
(SETQ *MSPEED (COND ((ERRSET *MSPEED NIL) *MSPEED) (T 1.0)))
(SETQ MOVIE-SWITCH (COND ((ERRSET MOVIE-SWITCH NIL) MOVIE-SWITCH)
(T NIL)))
(DEFUN MWAIT (MTIME) ;DEFINE DISFRAME-SLEEP FUNCTION
       (COND
        (MOVIE-SWITCH (DISFRAME (FIX (+$ 0.5
                                         (TIMES *MSPEED
                                                MTIME
```

```
                                                        24.0)))))
        (T (SLEEP (FLOAT (TIMES *MSPEED MTIME))))))
(DISINI)
(MWAIT .2)
(COMMENT THIS IS A TEST)
(DISCREATE 512. 512.)
(DISALINE 1. 512. 512.)
(MWAIT 3.)
(DISLOCATE 1 143. 178.)
(IOC V)
```