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PROJECT MAC

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Time-Sharing LISP for the PDP-6

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This Memo. written in the style and convention of A.I. Memo. No. 116A, may be considered an addendum thereto. It should prove to be a welcome updating on the LISP system.

Allocator

In the Time-Sharing version, the allocator asks "CORE?" instead of "MEMTOP?". The response should be the number of 2000-word blocks of memory desired, although the allocator will force this number to be at least 20, so that MEMTOP is at least 37777. See CORE below.

CLENGTH SUBR

(CLENGTH n) is same as calling CLENGTH with n in accumulator C. Returns a non-LISP number. See "Plotter" below.

CORE SUBR

In TS LISP, (CORE n) will attempt to set the program's CORE allocation to n 2000-word blocks, but in no case will it make a re-allocation which leaves less than one block of Binary Program space (Bin. Prog. Spc. occupies the higher addresses of the program). Thus if one needs more Bin. Prog. Spc. he may call CORE (thereby extending the program's MEMTOP) and set BPEND appropriately. If there is

not enough memory available to make an increased allocation, no change is made and NIL is returned; otherwise CORE returns as value the current CORE allocation.

Current I/O Device

LISP has bookkeeping room for one input file, opened by UREAD, and one output file, opened by UWRITE. There is an internal register herein called current device name, that remembers which auxilliary storage device contains the newly opened file, and this register may be changed by optional arguments to UREAD, UWRITE and UKILL. An open read file is closed by reading an E-O-F character, and an open write file is closed by executing a UFILE (q.v.).

DESCR LSUBR

Part of the PicPac package (see below). If there is an argument, its value is assumed to be an array name and DESCR (for "describe") produces a list of ten numbers, associated with the array: (xdim ydim lowx lowy dx dy hash vd light data) where the last three numbers give information about the vidisector used, the lighting, and the mode of the data. Numbers three through six are in floating point, and "hash" is irrelevant. xdim and ydim

are the x and y dimension (see PICARRAY). If there is no argument given, the array described is the one which the most recent call to READPIC read from. The array stored on tape which serves as the data source for the call to READPIC will in general have a description different from that of the array in core. (DESCR NIL) is NIL so that (DESCR (READPIC arr lowx lowy delta)) produces either a description or NIL depending on whether or not the read was successful. (See READPIC).

DESCRX LSUBR

Same as DESCR except that numbers three through six are converted to fixed point, assuming a grid of 10000 by 10000.

FIX1A SYM

(PUSHJ P FIX1A), as a LAP instruction, converts the fixed-point machine number in 1 into a LISP fixed-point number.

FIX2 SYM

(PUSHJ P FIX2) as a LAP instruction, converts the floating-point machine number in 1 into a LISP fixed-point

number.

FIXP SUBR

A predicate, non-NIL only for S-expressions which are fixed-point numbers.

FLOAT SYM

(PUSHJ P FLOAT) as a LAP instruction, converts the fixed-point machine number in 1 into a floating-point machine number. In EXPR's to float a fixed-point LISP number, do (PLUS number 0.0).

FLOATP SUBR

A predicate, non-NIL only for S-expressions which are floating-point numbers.

IMPX SUBR

Reads the input multiplexor channel specified by its argument. (See MPX).

IPL SUBR

Opens the plotter and initializes it for plotting display lists. Returns NIL if the plotter is busy and T otherwise.

LPEN SUBR

Has no arguments. Reads the 340 light pen scanner and returns (count . (x . y)) where count is the number of times the light pen was seen (since the last call to LPEN or since the program's beginning) and x and y are the average abscissa and ordinate values of the light pen when seen.

MAX LSUBR

Returns the (numerical) maximum of any number of arguments using contagious floating arithmetic. Thus (MAX 12 4.0) is 10.0.

MEMBER SUBR

If (MEMBER x l) is not NIL then it returns l' where (EQUAL x (CAR l')) holds and l' is some tail of l; i.e. there is an l" such that l is (NCONC l" l').

MIN LSUBR

As above for MAX, but returns the minimum.

MPX SUBR

(MPX T) opens up the multiplexor I/O Device for subsequent D/A and A/D use. (MPX NIL) closes it.

NEXTPLOT SUBR

Moves the plotter paper to a clean section. To be used after a call to PLOTLIST (q.v.).

NVID SUBR

Reads the new video processor and returns a floating-point number (with an information content of ten bits) which is an inverse linear measure of the light intensity at the selected vidisector point. (The manual switch located on the video processor should be in the "LIN" position when NVID is used. Use NVFIX when it is in the "LOG" position). The two arguments are respectively abscissa and ordinate values for the image dissector, and must be fixed-point. Returns -1.0 for the dim or dark cutoff condition.

NVFIX SUBR

As above for NVID, but is essentially a logrithmic measure of intensity, scaled between 1 and 1777. Returns a fixed point number. (NVFIX and NVID will differ at most in the

three least significant bits depending on the state of the "LIN-LOG" switch. See NVID). Return 0 for the dim or dark cutoff condition.

NVSET SUBR

Used to set certain programmable conditions for the new video processor The arguments are in order:

filter - three bits (0 - 7) to designate the presence or absence of the color filters over the lens.

confidence - should be 0,1,2, or 3. Determines the speed and accuracy of the video processor, 0 being the slowest but most accurate.

resolution - the number of equally-spaced lines over the field of view - maximum of 40000. (Actually, the video processor always dissects the scene onto a 20000 by 20000 grid. This merely provides a scale factor for the arguments to NVID and NVFIX). For many reasons 1000 to 10000 is an extraordinarily good range for this argument.

dim - should be in the range 0 - 17 inclusive. Selects one of sixteen dim cut off levels. See a hacker for more elucidation.

xyz - Zero means the video processor receives its input from the new ITT vidisector (TVC); non-zero means the signal comes from the old ITT vidisector (TVB).

NIL may be used for any of the above arguments, in which case the specified condition is not changed. Initially all conditions are 0 except resolution, which is 2000. Returns

the value of the device status register.

PICARRAY FSUBR

Declares an image array for use with PicPac. Its use is exactly the same as the function ARRAY: its arguments are respectively:

the array name
NIL
the x dimension (or number of rows)
the y dimension (or number of columns)

The array elements are accessed as usual - (arrayname n m) evaluating to the n,mth entry in the array.

PicPac

In an effort to utilize taped vidisector scenes, several functions for performing the necessary I/O have been added to LISP. (See PICARRAY, READPIC and WRITEPIC). There are obvious advantages for the debugging programmer to having standard, well-described scenes available, as it were, through a simulated vidisector. Before using the routines, however, one must become aware of the image conventions of PicPac. Images (or scenes) are considered to be rectangular sub-portions of a unit square, and hence image co-ordinates are floating-point numbers between 0.0 and

1.0. This facilitates the mapping of an image space onto various I/O devices. Needless to say, some discretized approximation to the image is what is actually stored on tape, so that the co-ordinates mentioned in READPIC really refer to the nearest lattice point in the image space recorded on tape. Once an array has been read in, however, there is no further use of image space co-ordinates except for the description produced by DESCR. Reference to the array is done as usual on ordinary LISP arrays. The PicPac system will be maintained by Larry Krakauer, Room 819, 545 Technology Square.

PLOT SUBR

(PLOT n) is the same as calling PLOTC with n in accumulator C. (See A.I. Memo. No. 125). If n = 0 or 200 and the plotter is not open after the command has been executed, then NIL is returned.

PLOTLIST SUBR

If the argument is an array name, the contents of the array are plotted as they would be displayed on the 340 scope. (See "Display - See also NEXTPLOT).

Plotter

The CALCOMP plotter is available as an output device for LISP. In addition to the PLOTLIST feature and PLOT described above, |P causes LISP output to be plotted (in character mode) and |U turns off this output. Before using it as such, it is advisable to execute a sequence of commands such as (PLOT 31 (PLOT 10 (PLOT 22))) in order to make the results more legible.

READ LSUBR

Reads one S-expression from the current input device (see "Input-Output" and "Current I/O Device"). Takes 0 or 1 arguments. If character is read and no argument given, teletype-input is re-selected; otherwise on reading E-O-F a non-printing error is caused and the value of the argument is returned as the value of the most recent ERRSET.

Numbers are atoms differentiated as seen by their form. Floating point numbers follow exactly the same format described in the LISP 1.5 Programmer's Manual and should not contain non-decimal digits. 0,1, ... ,8,9,A,B, ... ,Z are used as the first 36 digits, so that IBASE may reasonably be any number from 1 to 36. inclusive. Let a and b be any string of the above digits. There are four forms for unsigned fixed point numbers:

"a" is interpreted as an integer base IBASE

"a." is interpreted as an integer base 10.
"a↑b" is a*(IBASE exp b)
"a←b" is a*(2 exp b)

A fixed point number is thus an unsigned fixed-point number preceeded by an optional "+" or "-" sign; but if digits higher than 9 appear in the number, the preceding sign is obligatory. (Hence any atom whose first character is "+" or "-" is a number, except the single-character atoms "+" and "-" themselves). (The remainder of the comments under READ, beginning "Typing a rubout...", in A.I. Memo. No. 116A page 18, still apply).

READPIC FSUBR

Reads into the array specified by the first argument (which must have been declared by PICARRAY), receiving data from the device and file selected by the most recent UREAD. The second and third arguments specify lower-left x- and y-co-ordinates respectively; the fourth argument is a delta d such that adjacent entries in the array are filled by incrementing the image co-ordinates by an amount d. (See PicPac for an elucidation of image space co-ordinates). An

alternative form is to specify separate deltas for the x and y directions: (READPIC array lowx lowy d) or (READIC array lowx lowy dx dy). The coordinates of the upper-right point of the image area read in are given by upx = lowx + xdim*dx and upy = lowy + ydim*dy, where xdim and ydim are the x-and-y dimensions respectively of "array". All arguments except "array" are assumed to be floating, in accord with the PicPac convention; however fixed-point numbers may be used; it will be assumed that they refer to a 10000 by 10000 grid and they will be floated accordingly. If a section of the requested input area, i.e., the rectangle from (lowx,lowy) to (upx,upy), is not recorded on the input file, then READPIC prints an error comment and returns NIL; otherwise it returns the name "array".

RUNTIME SUBR

For time-sharing LISP, returns the number of microseconds of CPU time used by the current job, as a fixed-point LISP number, accurate to about 50 microseconds.

SPOP SUBR

(SPOP) restores the most recent batch of special pdl bindings. This is the way an EXPR calls SPECSTR (q.v).

SPUSH LSUBR

(SPUSH atom V atom V ...) saves up the current values of the atoms atom ... atom on the special pdl and for each one performs in effect (SETQ atom V). This is the way an EXPR can call SPRCBIND (q.v).

SLEEP SUBR

(SLEEP n) causes the program to stop temporarily and take a nap for n thirtieths of a second.

SMALLNUM SUBR

Is non-NIL only if its argument is a small-number, which is represented as a pointer equal to number + 1.

TIME SUBR

For time-sharing LISP, returns the time counter from the TS system, as a fixed point LISP number. Currently, this is the number of thirtieths of a second that the system has been running. There may soon be a feature to read the date and a real time, as accurately as possible. Note that in TS LISP there is no SETTIME.

UREAD FSUBR

Takes two or three arguments. The first two are file names, the first of which must be @ if the file has only one name. Typing |Q or evaluating (IOC |Q) changes LISP's input from teletype to the current auxilliary storage device and file as specified by the last UREAD. If UREAD has a third argument, it updates the current device name as follows: If it is non-numeric, then it may by UT1, UT2, UT3 or UT4 for Dectape and DD0, DD1, DD2, etc. for disk. If it is numeric then only the last character of the current device is changed. Initially, UT0 is current; thus before switching input a UREAD should be evaluated with third argument, for example, UT2. See "Current I/O Device". Returns the current device name.

UWRITE FSUBR

Selects an auxilliary storage device and opens an output file on it under the name .LISP. OUTPUT. If there is no argument, the current device is selected. Otherwise the current device is updated in the manner described under UREAD and then selected. Returns current device name. If there are no more free files on it, prints the error message "TAPE FULL". See "Current I/O Device."

UFILE FSUBR

Closes the current output file and changes its name to that specified by the two arguments to UFILE. Returns the current device name unless the file failed, in which case it returns NIL

UKILL FSUBR

Flushes the current I/O device (q.v.). In time-sharing LISP, this makes sense only if the current device is a DECtape - random results may occur if one tries to flush a disc. If there is an argument, the current device is updated in the manner described under UREAD and then flushed. Returns the name of the device flushed.

VIDI SUBR

Takes two fixed-point arguments. Returns a fixed-point number which is an inverse linear measure of intensity on the old ITT vidisector (TVB) at the point specified by the two arguments, using the old video processor which is slaved to the 340 scope display.

VIDLOG SUBR

Uses VIDI. Returns a logrithmic measure of intensity as a fixed-point number between 0 and 400.

WR760 SUBR

Outputs to the 760. See J. Holloway for more information.

WRITEPIC FSUBR

(WRITEPIC array) writes out on the currently open output device the entire array specified by the argument (in binary image mode). In general, WRITEPIC is preceded by a UWRITE and followed by a UFILE.