

## MICROPOLIS USERS GROUP

MUG Newsletter # 3 - October 1980

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### SYSTEMATION'S ASSEMBLY LANGUAGE SORT

SORT/A, a recent release of Systemation (PO Box 75, Richton Park, IL 60471 (312)481-2420), is an assembly language routine that is accessed by Micropolis' Assembly Language Function statement. The cost is \$75. No particular knowledge of either the Function statement or assembly language is needed to use the routine. SORT/A is 1000-words long and must be loaded in either a non-contiguous part of memory, or, by using the MEMEND statement, in the last part of contiguous memory. Those of you with a 1K RAM as part of your operating system's PROM/ROM/RAM board may be able to use the RAM for SORT/A. I say 'maybe', because my System-B Vector Graphic still uses a few words of the system (non-contiguous) RAM even when in Micropolis control. I therefore had to use a MEMEND. I understand that different versions of the System-B leave the RAM free.

SORT/A allows you to sort any array-type allowed by Micropolis; strings, integer numbers, or real numbers. You can sort in ascending or descending sequence, can specify that a parallel array be sorted in concert with the prime array, and can specify that data input as lower or mixed case be sorted as though it were all upper case.

### BASIC QUICKSORT PREVIOUSLY USED

Listing 1 shows a BASIC quicksort routine that I had been using. Quicksort, listed from lines 200 to 365, was adapted from "BASIC and the Personal Computer", written by Dwyer & Critchfield, published by Addison-Wesley. The data that I sorted was not strictly random. It was a 1000-record portion of a mailing file I maintain, containing several hundred unique ZIP codes. The file is in alphabetic-by-last-name order when input to the sort. For mailing, the user requires ZIP order mailing labels.

The input section of the program is relatively unimportant for our present purpose of investigating sort times. It is necessary for accessing the data I wished to test with, but you can use a random number generator for investigation if you don't want to wait for the disk access times. For my test, I put a 5-character string representation of the ZIP code in the Z\$-array, and an integer number representation of the ZIP's file location in the Z-array. My data is packed at two logical records per Micropolis physical record and is fixed length. I know that the ZIPs always start at location 72 and 197 of each physical record.

```

Title: QUICKSORT    MUG Sort Tests

5      ! QUICKSORT 09/15/80
6      !
7      ! INITIALIZATION SECTION
8      !
10     SIZES(3,2,15)
15     DIM S(60,2),W$(250)
20     INPUT "PRESS 'RETURN' TO STAR
T INPUT";R$

100    !
105    ! INPUT SECTION
110    !
115    OPEN 1 "1:TESTCASE"
120    DIM Z$(1000,5),Z(1000)
125    I=0
130    FOR K=1 TO RECPUT(1)-1
135        GET 1 W$
140        I=I+1
145        Z$(I)=MID$(W$,72,5)
150        Z(I)=I
155        I=I+1
160        Z$(I)=MID$(W$,197,5)
165        Z(I)=I
170    NEXT K
175    PRINT "INPUT";I;"RECORDS"
180    CLOSE 1
185    PRINT "NOTE TIME REQUIRED FOR
INPUT"
190    INPUT "PRESS 'RETURN' TO STAR
T SORT";R$

200    !
205    ! SORT SECTION
210    !
215    P=1
220    S(P,1)=1
225    S(P,2)=I
230    > IF P<0 GOTO 370
235    L=S(P,1)
240    H=S(P,2)
245    P=P-1
250    > IF H<L GOTO 230
255    A=L
260    B=H
265    S=-1
270    > IF A>=B GOTO 340
275    IF Z$(A)<=Z$(B) GOTO 315
280    F$=Z$(A)
285    Z$(A)=Z$(B)
290    Z$(B)=F$
295    F=Z(A)
300    Z(A)=Z(B)
305    Z(B)=F
310    S=-S
315    > IF S<0 GOTO 330
320    B=B-1
325    GOTO 335
330    > A=A+1
335    > GOTO 270
340    > IF A+1>=H GOTO 360

```

```

Title: QUICKSORT    MUG Sort Tests

345    P=P+1
350    S(P,1)=A+1
355    S(P,2)=H
360    > H=A-1
365    GOTO 250
370    > PRINT "SORT COMPLETE FOR";I;"
ZIPS"
375    PRINT "NOTE TIME FOR SORT"
380    END

```

```

Title: SORT/A      MUG Sort Tests

5      ! SORT/A 09/15/80
6      !
7      ! INITIALIZATION SECTION
8      !
10     IF PEEK(16R0500)=79 GOTO 30
15     LOAD "SORT/A.FC"
20     DEF FAA=16RFC00
25     GOTO 45
30     > MEMEND 16RDBFF
35     LOAD "SORT/A.DC"
40     DEF FAA=16RDC00
45     > SIZES(3,2,15)
50     DIM W$(250)
55     PRINT "SET-UP COMPLETE"
60     INPUT "PRESS 'RETURN' TO STAR
T INPUT";R$

100    !
105    ! INPUT SECTION
110    !
115    OPEN 1 "1:TESTCASE"
120    DIM Z$(1000,5),Z(1000)
125    I=0
130    FOR K=1 TO RECPUT(1)-1
135        GET 1 W$
140        I=I+1
145        Z$(I)=MID$(W$,72,5)
150        Z(I)=I
155        I=I+1
160        Z$(I)=MID$(W$,197,5)
165        Z(I)=I
170    NEXT K
175    PRINT "INPUT";I;"RECORDS"
180    CLOSE 1
185    PRINT "NOTE TIME REQUIRED FOR
INPUT"
190    INPUT "PRESS 'RETURN' TO STAR
T SORT";R$

200    !
205    ! SORT SECTION
210    !
215    A=FAA("Z$ Z")
220    IF A<>0 PRINT "SORT ERROR":ST
OP
230    PRINT "NOTE TIME FOR SORT"
235    END

```

Only the Z\$-array is sorted, but if an interchange is made, then the corresponding interchange is made in the Z-array. When the sort is complete, the Z\$-array is in ZIP code order, but more importantly, the Z-array is a sequence of record numbers in the proper order for accessing the total file in ZIP code order. You can now print your current file in ZIP order, or create a new file with all records in ZIP order, or save the Z-array as a separate file which can be recalled for subsequent use.

#### EASY TO IMPLEMENT - AND FAST

To run SORT/A, the program requires modification in the initialization and the sort sections, which are shown in listing 2. The input section doesn't change. Not too surprisingly, SORT/A requires some 800 words less of contiguous memory than Quicksort. Removal of the Quicksort code and the doubly dimensioned S-array provide this savings. You have used 1000 words for the assembly language sort routine, however, so the net savings are nil.

In listing 2, lines 15 and 20 are required for a system having some non-contiguous memory, or lines 30, 35, and 40 if you use the end of your contiguous memory. Nine different load modules are supplied so you can place SORT/A at the end of any 4K boundary from 32K to 64K. Line 215 is all you need to do to execute the sort. In this case, I selected only the prime sort on Z\$, with parallel movement of the contents of Z. The program defaults to an ascending sequence sort of 'as is' strings. As discussed last month, line 10 determines whether the program is running on the SOL or the VG.

The results, on a 4MH Z80 Vector Graphic, are:

```

QSORT  698.4 seconds
SORT/A   4.6 seconds

```

Amazing. SORT/A is not twice as fast, not ten times as fast, but is 151 times as fast as QSORT. Do I love it? You bet.

#### GREAT! BUT UNSTABLE

The results of both SORT/A and quicksort are unstable. That is, the contents of the sorted file which are exclusive of the sort key are not in the same order as the input file. Specifically, the input file was in alphabetic order by last name. The sorted file is NOT in alphabetic order by last name within each ZIP category.

One way to make either of these sorts produce a stable file is to append something on the ZIP (sort key) to force the desired order. One could use a section of the name field, or, as I did, use the input record sequence number, which, of course, preserves the alphabetical order of a file which is already in alphabetical order. In my data, this number is contained in the last four characters of the logical record of the disk data. I edited the following lines to read:

```

120 DIM Z$(1000,9),Z(1000): ! TO HOLD EXPANDED DATA
145 Z$(I)=MID$(W$,72,5)+MID$(W$,122,4)
160 Z$(I)=MID$(W$,197,5)+MID$(W$,247,4)

```

You realize that this appended data is essentially the same number as 'I'. Don't try to append 'I', however. The statement

```
Z$(I)=MID$(W$,72,5)+STR$(I)
```

will not produce a stable sort. STR\$(I) will convert 'I's of '2' and '19' to "blank,2,blank" and "blank,1,9,blank". Since comparison is done on a character by character basis, the text representation of '19' is smaller than that of '2'; '101' is smaller yet, and '1000' is the smallest of the four. Within groupings of the same number of digits, everything works as expected. Whenever the digit length changes, however, the sort goes unstable. Using 'I', these sorts are made stable by stating:

```
B$=MID$(STR$(I),2,LEN(STR$(B))-2)
IF LEN(B$)<4 B$=REPEAT$("0",4-LEN(B$))+B$
Z$(I)=MID$(W$,72,5)+B$
```

We know the maximum record number will be 4 characters (1000) and that conversion by the STR\$ statement returns a leading and trailing blank space. The first statement gets rid of the blanks. The second statement right justifies the number in a 4-character field and left fills, if less than 4 characters, with zeros. The above mentioned 'blank,2,blank' and 'blank,1,9,blank' now read '0,0,0,2' and '0,0,1,9', which will cause the sort to be stable.

#### RESULTS DEPEND ON INPUT DATA

At any rate, running the modified program produced sort times of:

```
QSORT 515.5 seconds
SORT/A 6.8 seconds
```

Strange, now SORT/A is only 76 times faster. What's really strange is that QSORT ran appreciably faster when sorting a longer text string. I'm not going to attempt to explain it (because I don't know). Sorting is a mysterious art, whose results depend on the input data. Some sorts are good on truly random data, terrible on nearly ordered data. This result may be a characteristic of quicksorts combined with my particular data, or I may have made an error in translation of the algorithm. As far as end results are concerned, it does work properly, though.

For the record, if one is going to use the second method, then the Z-array is redundant and all references to it can be removed. Line 215 would then read A=FAA("Z\$").

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FOR FURTHER INFO -  
SORTS AND MORE

The reference cited for quicksort, "BASIC and the Personal Computer" is a good addition to one's library. In addition to sorting, there is material on word processing, graphics, data bases, and simulations, as well as information on games and a general introduction to BASIC. All material is introductory in nature, but is applicable to

real situations. For further study of sorting, you may wish to look at Creative Computing's "Sorting, Shuffling and File Structures" mini-book. I got my copy as part of a new subscription offer. Whether it's available for separate purchase is unknown.

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#### HARD DISKS: WORTH WAITING FOR

According to Micropolis' Bob Woytovick and Bob Rauch, the hard disk (Micropolis prefers the term 'rigid disk') is indeed being produced. The production rate is currently 10 to 15 drives a day. The majority of these drives are going to OEMs for inclusion in 'value-added' systems. Full production is expected by early 1981.

The system is being produced in three major configurations.

Model	Construction	Capacity, Megabytes		Price
		Formatted	Unformatted	
1261-1	single platter	6	9	\$5700
1262-1	double platter	18	27	\$6000
1263-1	triple platter	30	45	\$6300

The formatting is 256 bytes/sector, 40 sectors/track, 580 tracks per surface, or 6 megabytes per surface. As you can see from the specifications, one platter is single sided, all others are double sided, so capacity is calculated as

((# of platters X 2 sides) - 1) X 6 megabytes.

You can also see that if you're going to buy a rigid disk, you might as well buy the big one. For 10% increases in price you can double and triple your capacity.

The units are available in either desktop or rackmount configurations for a variety of voltages. The prices include an S-100 IDA (Intelligent Disk Adapter) board, a multi-user, multi-tasking operating system named OSM (written in 8080 code), a bunch of utility programs, a BASIC interpreter, and all cables. Other units are available without cabinets, power supplies, etc., for lower prices.

So, for \$6300 you can plug it all in and have both the rigid and floppy disks operational. Your present BASIC software will work but, if you access MDOS parameters and routines, your assembly language programs will need modification. Most of your current purchased applications software won't work because it uses MDOS.

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#### SECOND SOURCING, ALMOST

Vector Graphics is also developing a system that produces the desired configuration of Micropolis hard and floppy disks. They are producing their own operating system and interface hardware to accomplish it. Whether the system will be available as an add-on module for 'old' VGs or other S-100 systems is unknown, but I'll continue to investigate. VG's operating system is based on CP/M, though, so there may be problems in converting your present Micropolis-

formatted files. VG can be considered a second source only if you're just interested in the hardware.

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#### MICROPOLIS NEWS

After the long wait, the Micropolis News was released. Contrary to their belief, it wasn't particularly worth waiting for. I'm not saying that the ads aren't wanted or that the auto-execute isn't useful. It doesn't, however, take a year and a half to put that information together. If you didn't get your copy, write Jim Molenda, Micropolis Corporation, 21329 Nordhoff St., Chatsworth CA, 91311.

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#### S/W FOR MICROPOLIS

The following items were mentioned, at least in part, in the Micropolis News. Since the authors took the time to inform me of their existence, I'd like to mention them again. I am attempting the compilation of a total directory of S/W. When sending notice of S/W, please indicate whether the program requires any particular configuration, eg; memory mapped video, 130 char/line printer, etc. If it is configurable to various systems, say so.

#### PROPERTY ANALYSIS & DATA BASE MANAGEMENT

First, here are two programs written by member Joe Castaldo, of Investment Analysis Systems, PO Box 282, Palos Verdes Est., CA 90274, (213) 375-7784. Both programs require a 48K, S-100 (Vector MZ) system, with Micropolis drives, and a CRT with cursor controls. They will run on either Micropolis BASIC or CP/M with CBASIC2. Each program is \$125, plus \$2 shipping, or \$3 for brochure and sample printouts. Joe will also consider trading his S/W for something you have written.

Property Analysis System (PAS) analyses the effects of nine years worth of financing, expenses, depreciation, taxes, and inflation for both residential and income property. Produces a three-page report. All data is modifiable with effects immediately displayed for review, allowing the user to model a property and ask "what if". Capacity of 20 properties per disk, with full file management capabilities. Five programs and 60-page manual.

Infomedia System (IMS) is a menu driven data base and file management system plus report writer. Capacity of 20 files, 999 records, 20 data formats, 20 report formats per disk; and 24 fields per record. Fields may be specified as mathematical functions of other fields. All format and field definitions are listed in the system directory.

File Functions: Create, delete, duplicate, add/modify, list.

Record Functions: Add, update, delete, scan, list, sort, compact, duplicate.

Report Functions: Create, delete, add/modify, list, print. User selectable column or label format, titles, fields, subtotals, total, and printing of selectable records.

#### DISASSEMBLER, DATA BASE & PROPERTY MANAGEMENT

Member Dave Culbertson, of Custom Electronics Inc., 238 Exchange St., Chicopee, MA 01013 (413) 592-4761 also offers three Micropolis programs.

Listing Disassembler converts 8080/8085 code from memory to an assembly source file compatible with MDOS LINEEDIT. Although each file can contain only 176 opcodes, successive disassemblies coupled with LINEEDIT APPENDS will produce any size file. Relocatable from 16R2B00 to 16RF500. Cost is \$50 for either a program listing for MOD-I systems, or a MOD-II disk containing the programs.

Custom Electronics is now the exclusive distributor for the CCA Data Management System, selling for \$150 (MOD-II, Ver. 4.0). CCA DMS is a menu driven set of programs which allow the definition of 24 fields per record and has five operational modes.

File Definition Functions: Create, delete, list all file names, list particular file information.

File Maintenance Functions: Add, delete (flag), update, inspect, scan.

Report Generation Functions: Print all, print minus flagged, print flagged. User designated field selection, order. Auto titling & pagination, subtotals and total. Also mailing labels.

File Compacting: Removes flagged records, with or without backup.

Sorting Functions: On any field in ascending or descending order, or a full alphanumeric merging sort on any field or fields.

If you get CCA DMS, you can then also use the Property Management System. It performs the routine daily posting to accounts, and produces five standard reports. Explanation is given for modifying system to conform to user's exact needs. Cost is \$69.95 in MOD-II format.

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#### LETTERS

##### MUG:

Do you happen to know of a method for saving all of the variables generated by a BASIC program so that they may later be accessed by another BASIC program.

I'd like to do this without PUT-GET statements, if possible using SAVE-LOAD. In this way, I'd not be restricted to 250 characters each shot.

I've had good results using the DATABASE program published by Joel Shapiro in the Jan-March Kilobaud Magazines as a three-part article. The program is available from him at 491 Kenilworth Court; Des Plaines, Ill 60616. It comes in several versions at different prices.

Martin C. Rothstein  
342 Madison Ave. New York, NY 10017

Martin-

Other than using the CHAIN statement, I don't know any easy answer. I use the PUT/GET, myself. I'm sure that the variable section of memory is locatable, savable, and loadable. I'd think that there would be a lot of overhead necessary for the second program to figure out what the data is, though. Perhaps the readers can help.

MUG:

How can you run Micropolis BASIC on CP/M?

Al Brandli

3176 Pullman St., Suite 103, Costa Mesa CA 92626

Al-

If you mean running the Microplis BASIC interpreter on CP/M, I don't think you can. But then one can do about anything if they invest enough time. Readers? If you mean running programs created by Microplis BASIC, the idea is plausible, but not simple. Several people have asked about CP/M-MDOS conversions. I haven't done it yet, but I'm interested. I haven't the time to research it before this month's deadline. Anyone who has any thoughts on the subject, let me know. I suspect that some combination of Systemation's MDOS-CP/M conversion routine, and perhaps their Translator II, will do most of the formal conversion. Syntax differences between Micropolis BASIC and whatever CP/M BASIC you are using will have to be done by hand.

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NEXT  
MONTH

I intend to discuss CP/M on Micropolis (a little), modems, new Vector Graphic equipment, and the double-sided Micropolis disk. I would really appreciate hearing from anyone who has a working modem. What brand, what operating system, what special software? As for software, starting what I hope will be monthly items, I'll include some BASIC and assembly language routines.

.....

10/1/80

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## VERMONT

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617/244-4740

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11716 Parklawn Drive  
Rockville, MD 20852  
301/881-5300 -- 301/744-7700

## WASHINGTON

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14825 N.E. 40th Street, Ste. 340  
Redmond, WA 98052  
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## WASHINGTON, D.C.

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## WEST VIRGINIA

CARTER, MC CORMIC & PEIRCE, INC.  
409 Beatty Road  
Pittsburgh, PA 15146  
412/372-4415 -- TWX 7107973671

## WISCONSIN

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5808 W. Higgins Avenue  
Chicago, IL 60630  
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## WYOMING

WESTEK DATA PRODUCTS, INC.  
P.O. Box 1355  
Evergreen, CO 80439  
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**MICROPOLIS**  
INTERNATIONAL REPRESENTATIVES

**AUSTRALIA**

AMPEC ENGINEERING CO. PTY. LTD.  
1 Wellington St.  
Rozelle, NSW 2039, Australia  
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C.N. ROOD s.a.  
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**CANADA**

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COMPUTER STORE/DIV. ALBERTLAND ENT.  
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BOHN DATA  
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**SOUTH AFRICA**

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P.O. Box 56412  
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WEST GERMANY & AUSTRIA

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