

## POLYGONS

by John Kemeny

One of the best features of the T/S 2068 computer is its ability to create and display high resolution graphics. There are commands in TS BASIC to PLOT points, DRAW lines, and even make CIRCLES and arcs. This article will present subroutines to draw equalateral triangles, squares, penta-hexa-hepta- octa- nona-deca- and other polygons.

Polygon shapes have equal sides and equal angles. In addition, we hope to demonstate in this article something about developing programs and making them more efficient.

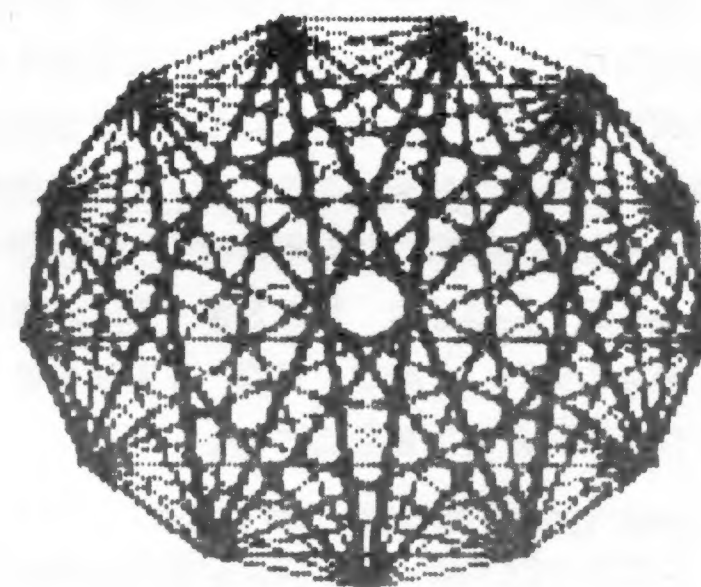
Let's start with the inputs (see figure 1). We need to know the coordinates for the center, O, and the radius, OA.

```
10 INPUT "CENTER'S  
COORDINATES" X,Y  
20 INPUT "RADIUS" R
```

The x-coordinate should be between 0 and 255, and the y between 0 and 175. Also, the radius should be small enough so that the polygon won't go off the screen, i.e., we won't do what's known as "clipping." To enforce our "shoulds" we can add the following line:

```
25 IF X-R<0 OR X+R>255 OR Y-R<0  
OR Y+R>175 THEN GOTO 10
```

We also need to know the number of sides.



## FEBRUARY MTG HIGHLIGHTS

With Sue at home in Waterbury recuperating from her automobile accident, the February meeting was chaired by John Kemeny. He spoke briefly about the proposed new library policy, asked for volunteers, told us about a machine code newsletter in Albany NY, and plugged the March meeting of our machine language group.

The group's library is now being kept at the BCS office (1 Center Plaza, Boston). It will no longer be brought to meetings and, if we can get a volunteer to be the librarian, things can be checked out from there one or two nights a month. As always the group needs volunteers for various jobs. John is organizing a project to index all the exchange newsletters we've received, and we need volunteers to help put out our own newsletter.

The Albany machine language group associated with Bonnie and Clyde Software is publishing a

10 REM

## TAKE THE MONEY AND RUN

Timex was involved with Sinclair computers from the very beginning. Early Sinclair machines were manufactured to Sinclair specs at a Timex factory in Scotland. One can speculate that this close association led to Timex's later role in this story.

Now Timex has dropped out of the personal computer market and it makes me wonder about their motivations from the very start. There's no evil in a company finding itself in financial difficulties and having to close a part of their business to save the rest. But that's only if the company was participating in the market in good faith in the first place. Texas Instruments had to abandon their home computers for these reasons but, even with all their mis-steps, I believe they really wanted to build great computers. That, sadly, is not always the case.

Timex brought nothing to the microcomputing community. They never made any serious attempt to promote the value of the Sinclair products nor to support the community of users that grew around the machines. When there was money to be made Timex accepted it and when things got rough they pulled out.

I am a capitalist by nature. I have absolutely no objection to one making money, lots of money.

But to make it fairly you should produce a valuable commodity. Make some good contribution to the marketplace. I have no inside information, but I feel that Timex never had any intention of adding something to the home computer community. They were in it to make a fast buck. All they wanted to do was take our money. That's not good capitalism and I think it's no coincidence that Timex ultimately failed. And perhaps no surprise that the whole Timex Corp is in trouble. As for me I'm now giving serious thought to ever again using other Timex products. How can their actions in computers not reflect on their attitude about all their other customers and products.

I'm very dissatisfied with Timex.

## A Final Note:

The grape vine says that Sinclair Research is on the verge of signing a U.S. distribution agreement for the Quantum Leap computer with The Betty Crocker Company.

A source in Sinclair is reported to have said that, "this agreement will pave the way for the QL to be sold in thousands of grocery stores and supermarkets around the country."

JGH II

 The  
 Boston  
 Computer  
 Society

This newsletter is produced to inform group members of the agenda and logistics of future meetings, as well as to recap and amplify the information provided at the meetings. It also provides a forum for members and interested parties to communicate what they have learned or developed relating to Sinclair and Timex computing. Meetings are open to the public (non-member admission is \$3); however attendees are encouraged to join the Boston Computer Society (BCS). This newsletter is free to members. Back issues are one dollar each.

**DIRECTIONS TO MEETING:** The S-T User Group meets in the Large Science Auditorium (Room 8/2/009) of the University of Massachusetts, Boston Harbor Campus. It is located only 3 miles from downtown Boston and easily accessible by public and private transportation. From the north or west, take the Southeast Expressway to Exit 17.

Turn left onto Columbia Road. Follow construction signs to get to Morrissey Boulevard in the direction of UMASS and the Kennedy Library. Bear right on traffic island, get in the right two lanes, following UMass/Boston signs. Turn left at the light into Campus. From the south, take Morrissey Boulevard northward to the campus. On the MBTA, take the Red Line (Ashmont Train) to Columbia Station. Transfer to the free University shuttlebus in the T parking lot.

The Sinclair Timex User Group

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The Sinclair Timex Newsletter is published monthly by the Sinclair Timex User Group of the Boston Computer Society. Membership in the BCS is \$24 per year which includes a subscription to its magazine "The Computer Update" and subscription to two of its group newsletters (such as this one).

Advertising space is available in this publication on a limited, first come first served basis. The rate is \$60 per quart page. At this time no other sizes are available. For detailed rate and discount information contact the Advertising Manager or the Publisher.

## HIGHLIGHTS continued

newsletter. Free sample copies are available if you send them a card requesting it. Ron Barnard, Bonnie and Clyde Software, 36 Tanglewood Rd., Albany NY 12205.

Henry April of EZ Key demonstrated Upload 2000. This is a program for the TS2068 which helps you to convert TS1000 family programs to run on the 2068. The main limitation is that the source program must be 100% in BASIC. Also some of the TS1000 commands have to be translated by hand after the UPLOAD program has done most of the translation. Henry also told us that he will be distributing the Compu Disk Drive system for the TS1000/1500 computers. EZ Key, Suite 75, 711 Southern Artery, Quincy, MA 02169.

Jack Hodgson took a couple of quick show-of-hands surveys of the audience. Of the 29 people there: 9 owned TS2068's, 3 owned TS1500's, and near 100% owned TS1000/ZX81's. Roughly 80% had been to 6 or more meetings, 20% had been to less than 6 and about 6-8 people were there for the first time.

## THE DEMISE OF TIMEX COMPUTER CORPORATION

(or What Is To Become Of The  
Timex Sinclair Owners)

By Susan C.T. Mahoney, Director,  
Sinclair Timex User Group

I was one of the first people to learn that Timex was getting out of the personal computer retail market. A friend of mine, who was working there called me to tell me the news, just minutes after she received the word herself.

My first reaction was that it was hard to believe, although Timex had suffered some setbacks, it was looking like they might make it. Especially with all the good reviews of the TS 2068 and the new peripherals that were about to be marketed, e.g., the modem, the 80 column printer, the microdrive.

I remember initially feeling like a member of my immediate family had died. I personally have been involved with both Sinclair Research, Ltd. and Timex Computer Corporation since August of 1981. I had observed first hand the excitement and enthusiasm that the Sinclair and Timex computer products had generated from its owners and users, not to mention all of the more than 500 third parties that had developed products to support the TS computers.

In addition I had worked for Timex and experienced being laid off myself, I knew exactly what those 24 people were feeling, after being told to get their personal belongings, since they no longer worked there. Some people, like my former boss had worked for Timex for 23 years, it is not easy to pick up the pieces and go on. To these people I wish them the best.

After a good night's sleep, I began to realize that this did not represent the end, in fact after reading several accounts of this dismantling in various newspapers and talking with a variety of individuals, including Timex and Sinclair spokespersons I was feeling much more hopeful. Some of the reasons for this included:

1. Sinclair is still in business. We have an unusual situation in that Timex was the distributor for the computer

only in North America and a few European countries. Sinclair Research is still marketing the ZX81 and the ZX Spectrum in the United Kingdom and the rest of the world.

2. Sinclair's newest computer, the QL or the Quantum Leap has been very well received in the UK. Sinclair Research will be marketing it here in the US this fall along with their flat screen tv.

3. Mike Jacobi, the Marketing Director for Timex, stated that the marketing and/or manufacturing rights for the TS 2068 are up for negotiation, which means that either Sinclair could get the rights back for the TS 2068 or some third party could get the rights to the computer.

Presently, Sinclair Research denies any intention to market any computer but the QL, but I have seen this type of situation change before. Also, the opportunity for a third party to step in could mean that an existing company could come in and take over the marketing rights or a new company could be formed of individuals who had the right combination of capital and understanding of the TS community.

This could work to the benefit of the present owners and third party manufacturers/marketers. With the right company in charge, we could see even more cooperation in dissemination of information between these groups.

Only time will tell, in the meantime, we cannot think that this whole issue is over, this is not like Texas Instruments announcing that they are getting out of the personal computer

market. There are a few more variables at play here.

What are we to do in the meantime? For one thing, I think that we have to unite. Particularly user groups, we need to form a tighter network of communication between our members as well as between user groups across the country.

One concrete suggestion that I can give is for user group directors to poll their members either formally or informally to determine which users are still interested in continuing with their Timex Sinclair computers. Then, if we could gather this data to disseminate it to the third parties and/or the any perspective investors for the Timex marketing rights, we would be able to document that there is a viable market out there! That it is worth someone investing more money for product development and support for TS related software and hardware.

As for Timex' plans for the future, they will continue to honor the warranties on their existing equipment, and they will be selling off their present inventory which includes TS 1500, TS 2068, limited supplies of their new modem, and existing software. The fate of their 80 column printer and their microdrive are right now on hold, with no plans to market either of the latter two products. Basically, anything that was produced prior to the announcement will be made available, but no new product development in the computer area is in the wind for now. (I qualify my statement because I have seen things change too many times to consider anything

MAHONEY continued

associated with either Sinclair or Timex as final.)

I recieved many calls from TS owners, third parties, and the press, from all over the country and the UK, expressing concern about what the future will be for the owners of the Timex or Sinclair computers. My answer has been that we need to hang in there, not to give up, and to remember that the dust has not settled. We have an opportunity to influence the future of the Timex Sinclair line, by showing that there is a strong enthusiastic market still out there!

Our group will be glad to act as a clearing house for dissemination of information relating to the Timex or Sinclair computers. You may contact Jack Hodgson (617-354-7899) or myself (203-755-2699) regarding questions, rumors, ideas and of course support. This is a time when we all must pull together and demonstrate our interest.

POLYGONS continued

```
30 INPUT "NUMBER OF SIDES" N
```

Finally, if we want to be able to draw polygons in any orientation, e.g., a 4-gon as either a square or a diamond, we need an initial orientation:

```
40 INPUT "ORIENTATION" P
```

For angles, computers generally use radians instead of degrees, that's what the Sinclair-Timex' expects for their trig functions. There are  $2\pi$  radians in 360 degrees. If we want to enter the orientation in degrees, it is a simple matter to convert it.

```
45 LET F=P*PI/180
```

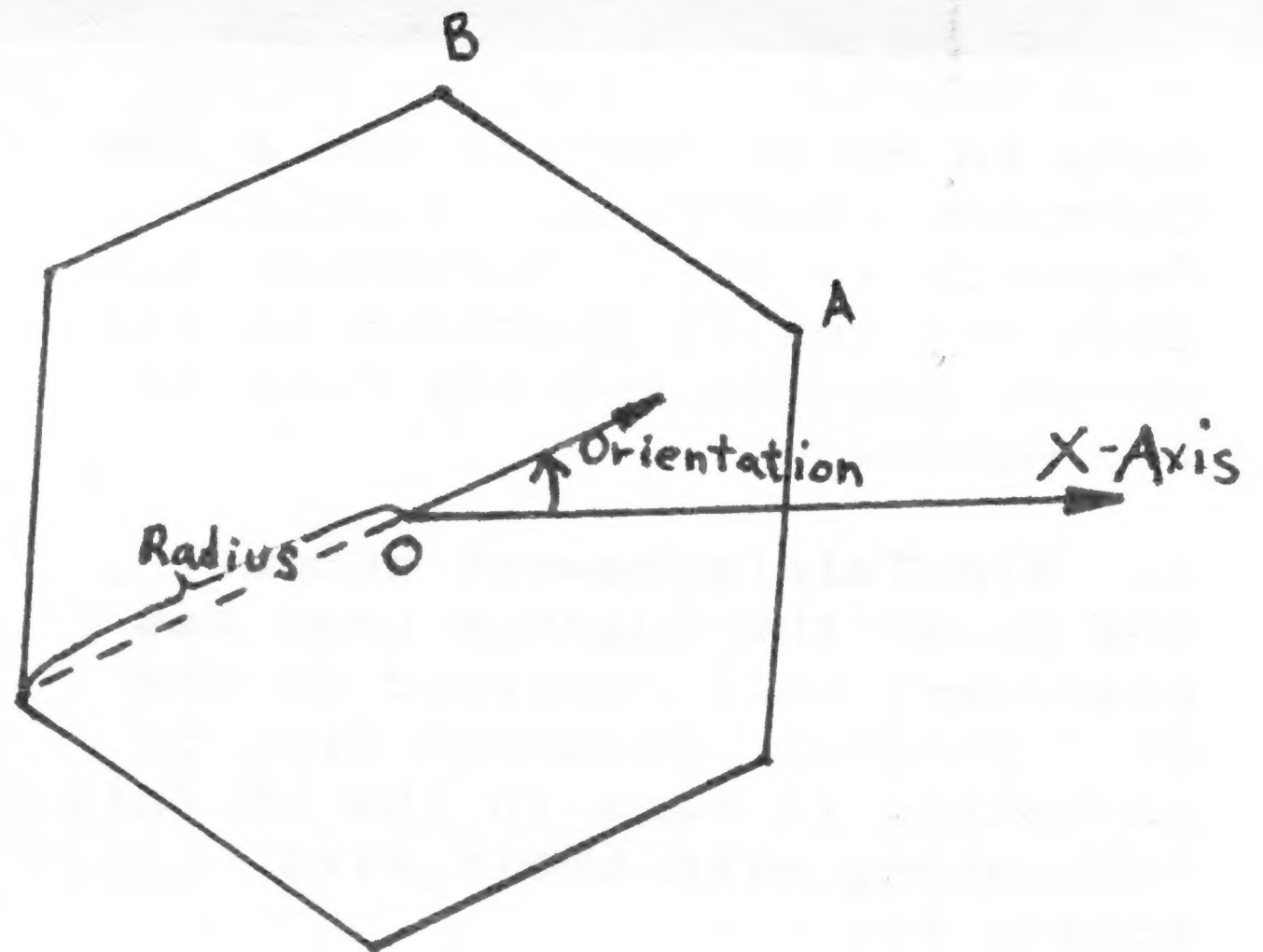


Figure 1 - HEXAGON

From now on we'll consider all angles in radians. We can develop our algorithm using a little trigonometry.

(If you want to create computer graphics, you shouldn't have slept through those trig classes in high school.)

We'll draw N sides, so:

```
100 FOR I=1 TO N
```

From figure 2 we can see how to PLOT the initial point, A.

```
110 PLOT X+R*COS P, Y+R*SIN P
```

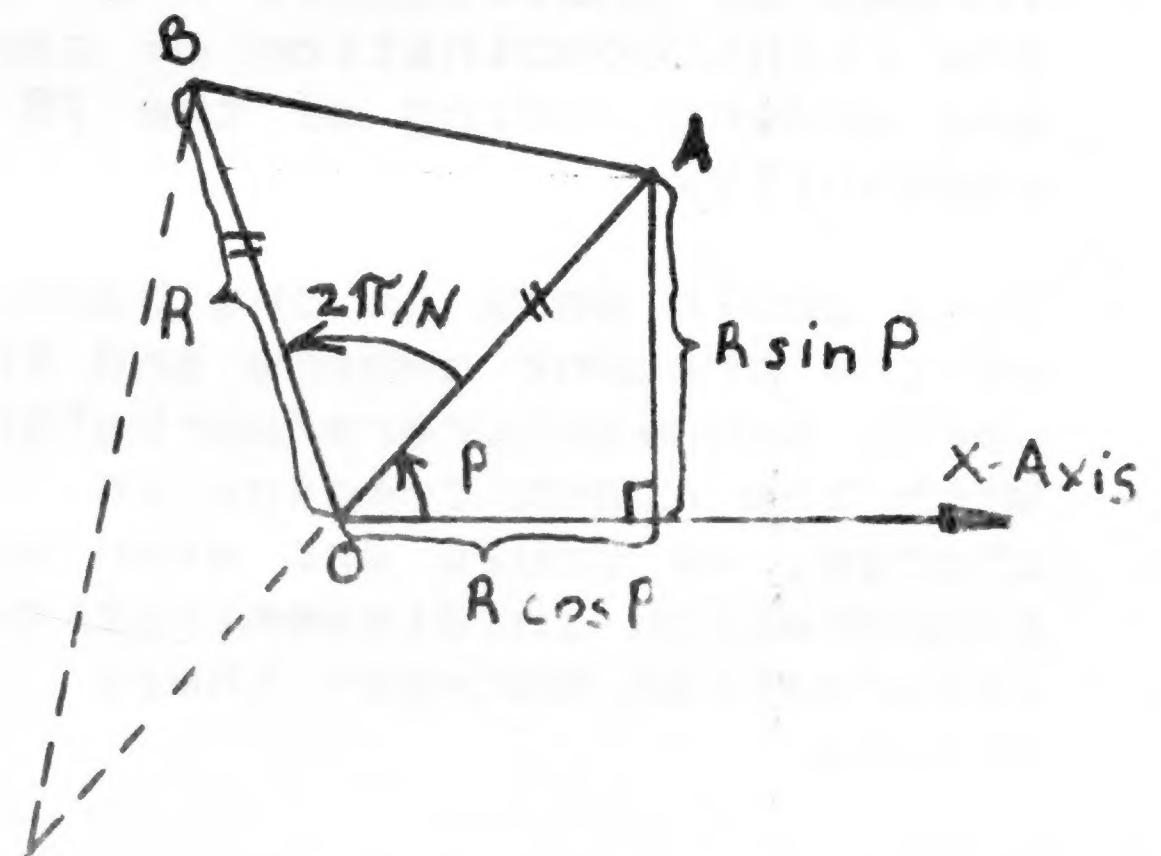


Figure 2

To get from A to B we have to draw the vector  $B-A$ . Since we have  $N$  slices in our polygon "pizza" and  $2\pi$  radians per "pie" ( $2\pi$ 's in 1?), each slice, like angle  $BOA$ , has  $2\pi/N$  radians. Thus drawing vector  $B-A$  is:

```
120 LET Q=P+2*PI/N
130 DRAW R*(COS Q-COS P), R*(SIN Q-SIN P)
```

To continue drawing the polygon we need to repeat (iterate) this step using the point B as our starting point. We can accomplish this by changing the "old" initial angle P.

```
140 LET P=Q
150 NEXT I
```

This is our first algorithm. Stop and try it. Enter 80 and 80 for the center, 60 for the radius, 8 for the number of sides, and  $\pi/8$  radians (or 22.5 degrees) for the orientation.

This algorithm is straightforward, but not very efficient. To make it run faster we can try to shorten the work done inside the loop. This may lead to a longer initialization, but it saves execution time because the work done inside the loop isn't

repeated. For example, let's add line 50 and change 120:

```
50 LET V=2*PI/N
120 LET Q=P+V
```

This saves some calculation time. But our real problem is that each iteration of the loop requires six trig functions (SIN and COS) to be evaluated. Can improve on this? Look at figure 3. Note that the length of each vector is the same. Call this length  $S$ . Also note that the angle of the vectors, call it  $T$ , keeps changing by  $2\pi/N$  radians in each iteration (going counterclockwise). Let's modify our algorithm by changing line 130 and adding 135:

```
130 DRAW S*COS T, S*SIN T
135 LET T=T+V
```

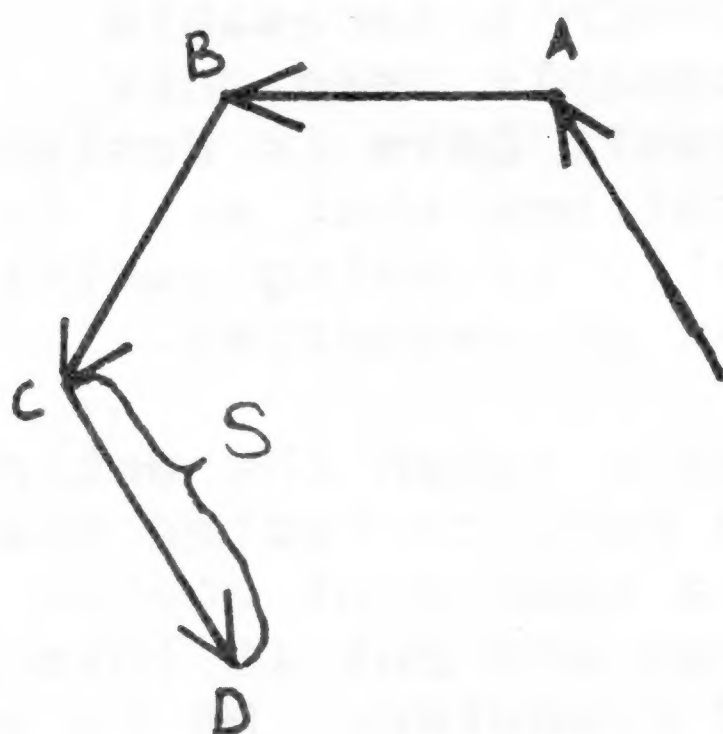
We must remember to initialize  $S$  and  $T$  (derivations are left as exercises for the reader).

```
60 LET S=2*R*SIN(V/2)
70 LET T=P+PI/2+V/2
```

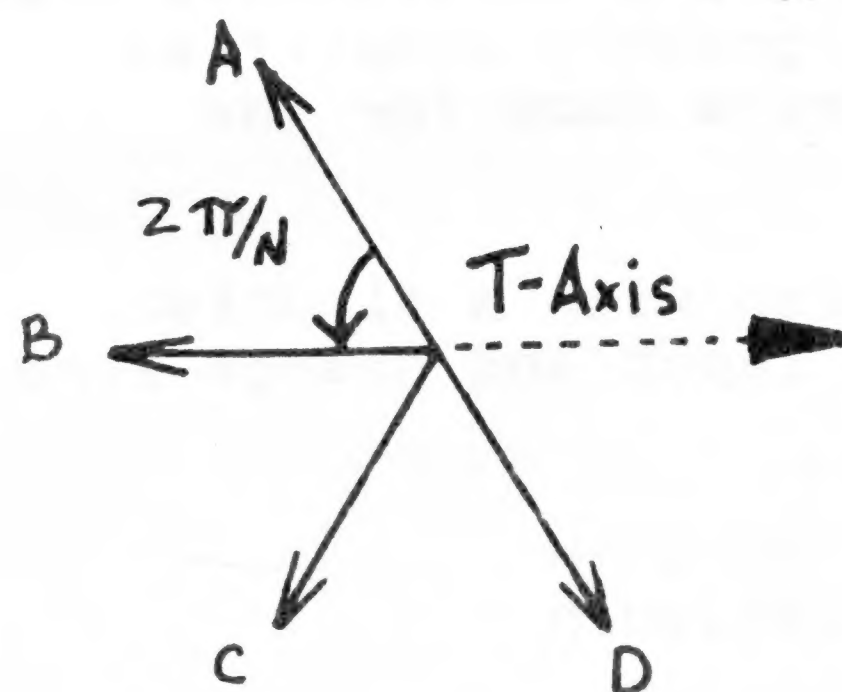
In addition, since  $Q$  is no longer used in line 130, we can consolidate by deleting line 140 and changing line 120 to:

POLYGONS

next page



(a)



(b)

Figure 3

POLYGONS continued

```
120 LET P=P+V
```

There is a second, faster, algorithm. Let's look next at moving the PLOT statement outside the loop. In theory, a new side starts where the previous one left off. But the fact that we are working on a high, yet finite, resolution computer, and not an ideal mathematical plane, can get us in trouble. Because in practice a roundoff may cause our point to be one tiny pixel off. Unfortunately, this condition is cumulative over the sides, so the net result can be a polygon that doesn't close properly.

But do not abandon hope! For small values of N the effect is negligible; and polygons with many sides aren't really distinguishable from circles anyway. So, to create this third algorithm, move line 110 to 80 and delete line 120. Notice how little is left in the loop. Further speedup is possible. For example, we could replace the FOR/NEXT control structure with an IF THEN and GOTO. Another idea is to use table lookup methods to compute the trig functions. Finally, we could always resort to machine code. Having identified and boiled down the bottleneck, i.e. the loop, greatly simplifies using machine code for the problem.

Let's finish with a flourish. Add a new input and change line 50 to:

```
49 INPUT "HOPS" H
50 LET V=2*PI*H/N
```

Try center 80 and 80, radius 60, sides 5, orientation 18 degrees, and 2 hops. Why do you think we called it "hops"?

FINAL POLYGON ALGORITHM

```
10 INPUT "CENTER'S
COORDINATES" X,Y
20 INPUT "RADIUS" R
25 IF X-R<0 OR X+R>255 OR Y-R<0
OR Y+R>175 THEN GOTO 10
30 INPUT "NUMBER OF SIDES" N
40 INPUT "ORIENTATION" P
45 LET P=P*PI/180
49 INPUT "HOPS" H
50 LET V=2*PI*H/N
60 LET S=2*R*SIN(V/2)
70 LET T=P+PI/2+V/2
80 PLOT X+R*COS P, Y+R*SIN P
100 FOR I=1 TO N
130 DRAW S*COS T, S*SIN T
135 LET T=T+V
150 NEXT I
```

## MACHINE LANGUAGE GROUP HIGHLIGHTS

Mitch Russo of Zilog, who was scheduled to speak to us in March was taken ill and his appearance will be rescheduled for a later month. In his place we held a free form discussion on a number of M/L topics. Answering each other's questions and passing on bits of information.

The bulk of the evening was occupied by Dave Miller telling us about his experiences working with EPROM's (erasable programmable read only memories). Dave is designing applications that will load instantly by using cartridges instead of cassettes.

Also he's taken the entire TS1500 ROM, corrected the bugs, added a couple of custom features and put it into his TS1000 computer. He is working with an EPROM burner which he built from plans in the ill-fated SQ magazine. He says he uses mostly Intel 2716 and TI 2516, 2K X 8, EPROMS. For more

info about Dave's work you can contact him through this newsletter or at our next M/L meeting.

Speaking of the next meeting. Because Bob Heath has moved to a new assignment it will no longer be possible for us to meet at ITEK. He is currently looking for a new location (any suggestions?). In the meantime the April meeting has been cancelled. Check this column next month for the new location or call Jack Hodgson (617-354-7899)

## THE WORM TURNS

by Will Stackman

This adaptation of a perennial game format features the fastest movement programmable in BASIC on the Sinclair. Characters are POKEd directly into the portion of the memory beginning at 16396 known as the Display File. Scoring occurs when positions in the same file are PEEKed to see if they are already occupied.

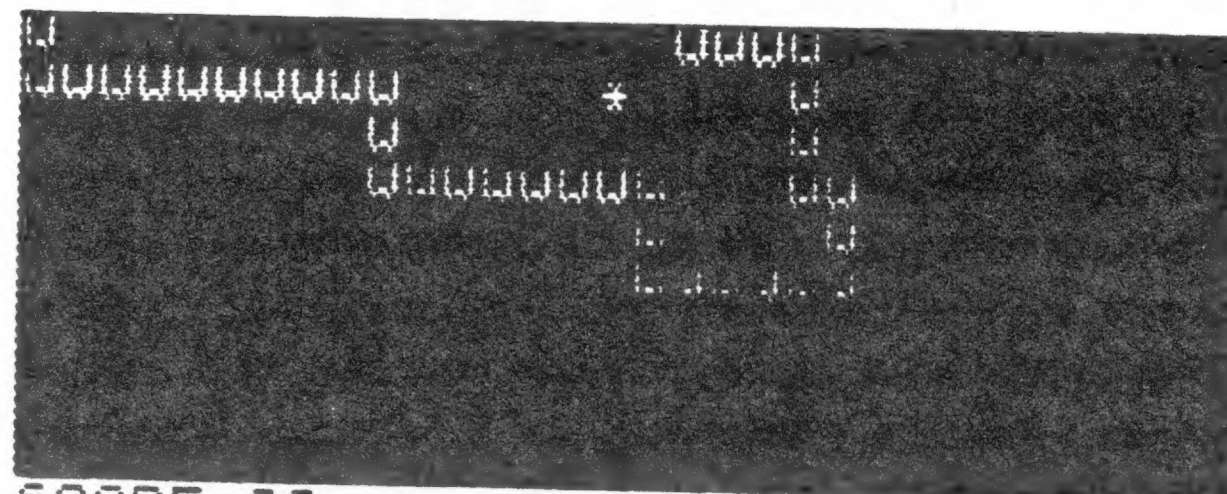
The listing is annotated using variable names which can be abbreviated to one letter for typing in. Timing Loops are used instead of the PAUSE command. The PRINT statements after line 900 indicate bytes used by this program. As given WORM will run in 2K or 16K on a T/S 1000. For 1K ZX81's, omit instructions and scoring messages as well as auto-run. You may want to remove one row from the playing field as well.

The INKEY\$ routine in line 110 is perhaps the shortest way to implement all four directions in one statement. Other characters may be POKEd into the field, but some of these will trigger lockup or a crash. Line 110 can also be adapted to work with a joystick such as described elsewhere in this issue.

This approach to manipulating the Display File is worth investigating as the first step towards understanding the machine code possibilities of our machines.

### THE WORM TURNS

USE ARROWS TO MOVE ■ TO \*.  
KEY "Q" TO QUIT.



```

1 PRINT AT 3,8;" THE WORM TUR
2 N"; AT 5,4;"USE ARROWS TO MOVE
3 ■ TO *." KEY ""Q"" TO QUI
4 T."
5
6 FOR L=1 TO 100
7 NEXT L
8 CLS
9 FAST
10 LET SCORE=0
11 FOR L=0 TO 319
12 PRINT "■";
13 NEXT L
14 SLOW
15 PRINT "SCORE=";SCORE
16 LET WORM=1+PEEK 16396+256*P
17 EEK 16397
18 LET PLACE=WORM
19 LET ASTERIX=PLACE+RND*329
20 IF PEEK ASTERIX<>128 THEN G
21 OTO 60
22 POKE ASTERIX,151
23 POKE WORM,188
24 REM POKE 142 = HARDER
25 LET MOVE=WORM
26 LET WORM=WORM+(INKEY$="8")+
27 33*(INKEY$="6")-(INKEY$="5")-33*
28 (INKEY$="7")
29 IF INKEY$="Q" THEN GOTO 250
30 IF PEEK WORM=151 THEN GOTO
31 200
32 IF PEEK WORM<>128 THEN LET
33 WORM=MOVE
34 GOTO 80
35 POKE WORM,188
36 REM POKE 142 = HARDER
37 LET SCORE=SCORE+10
38 PRINT AT 10,6;SCORE
39 GOTO 60
40 IF SCORE<100 THEN PRINT AT
41 10,10;"TRY HARDER"
42 IF SCORE>=100 AND SCORE<150
43 THEN PRINT AT 10,10;"GOOD. DO B
44 ETTER."
45 IF SCORE>=150 THEN PRINT AT
46 10,10;"*EXCELLENT*"
47 FOR L=1 TO 100
48 NEXT L
49 GOTO 4
50 SAVE "WORM"
51 GOTO 1
52 REM PROGRAM AND SYS.VARS.
53 PRINT PEEK 16396+256*PEEK 1
54 6397-16384
55 REM PROG.,SYS.VARS,PROG.VAR
56 S AND DISPLA
57 PRINT PEEK 16404+256*PEEK 1
58 6405-16384

```

**GRAPH 16K**

by Mark Tepper

Here is a program to draw a bar graph. When it runs you must enter 20 numbers, greater than 0 but less than 40. My goal in writing the program was to keep it as short as possible, thus it doesn't offer fancy borders, variable range for numbers, etc. The program illustrates a plotting technique you can use in other programs.

```

10 REM *** TS1000 GRAPH PROGRAM
20 LET Y = 4
30 DIM A(40)
40 FOR T = 1 TO 20
50 INPUT A(T)
60 NEXT T
70 LET T = 1
80 FOR Z = 1 TO 20
90 FOR R = 1 TO A(T)
100 PLOT Y,R
110 NEXT R
120 LET T = T+1
130 LET Y = Y+2
140 NEXT Z
150 PRINT AT 16,0; "10"
160 PRINT AT 11,0; "20"
170 PRINT AT 6,0; "30"
180 PRINT AT 1,0; "40"

```

*In the "let's start a rumor" dept:*

**MAGIC NEXUS STIRS AMID LANGUISH**

(The above title is a wonderful anagram for SINCLAIR-TIMEX HUGS SAMSUNG AID.)

Let me elaborate on this potentially good news. The March 12th edition of Electronic News reported that Sinclair Research Ltd. has signed a licensing agreement with Samsung Electronics of South Korea wherein Samsung will assemble and market the ZX81 and Spectrum

computers in South Korea. Samsung will use Sinclair parts and expects products by the fourth quarter.

What does this mean to the Timex-less U.S. market? There are three more ingredients needed to make this into a truly great rumor. First, the South Korean electronics industry is geared for export; the average Korean can't afford color TVs and VCRs.

Second, Samsung is a huge company and a big exporter to U.S. department stores. For example, many of the "no name" brand TVs in these stores are produced by Samsung. Finally, although perhaps an unrelated fact, the T/S 2068s were being assembled in South Korea. Conclusions--I'll leave you to draw your own.

**ZEBRA JOYSTICK**

by Will Stackman

The joystick adaptor available from Zebra Systems of Woodhaven, N.Y. is an easy-to-use hardware add-on driven by a 9 byte MC routine, compatible with Atari type "sticks". With its routine in 1 REM, the user can adapt any program where INKEY\$ would be used to accept an input. Thus this interface could also be used to accept up to 9 external switches for some practical applications as well as gaming. The device is well-made but barely shielded. It is possible to loosen the connector socket connections which are push-fit. There is no trouble plugging additional peripherals onto the expansion connector provided. The USR routine can of course be located above RAMTOP allowing a number of programs to be loaded under it.

**ZXL8R**

by Will Stackman

The leisurely LOADING speed of Sinclair computers has been a drawback since their inception. Several systems are available to overcome this handicap. The ZXL8R program package from G. Russell is the most economical and quite satisfactory. Rather than depend on a hardware filter or an elaborate checksum procedure, this method of increasing LOADING speed first has the user calibrate the program to a particular cassette recorder. The data received from the calibration program is then used to adjust the main program when LOADING or SAVEing.

The ZXL8R is actually a miniature operating system, allowing data as well as program LOADs. Since all programs must be LOADED by title, there is also a utility for scanning a tape to list all titles. Use of this system takes some practice, but the documentation is adequate. If programs are SAVED at lower calibration speeds (for more reliability) there is a good chance they can be reLOADED on similar machines. Since, as the name implies, this program speeds up the signal to the recorder, which raises its pitch, the machine used must have good treble tone and properly aligned heads. Strangely enough, the Winky Board doesn't seem to help when used with this system.

**SOME NAMES AT TIMEX**

Here are a couple of useful names of people who still work at TIMEX Computers.

Elaine Cristillo, 203-573-6815. Elaine is involved with third party documentation.

Cathy Hoolihan, 203-573-5246. Cathy is the person to talk with if you want to buy products direct from TIMEX.

**USR 832**

by Mike Coughlin

So you've loaded the copy protected program you spent the last month writing on your TS1000/ZX81, and it's so well protected that the keyboard doesn't work. Not only that but you've only got one copy. Serves you right! But there's a little known trick (first described in Syntax) that will come to the rescue.

Instead of using the normal LOAD "name" comand, use a USR call.

The LOAD and SAVE routines are unusual since they require a name string as input. The syntax checker doesn't like strings after a USR call. But there are two statements that will work.

```
LOAD CHR$ USR 832 "name", or
SAVE CHR$ USR 832 "name"
```

The USR 832 statement will start the LOAD routine, the CHR\$ converts whatever is left from USR to an acceptable input to LOAD and SAVE and the whole combination gets past the syntax checker. SAVE CHR\$ 832 "" is the more usual form. First your intractable program will be loaded and before it can do any funy business the save routine will execute. If you'real quick (you have five seconds) you can switch tapes and make a copy. As soon as you see the blank screen and the pattern from the SAVE routine, you can hit space and the program will be loaded but "unlocked" from any machine code or BASIC statements that normally run immediately. You can LIST and change BASIC statements, or refer to your detailed notes and POKE corrections to your machine code. You did keep detailed notes didn't you?

**The Boston Computer Society** helps make sense out of personal computers. If you're interested in computers for home, business or education, come to The BCS for objective information and support. The BCS is the largest nonprofit personal computer association in the United States; our goal is not to promote any particular brand of computer, but to help computer users and people who just want to know what a computer could do for them.

**Sign me up for these user/interest groups:**

- Apple/Boston (Apple)
- Atari User Group
- Business User Group
- Consultants & Entrepreneurs Interest Group
- Database User Group
- Displaywriter User Group
- Educational Resource Exchange
- 80/Boston (TRS-80)
- Family Home User Group
- Logo User Group
- IBM User Group
- North Star User Group
- Osborne User Group
- OSI/Boston (Ohio Scientific)
- Pascal User Group
- PET/CBM/VIC User Group
- Robotics Interest Group
- Sinclair/Timex User Group
- Telecommunications User Group

**\*\*\* ZX PRO/FILE \*\*\***  
a 16K+ file manager for the Timex

**ZX PRO/FILE** is a machine language data base that gives you tremendous versatility:

- \*instant access to any file stored in memory
- \*files of any size in the same program run
- \*single or multiple word search capabilities
- \*ordered file displays
- \*comprehensive programmable printer functions

A 59 page manual comes with the cassette. In it are complete instructions, examples, directions for upgrading to larger memories, modifications, program listings, and a detailed explanation of how the program works. There's even an introduction to machine coding for beginners.

ZX PRO/FILE is the best file manager you can get for your Timex. In fact, users report that it provides data handling functions found only on the most sophisticated systems.

Price: just \$16.95

Let me send you full specifications. Write to:

Thomas B. Woods  
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