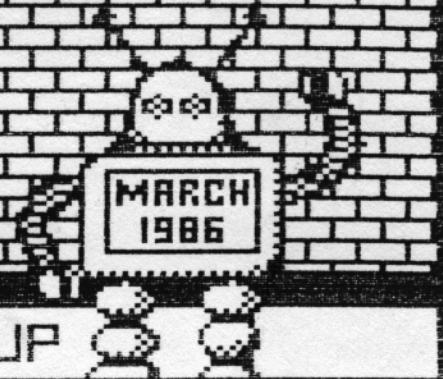


THE ROBOT COMPANION



DALLAS PERSONAL ROBOTICS GROUP

HERO 2000 LIVES!

The Heath company has provided previews of its new, state of the art, experimental robot to members of the press. The Hero 2000 will not be available until sometime in March, but here is the information which has been published so far. The Hero 2000 offers major improvements over the Hero 1 in computational power, manipulator capabilities, mobility, sensors, ease of use and expandability.

Compute power is something the Hero 2000 has in abundance. The primary processor is an 8088 (the same as used in the IBM PC) with eleven additional 8042 microprocessors to control each of the motors and sensor systems. This means that the Hero 2000 can simultaneously move every motor, obtain sensory input and evaluate what to do next. The main processor will come with 96K bytes of ROM and 24K bytes of RAM, expandable to 576K bytes. An on-board disk drive is an option to be available soon after introduction.

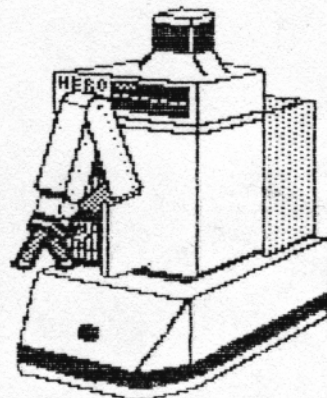
You may interface to the robot either through any attached RS-232 terminal or through the wireless RF two-way keyboard provided. The remote keyboard has an 80 key ASCII keyboard, a two-line 40 character per line LCD display and teaching pendant keys. An RS-232 port is provided on the back of the keyboard so that an external computer may be interfaced through the radio link.

The manipulator system provided on the Hero 2000 is a vast improvement over the one available on the Hero 1. It is a CLOSED LOOP SERVO system, meaning that the current position of each degree of freedom is constantly fed back to the motor microprocessor for position corrections. The system can repeatedly reach and maintain any desired position. As mentioned earlier, all movements can occur simultaneously. The Hero 2000 arm is jointed and is mounted on the front of the rotatable torso. It has a lifting capacity of at least one

pound in any position, a gripper opening of 4.375 inches and a maximum gripping force of 3.75 pounds. The gripper incorporates a patented force sensing mechanism which gives the robot a primitive sense of touch. All motors are DC servomotors instead of the stepper motors used in the Hero 1.

The mobility system must transport the robots 16.5 inch wide by 22.5 inch long by 32.4 inch high, 78 pound frame around on flat surfaces. The robot uses two driven wheels and two idler wheels to accomplish this. The system has substantially more accuracy than the Hero 1 and uses the dual sonar system to assist in navigation.

The dual sonars are part of the



improved sensor systems. One of the two sonars is mounted low on the front of the base section and the other is contained in the unique rotating sensor pod located on top of the head. This sonar and the light detector look down on an angled reflector which can rotate 360 degrees for sensor scans. The Hero 2000 also has sound temp-

erature, battery voltage, gripper force and the important joint position sensors.

Several important improvements in "user friendliness" are included in the new robot. An enhanced version of XYBASIC is included in ROM as the primary programming language. The arm teaching mode includes algorithms which permit you to position each joint at the desired position at the end of a movement. The software then automatically calculates the optimum path for moving to that position utilizing simultaneous joint movements. The SSI 263A voice synthesizer provides 64 phonemes, 4096 inflection levels, 16 rate and loudness

(continued)

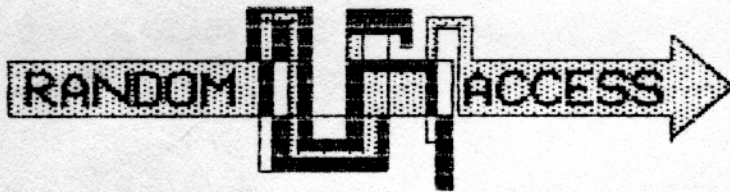
(HERO 2000 continued)

levels, and four octaves of music. Text to speech, phoneme translation algorithms are included in ROM.

The Hero 2000 will also soon have an automatic docking system so that it can automatically go recharge its batteries whenever they are low. It will utilize an infrared transponder unit mounted on the wall above the charger to help the robot find it. The robot has a cardcage backplane which will make the addition of new features a plug-in operation. Among the options planned is a vision system based on the "Micron Eye" optic RAM technology.

Now for the bad news! All of this capability doesn't come cheap. A kit form robot with arm will probably run close to \$2500. An assembled version with all the options could easily run close to \$5000. Heath is stating that this is still an educational/experimental robot and that it is not intended for production use. It is obvious, however, that the Hero 2000 represents a major step in the development of general purpose mobile robots. As such, it is much closer to the truly capable personal robot we would all like to have. Now, how much did you say we have in the savings account?

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By Paul Swan

Huzzah! There's a new robot magazine on the stands! I had to give up ROBOTICS AGE, as they have gone entirely to industrial robotics and have changed the name to ROBOTICS ENGINEERING (when I subscribe to Road and Track, I don't want to read about the latest trucks). The new magazine is the ROBOT EXPERIMENTER, and is published by CEARGS, 174 Concord St., Suite 31, Peterborough, NH 03458. A twelve issue subscription is \$24. It's a nice looking rag, with some informative articles, advertising, etc. (Most of the Hero 2000 information in this issue was gleaned from its pages.) Best wishes to them! *** A new Movit kit on the market is the "WAO" (standing for Wise, Argent Or5). This is a product of ELEHobby, the loving folks who brought us the Memoon crawler. This new critter has an on-board CPU, so the possibilities are enhanced greatly compared to the earlier line of kits. It has a pair of "whiskers" that can be programmed for various input responses and a 25-key on-board keyboard, complete with flashing lights and a tiny LCD

readout. I've ordered one of these (retail \$99.95), and if I don't break it or solder myself to the chair, I'll report on it in the next RC. *** The National Personal Robot Association is at P. O. Box 1366, Dearborn, Mich. 48121. The yearly dues are \$30 (or \$10 for full-time students). *** Bersearch Information Services, 26160 Edelweiss Circle, Evergreen, CO 80439 offers some slick stuff to enable you to interface your Apple II with the Hero-1. They call their unit "ROBI", so I imagine Walter will have to have one, if for no other reason! *** Tom Bernard, who is one of the whips with Bersearch, has a fine article in the above mentioned ROBOT EXPERIMENTER (Vol. 1, No. 2) which goes into great detail with a program which enables the Hero to do some useful things.



Paul Swan

The program is listed in the magazine. With their cross-assembler and this program, the Hero is able to talk and walk at the same time. (My wife still has trouble with this same activity!) *** A catalog of robotic goodies is available from the Robot Store, 906 Bancroft Way, Berkeley, CA 94710. It's \$2, refundable. They offer a complete line of kits, toy robots, and peripherals. *** Another place is Cal-Robot, 16200 Ventura Blvd., Suite 233, Encino, CA 91436. They claim discount prices on kits, books, etc. *** If you have an aversion to dealing with California firms, check out Stock Drive Products, 2101-E Jericho Turnpike, New Hyde Park, NY 11040, and tell them FRD sent you. They offer a catalog of robotic motion control products for \$3.25, and one on robotic grippers for \$1.25, both prices include postage. *** If you're into AI, and have an MSDOS or PCDOS computer, Solution Systems, 335-R Washington St., Norwell, Mass. 02061 offers a complete tutorial, interpreter and screen editor which will enable you to amaze your friends with programs written in LISP. The package costs \$75. *** Incidentally, Cal-Robot mentioned above, is having a sale on RB5X robots, with the voice for \$1245 and they pay the shipping. A tad nicer than the \$2540 retail! If this grabs you, they can be reached at (818) 905-0721. *** If any of you tinkers need a Robotix R1000 set, I've got one, almost new, and it's yours for \$25. ***

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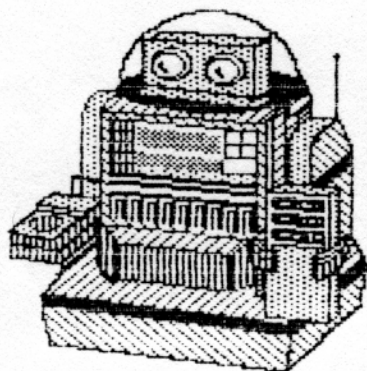
The Tomy Omnibot

by Paul Swan

The Omnibot is fun! It's not very smart, but fun. The inepecunious roboticist will find lots to keep him busy with this little feller, and it could serve as, perhaps, the basis for a much more sophisticated robot. This inexpensive (\$299 originally, and now available at many stores for \$199) little critter has some surprising features for the money. There is an on-board cassette player which enables you to record movements and sounds, so that you are limited only by the length of the tape as to just how complex a series of movements you can set up. The tape can, of course, also be used to record sounds, including words spoken into the remote control microphone (see programming below).

In addition to the cassette player, there is an on-board clock which can be used to cause the robot to "come alive" at certain times and begin a pre-set series of movements. It can also be set so as to give one of three built-in alarms at any time up to a week in the future. (This is VERY impressive at about 3:00 AM when you don't realize you've inadvertently set it! I'm still trying to get the bed dry.)

The Omnibot is programmed by using a remote R/C box which has a joy-stick built in, along with a microphone. With the robot set in program mode, you simply move it about with the controller, speaking into the mike when needed. When the tape is played back in this mode, it will repeat all movements and sounds. There are two built-in musical sounds that can be called up at any time, either when in the R/C mode or in the program mode. The operation and programming of the Omnibot is very simple, but the keys, which serve as multi-function macros, take a little getting used to before you can freeze through a series of commands without the manual, which is very complete and straight-forward. The robot comes with a tray so that it can carry drinks, but you'd better have a heavy duty sweeper and a patient "help-mate" before you try this!



The Omnibot is limited, of course, by its lack of input sensors. A "home plate" is furnished so that it starts off from the same place each time, but the old problem of wheel slip

results in the program's not being able to precisely repeat each time. An adjustment is furnished so that the wheels can be made to drive the robot in a straight line. About the only bells and whistles it comes equipped with are the brightly flashing eyes which respond to audio, so that the robot's eyes light up each time it says something or plays one of its "tunes". A built-in nicad cell powers the wheels, but the clock and hand-held controller require 6 AA alkalines.

I plan to tear into mine soon to see if perhaps some true input from the real world can be rigged. If nothing else, Omnibot is serving as an inexpensive "think piece", and, like I said, it's fun!

Talk is Cheap!

by Paul Swan

The Vol. 1, No. 1 issue of ROBOT EXPERIMENTER, mentioned in Random Access, has a little program in BASIC which demonstrates the ability to program your Hero 1 to speak random phrases from the robot's ROM. You can add your own statements to the DATA list in line five, but you must list the addresses for them in decimal instead of hexadecimal for this program to access them. The RND statement in line ten returns a value from 0 to 99, and lines 20, 30 and 40 adjust the value so as to reflect the number of addresses in line five, in this case, nine. This program might serve as a good one to run while setting the pitch and tone of your Hero's voice. You may even hear some phrases you didn't know that Hero knew! You must, of course, have the voice synthesizer and BASIC interpreter for this program to work!



```
1 2=1
5 DATA 64075, 64363, 64342, 64379,
   64449, 64603, 64669, 64709, 64838
10 X=RND
20 IF X<10 THEN GOTO 50
30 Z=X/9
40 GOTO 30
50 FOR I=1 TO 9
60 READ H
70 IF Z=X THEN SPEAK H
80 Z=Z+1
90 NEXT I
100 GOTO 1
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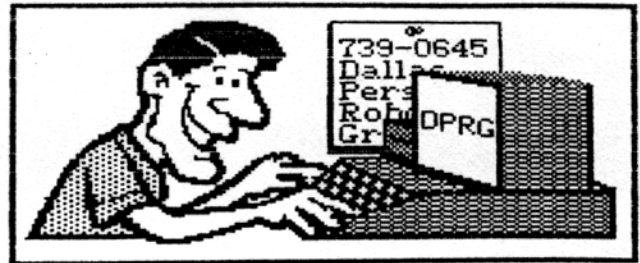
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BULLETIN BOARD NEWS

Don't forget! For the latest news from the Dallas Personal Robotics Group, call our computer bulletin board at (214) 739-0645 any time!

1986 DPRG Elections Held

New officers for the Dallas Personal Robotics Group were elected at the December meeting. Walter Bryant was elected President and Ed Rivers will be Vice President. Bud Collins was elected Secretary/Treasurer, but subsequently resigned, leaving that post open.

Joe Rowe was selected as editor of the "Robot Companion" and Paul Swan as contributing editor. Many more volunteers are needed for the newsletter. If you would like to write articles or columns, please send your suggestions to Joe Rowe, 405 Tiffany Trail, Richardson, TX 75081.

DPRG meetings are held at 3:00 pm the third Saturday of each month at the Heath/Zenith Computer Center.

