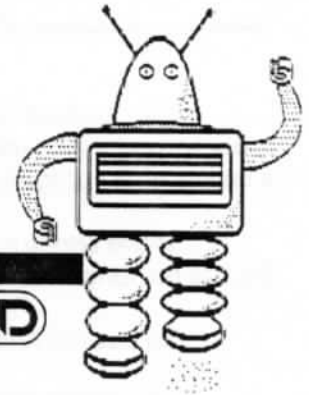


THE ROBOT COMPANION

The Newsletter of the Dallas Personal Robotics Group
January, 1990
Stan Spielbusch, Editor



PRESIDENT'S CORNER

by Ed Rivers, President

On December 19th the club put on a robotics demo for the Fort Worth PC User's Group. I demonstrated my Hero 1 and Brian Vaceluke brought his Hero 2000. Bart deBoisblanc came along to help carry things in and out. Thanks guys! Perhaps in the future the club should charge so much per mile so that members can be reimbursed for gas when doing demos out of town.

Don't forget that we will be holding our yearly elections at our January meeting. All members should attend if possible. We'll be attempting to fill the four offices of President, Vice-President, Secretary, and Treasurer. One officer will also be required to take over the post of CCD representative. Any member of the club can serve as alternate. (1990 CCD meetings will be held at InfoMart at 7pm on the Monday following the Saturday meeting day.)

NOTES FROM THE EDITOR

by Stan Spielbusch

I apologize for skipping the December newsletter, but the holidays and business travel wiped me out. This month isn't much better, but thankfully Brian has supplied me with an updated article on his homonav program.

Apparently the CCD hasn't put out a new schedule yet (or continuing CCD Access articles), so we'll just have to wing it until they do.

Doug Chitwood has a Hero 1 to sell (\$900) or trade for VGA monitor & card. Call him at (214) 849-6464. Please note that this information is a couple months old.

A couple articles of interest:

LIMBO, part 4 -- the series in Micro Cornucopia continues, this time with detailed construction plans for the main body of the robot and a stepper motor controller circuit (with PCB artwork).

Implementing a Neural Network in C: Part 1 -- also in Micro Cornucopia (Jan-Feb 90), starts a series of articles complete with source code for a real Neural Net. Includes a pretty good intro to what a Neural Net is and what it's supposed to do.

Next month: Brian promises an article and complete schematic for his Mouse robot (that's right, somebody actually did it!). His version is built inside a Radio Shack Robie Jr robot, and looks really cute (I have yet to see it operate).

ANDROID OPERATING SYSTEM REVISITED

by Brian Vaceluke

The Android Operating System (AOS) is a useful program that allows the operator to schedule their home robot to perform specified tasks at the appropriate location in their house as scheduled on a weekly basis. When a task is not in progress, the robot will remain sleeping awaiting the next scheduled event to occur.

I have added many new features since the last writing. The most important is that a disk drive on the HERO 2000 is no longer a requirement.

To use the Android Operating System you will need:

One HERO 2000 with at least 64K memory

One IBM PC or compatible

One IBM PC to MODEM cable

-- or --

One HERO 2000 with one disk drive and at least 128K memory

There are three parts to the Android Operating System Data Base. Each one is a separate text file that reads like a programming language. There are instructions, parameters, and even comments. The interpreter does not differentiate between upper and lower case.

The first and lowest level is a description of the house where the HERO 2000 will perform its tasks. It is called the Path file, and it has a default extension ".PTH".

The second and mid level part to the Data Base is the Behavior file. It has a default extension ".BHV". This file is a collection of programmed behaviors that constitute a more complex behavior. These behaviors may draw from the Path file with "GOTO" instructions. These behaviors are user extensions to the language.

The third and highest level of the Data Base is the Schedule file. It has a default extension ".SCH". This file draws upon the first two files such that at a predetermined time the HERO 2000 can be instructed to navigate into a certain room via the Path Data Base and perform a certain task or behavior from the Behavior file. The schedule data base is the easiest to write in.

Data Base modularity allows the HERO 2000 to run the same program in any environment provided that only the Path Data Base is changed. Or adding new complex behaviors to the HERO 2000's vocabulary is as easy as updating the Behavior Data Base. Or making a new schedule does not require a new set of Behavior's or Instructions on how to navigate the same house.

New combinations of programs can be created by mixing and matching different Path, Behavior, and Schedule Data Bases at initialization of the Android Operating System.

Programming Instructions

There are two levels of instructions. Most can be used by all three Data Bases, while the GOTO instruction can only be used from the Behavior and Schedule Data Bases. All instructions have exactly one parameter, which follows the instruction name. The parameter is separated by one or more spaces. This is the instruction parameter pair, designated <ip> in this text. (ALL instruction parameter pairs are separated by one or more spaces also.)

Instructions that may be used by any data base are:

LEFT <angle> Turns the robot left from present position by <angle> degrees

RIGHT <angle> Turns the robot right from present position by <angle> degrees.

WALK <distance> Moves the robot forward <distance> feet if <distance> is greater than zero, or backward <distance> feet if <distance> is less than zero.

WALKFROM <distance> Moves the robot to a distance <distance> feet from the wall behind the robot.
WALKTO <distance> Moves the robot to a wall in front of it leaving <distance> feet between the wall and the robot.

LEFTPARALLEL <dist> Moves the robot <dist> feet; however, a distance reading is taken to the left of the robot prior to moving and also after moving. An angle relative to the robot and the assumed wall to the left of the robot is calculated. The robot is turned so that its base is parallel to the wall, if it was not to begin with.

RIGHTPARALLEL <dist> Like LEFTPARALLEL, in the other way.

Arm instructions, SAY, HOME, and SPEED are included similar to BASIC's instructions

Sequence control instructions:

SLEEP <minutes> Puts the robot to sleep for <minutes> minutes.

DELAY <seconds> Suspends execution for <seconds> seconds.

WAITFOR <sensor> The robot will pause until a change is detected by one of its specified sensors: SONAR, SONARB, LIGHT, or SOUND. Then execution will continue with the next instruction parameter pair.

IF <yes/no> Waits for the user to press the "0" Key or "1" Key on the robot's Hex Keypad. If the "1" Key is pressed and YES is specified the next <ip> will be executed, otherwise it will be skipped. If the "0" Key is pressed and NO is specified the next <ip> will be executed, otherwise it will be skipped.

SKIP <#<ip>'s> Skips over the following number of <ip>'s specified. If <#<ip>'s> is less than zero, skips back the specified number of <ip>'s.

EXIT <is/do> Terminates execution of the present structure.

User defined instructions:

<behavior> <parametr> At run time, substitutes a series of commands for the <behavior> command, as specified in the Behavior data base. Also passes <parametr> to one or more of the commands which constitute it. It is a user extension to the language.

The GOTO instruction may only be used from the Behavior and Schedule data bases:

GOTO <node> Moves the robot from its present node location to <node> along a logical path which it searches out from intermediate paths described in the Path data base. The physical path is a result of substituting low level movement commands as specified in the intermediate path descriptions in the Path data base. If the robot is already at <node> when the GOTO <node> instruction is executed, the robot will respond by saying "I am already at <node>".

The Path Data Base

The Path data base is a series of PATH statements. A PATH statement is as follows:

PATH FROM: <node1> TO: <node2> IS: <ip>

-- or --

PATH FROM: <node1> TO: <node2> IS { <ip1> <ip2> ... <ipN> }

The series of statements in the Path data base is ended by a THAT'S_ALL statement.

When a GOTO <node> command is encountered in the Behavior or Schedule data bases, the search for a logical path from its present node to <node> will be conducted from a tree described by the <node1> <node2> pairs in all of the PATH statements. The physical path will be the sum of the <ip>'s substituted for each individual partial path in each appropriate PATH statement.

Since the resultant path is one constructed from partial paths, it best that the user keep a reference direction in mind for each node when building a Path data base. The data base should be defined such that the robot always ends up facing ONE direction when it arrives at a particular node, no matter which node it came from. This way, when the robot passes through a node, it will always be facing the same direction when it leaves that node, since all movement commands are relative to their starting position. If the robot is passing through a node on its way to <node> in a GOTO <node> command, it will not make unnecessary turns when it arrives at and leaves from the node that it is passing through because there is a turn cancellation routine built into the GOTO <node> command.

The Behavior Data Base

The Behavior data base is a series of BEHAVIOR statements A BEHAVIOR statement is as follows:

```
BEHAVIOR <behavior> [<parameter>] IS: <ip>
      -- or --
BEHAVIOR <behavior> [<parameter>] IS{ <ip1> <ip2> ... <ipN> }
```

The series of statements in the Behavior data base is ended by a THAT'S_ALL statement.

When a <behavior> <parameter> command is encountered in the Path or Behavior data bases the associated <ip>'s will be executed. Since the new <behavior> command is also allowed in the Behavior data base, complicated behaviors can be built from several less complicated behaviors. The optional <parameter> may be passed on to one of the <ip>'s as its parameter.

The Schedule Data Base

The Schedule data base is a series of SUNDAY, MONDAY, TUESDAY, WEDNESDAY, THURSDAY, FRIDAY, SATURDAY, WEEKENDS, WEEKDAYS, DAILY, or STARTUP statements as illustrated:

```
SUNDAY 10:00 AM DO: <ip>
SATURDAY 23:00 24hr DO{ <ip1> <ip2> ... <ipN> }
DAILY 12:00 PM DO{ <ip1> <ip2> ... <ipN> }
STARTUP DO{ <ip1> <ip2> ... <ipN> }
WEEKENDS 10:00 AM DO: <ip>
WEEKDAYS 7:00 AM DO: <ip>
```

The series of statements in the Schedule data base is ended by a THAT'S_ALL statement.

When the Android Operating System begins executing, the robot will begin executing the first if any STARTUP statement it encounters in the Schedule file. After execution, the next if any STARTUP statement will be executed, etc. Then the robot will sleep until a weekly or daily scheduled event. The associated <ip>'s for that event will then be executed, then the robot will again sleep until the next scheduled event.

Now, the answer to that age old question: "What can the robot do?" does not have to be: "Anything I program it to do". Now it can be: "Anything I want, when I want it".

CLUB INFORMATION

The Dallas Personal Robotics Group is a non-profit organization of individuals interested in learning about personal robots, sharing ideas, working on projects, and informing the public about the world of personal robotics. We are open to anyone who has an interest in personal robotics, whether or not they currently have a robot, and whether or not they have any knowledge of robotics.

To become a member and receive the newsletter, have access to program library, and be involved in our monthly clubs and user's labs, simply fill out the form below, and send it with \$10.00 to Stan Spielbusch, Treasurer (address below).

If you are interested, but not sure you want to be a member, feel free to visit our meetings. If you like, we can send you a sample issue of the newsletter.

Tentative Meeting Schedule (1990)

(unknown)

Meeting times and location: 1:30 P.M. at the Dallas Infomart.

Club officers:

President: Ed Rivers (214) 840-3044 Vice-president: Brian Vaceluke (214) 298-2225
Treasurer: Stan Spielbusch (214) 418-8934 Secretary: David Ratcliff (214) 231-9346

Back Issues

Back issues are now available in four sets. Each set is \$8.00, plus \$2.00 postage and handling if ordering by mail. Set 1: From the start of the club in 1984 through 1986. Set 2: 1987. Set 3: 1988. Set 4: 1989. Issues from 1990 are \$0.50 each, plus \$0.25 p&h. Contact Stan Spielbusch, Editor, 2404 Via Barcelona, Carrollton, TX 75006.

MEMBERSHIP APPLICATION

Dallas Personal Robotics Group

c/o Stan Spielbusch 2404 Via Barcelona Carrollton, TX 75006

Check one: () Renewal () New Member () Info Change () Sample issue request

NAME (please print) _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

HOME PHONE (____) ____ - _____ WORK PHONE (____) ____ - _____

TYPE OF ROBOT (if any) _____

TYPE OF COMPUTER (if any) _____ MODEM: _____ BAUD

Do you want the above information available to other members? _____

(We do not sell our mailing list to businesses, but it is available free to all club members.)