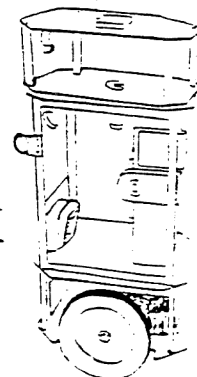


ROBOT BUILDER

The official publication of the Robotics Society of Southern California
P.O. Box 3227, Seal Beach CA 90740. Meetings the 1st Tuesday @ 7:00 PM at MTI College



UPCOMING EVENTS CALENDAR

MAY 1991

- May 7 RSSC Meeting at MTI College: 7-9 PM
Topic: Robotic Intelligence Software
- May 11 RSSC Robot Project Workshop, at Jerry
Burton's
- May 19 ACP Swap Meet
- May 28 RSSC Board meeting, at Jerry Burton's
- June 4 or 6 RSSC Meeting at MTI College: or Orange
Coast College:
Topic: RF data link.
- June 8 RSSC Robot Project Workshop.
- June 25 Board Meeting at Jerry's place.

PRESIDENT'S MESSAGE

Last month's meeting was another great success with a packed house. The proposed move to larger facilities at Orange Coast College is in process. Joe will be going before their Board of Director's at the next meeting requesting an insurance waiver. At the last meeting, the membership present agreed that Thursday evening would be OK if the parking fees were not a problem. Word has it, that parking is only 50 cents, so I think we can manage that. The board will keep everyone posted as the process unfolds.

At the Saturday lab we repaired the motor driver board and demonstrated controlling the robot via pcAnywhere. Somehow two of the HEX-FET drivers on this board got munched. We will be upgrading this circuit with larger capacity FET's on this board since our motors have a potential to draw a lot more current than the motors provided with the Newton.

We were able to demonstrate the robot operating under pcAnywhere control at 57600 baud!!!! We started at 19.2 KBaud and increased from there to the present 57.6 KBaud. I was also able to operate the Zortech Debugger which uses multiwindows and did not

notice much display degradation thanks to this high baud rate link. Now I should be able to display the maps being created in the ROBOT in real time. Don Golding has had the robot this past month to assist in software development and as soon as he is completed, I'll start on the display software.

At this month's general meeting Don Golding will unveil the latest version of his soft (vapor)ware and also discuss how we interface to the assemble language TSR that John wrote. This TSR program is needed to provide proper interface hooks to the HPC board. It should also be possible to interface or call to this TSR from any high level language as well.

At Saturday's Lab we will continue investigation of sonar characteristics and navigation errors.

Hope, you ALL can attend. Do you realize that 1991 is now one third over? Let's make the remaining two-thirds of the year really count and move our ROBOT to the next plateau of competence - with a new sensor platform, new bumpers, and RF control link, and whatever you can think of ?????

.....JB

RSSC Robot Laboratory 6 Apr. 91

The Societies monthly Robot Laboratory meeting was held 6 Apr. at Jerry's place. The meeting is held regularly on the first Saturday of the month at 10 A.M. More than a dozen members and a guest showed up and contributed to the activities.

It was discovered that the ROBOT had two blown power HEXFETs on the motor control card. The ROBOT had been operated on carpet and the extra work required to move the machine across the additional surface resistance possibly drew a current that exceeded the FETs power capacity.

Don Golding substituted his new out of the box controller card from his Newton and it too proved to be defective. Roland did some fancy soldering and lifted a pair of parts from Don's card and installed them into the ROBOT's card to get the machine operational again. This card may be satisfactory for the Newton size machines but it has proven to be a problem for our machine. The Newton's are lighter machines than RSSCY. A proposal was made to refit the controller card with larger power FETs to handle the larger drive motors in our ROBOT.

Newtons out of the box are still showing problems. Don Golding's controller card has proven to be defective. Don will have to trouble shoot and repair it. He reports that he still has not gotten his Newton assembled. Don has, however, only been working on it as time allows since December. Don has had problems with his computer board and the power supply did not have the correct connector. There were other problems pertaining to the wire harness. It seems that some

additional engineering and fabrication is required with the kit.

After a short time we finally got the ROBOT running again. We were, however, never sure exactly where it was running. After repairs Jerry put a long serial communication wire on RSSCY and we booted it with "PC Anywhere". The serial link does allow much more freedom of operation.

We are still working on the sonar problem. A second problem is repeatability of movement across the floor. Jerry has demonstrated that RSSCY can not even turn around twice and know where it started. Possibly an external reference and a lot of software is needed to solve both of these problems....RR

RSSC Wireless Communication Link

A report on the current progress of developing an RF link between Club ROBOT and a desk top PC for use as a terminal. The current thrust is to use a cordless phone as the RF portion of the link. The completed project will be presented at the June 4 general meeting. The status of the project seems to fall into the standard two parts. I have some hardware and I have some software.

I currently have an operational wireless link running on the bench between two PC clones. To reach this point in the development, two swap meet \$5.00 modem cards and a K-Mart \$60.00 GE cordless telephone were combined into a working wireless link. The hardware also includes some various and assorted interface goodies to "glue" it all together.

One link end has the phone base, and the other link end utilizes the phone handset. I have the phone and modems operating without any modifications. I am sure this will please the FCC.

Currently, "BITCOM" is running on both ends as the interfacing software. Either keyboard can now operate the other screen in a full duplex fashion. I tried four different communication programs before I got all the bits aligned into an operational sequence. "BITCOM" was the final choice as it seems to offer more flexibility and allows more software control.

To glue the handset to the modem, a pair of transformers was used. One is needed to interface the mike to the modem line and the other interfaces the speaker output to the modem line. A DC blocking capacitor was also required as the mike is powered. These parts were all placed on a small circuit card external to the handset. The handset is currently battery powered and I plan to use 5 volts from the PC power supply and regulate it to 3.8 volts for the handset power. To "get at" this 5 volts, I plan to fabricate a "T" harness for the disk drive power circuit and take the 5 volts from there. This will alleviate the need for the batteries. When the ROBOT's powered up the handset transmitter will also be powered on. The power regulator will also be placed on the printed circuit card. The assembled card will be installed into some type of protective case. This would allow mounting the handset and power regulator case on RSCCY in a proper manner.

The \$5.00 modem is limited to COM1 or COM2. The ROBOT's COM interfaces may have to be rearranged to accommodate the modem. An alternative would be to obtain a more flexible modem that could reside at COM3: or COM4:.

The ROBOT now needs a club PC to communicate with. On the road RSCCY needs an El-Cheepo ACP swapmeet clone for the bench top terminal of the link. I am requesting help collecting the following parts; case, power supply, 2 360k floppy disk drives, 4.77 mother board, some memory chips, clock, serial interface card, parallel interface card, monitor card, floppy disk drive card. We can use the ROBOT's monitor and keyboard. I have the modem and phone link. Would you please look into your parts collections and see if you have something to donate. I'll do you a letter to get you the tax deduction for your donation. For the parts that are not available as donations, I hope to get volunteers to make selected purchases at the next ACP swapmeet to complete the desk top PC end of RSCCY's wireless link.

Part two software.

I am currently working software for each end of the link. The easy end first. On the bench end we can run most any communications link software package. The communications program will load from the autoexec.bat as the machine is turned on. The program needed to be tailored to set up the modem and establish the link upon startup. A script file will perform this required operations.

An autoexec.bat file on a floppy with DOS and the communications software will let almost any one with a modem plug the phone into their modem boot the system from the floppy and operate the link. The communication program will let us send commands and file to RSCCY. The program will also capture all of RSCCY's information to disk and also display it on the screen. I am currently putting this floppy diskette together.

Software on RSCCY's end is not so easy. RSCCY must boot with out a monitor or a keyboard. RSCCY must boot from the autoexec.bat and establish a link via the modem interface. We want to run dos commands and programs from the modem link. For this end I am writing a PORT.COM executable file. The file will be called from the autoexec.bat file. The program will first setup the modem COM: interface. Then the program will send commands to the modem to set it up. The program will then swap the keyboard and screen to the modem interface. Third the program must establish a link. Once the link is established the program should then exit to DOS. The bench end of the link will get RSCCY's DOS prompt and have control. As long as the programs executed on RSCCY mind their DOS manners and not grab the modem interface, hardware communication will be maintained. Ill mannered programs will have to deal with the link problems all by themselves. I'll leave that software as an exercise for its authors.

I hope to present all the hardware and software at the June 4th. general meeting. I think I'll be ready to field questions and demonstrate the wireless link between two PCs. I hope we can install the link on RSCCY at the June 9th. workshop.....RR

ARTICLE REVIEW

For the last few months I have been bringing you a review of various design articles written about robots. Once again for May I bring you the highlights of another much different type of robot. In the March issue of the ROBOT BUILDER I reviewed the "Basic Educational Robot Trainer" called "BERT" for short. In April I reviewed a simple little robot called "KEN". This month the robot is ROBART II of the Naval

Ocean Systems Center in San Diego and is not a kit type of machine. It is being used as a test bed to provide a study in multi sensor detection, verification, and intelligent assessment capability for a mobil security robot.

This is a very interesting and complicated machine and much can be learned from reviewing the design.

Lets start by saying that it is just a simple ten(10) CPU design that takes the development through to the "autonomous wander mode" capability.

The ROBART projects, both I and II was managed and developed by CDR H. R. Everett.

His first ROBART was a project for his masters thesis at the Naval Postgraduate School in Monterey, California.

The complete schematics and instructions for the ROBARTs are not readily available but much has been written and reported about their design. These articles and a lot of effort should be enough to assemble the mechanical hardware and the circuit boards.

ROBART II is his second generation security robot and it is being developed at the Naval Ocean Systems Center, San Diego, Ca. It employs over 128 external sensors and a control hiererchy of nine microprocessors.

It was very interesting that this design simplifies the generation of most of the major functions that our ROBOT has on the High Performance Card(HPC) by the use of distributed processing.

The CPU's are 6502 on single board computer modules and are interfaced via an 8 bit parallel bus and multiplexed RS-232 serial ports.

The design of ROBART's brain board (CPU #1) consists of an SBC that handles the scheduler tasks of the machine and most of the software is written at an assembly language level.

The head positioning of the robot has a scan of +/- 100 degrees and is handled by SBC #2. It services all PWM signals needed to drive the head slew motors, auto track on a beacon, or auto scan functions for the recharging station.

The SBC #3 handles all the sonar ranging functions. It controls which sonar to fire. It cycles all 36 sonars, converts the elapsed time to distance, corrects for temperature, stores distance data, requests permission to transmit data to scheduler SBC, and then transmits data all at once when asked to pass data.

The SBC #4 controls the motor drives. It generates all drive and steering control commands. It outputs the PWM signal to the motor drive board and it also reads the encoder inputs from each motor.

The SBC #5 contains the real time clock for ROBART and also controls the speech I/O. It works in conjunction with SBC #7 & 8.

The SBC #6 handles the vision systems. It controls two(2) 256 element linear arrays which determine range to each obstacle.

The SBC #7 provides all the voice synthesis by controlling a DT1050 chip.

The SBC #8 works with voice recognition and controls the recognition of 256 words.

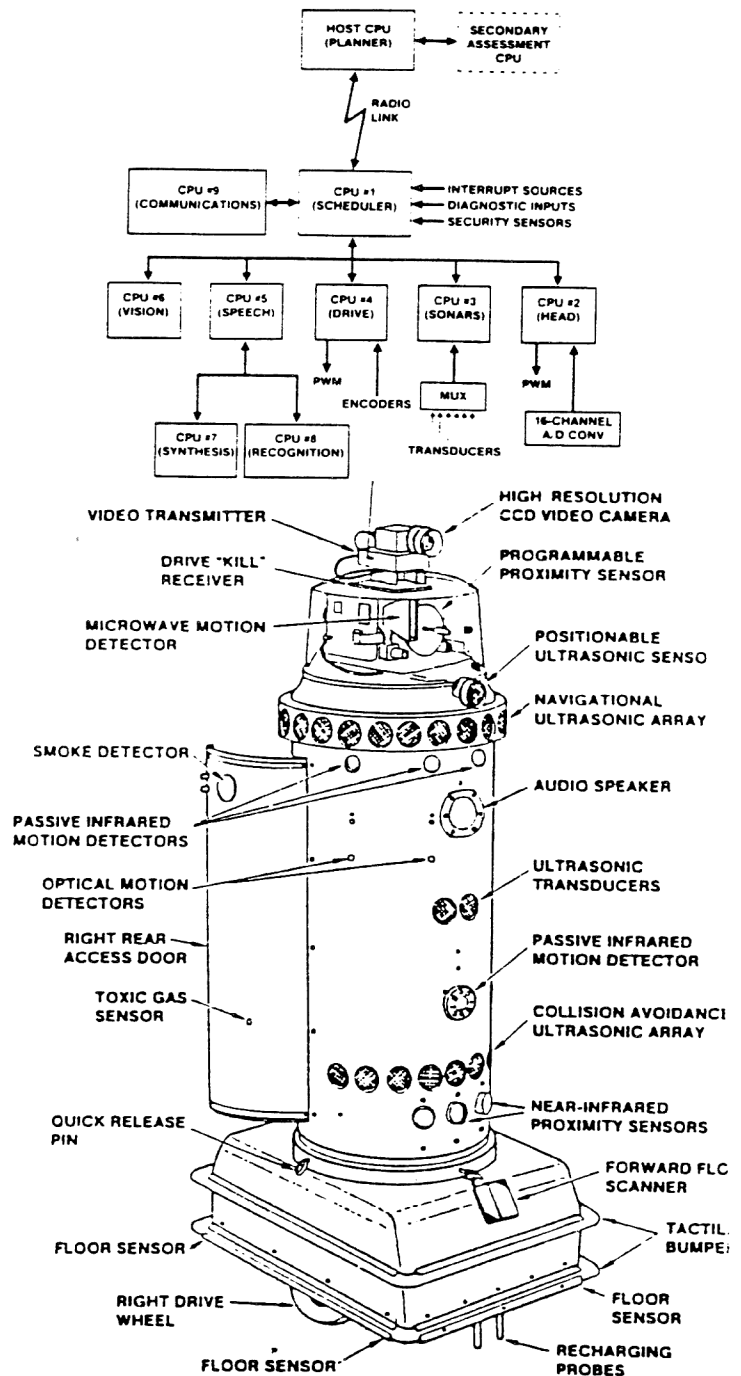
SBC #9 is the controller of the communication function.

Processor # 10 presently is a 386 PC and is running the planner software. This machine is not located on ROBART but is remoted and connected via a 9600 baud modem.

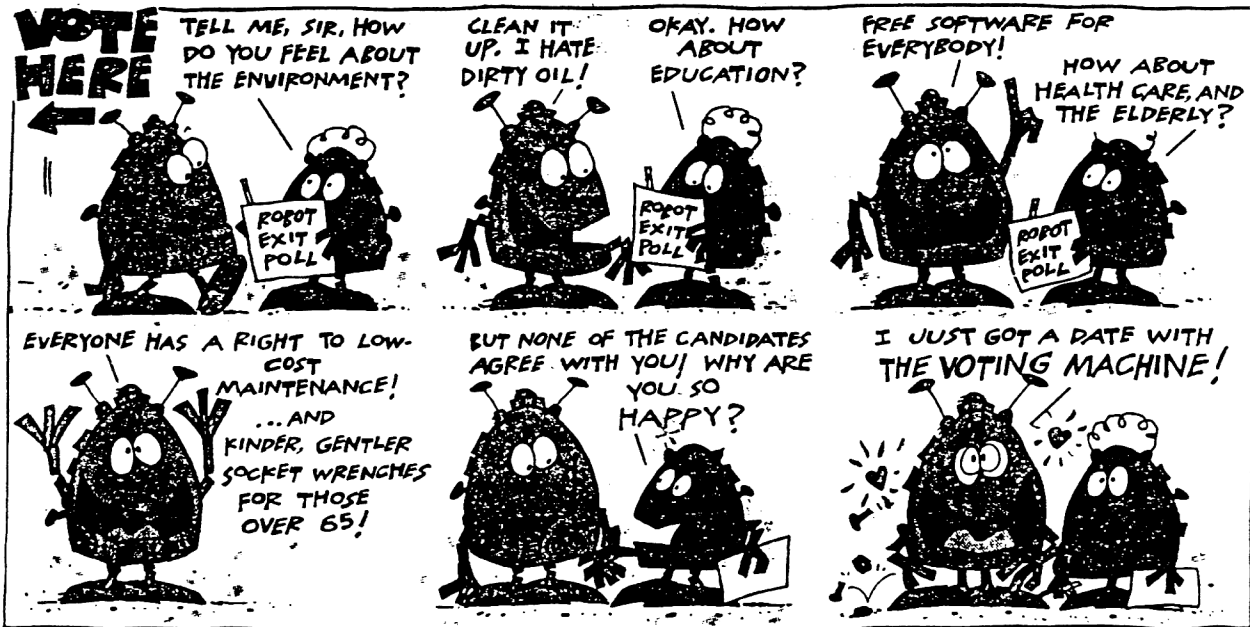
Examine the distributed computer architecture diagram and you'll appreciate the complexity of the effort. This is really tax dollars in action.

This is a very interesting design and I think it has a lot of value to the robot builder. There are some basic building blocks presented here that the club members could easily expand on for bigger and better machines.

This article was found in a ROBOTICS magazine published in Holland. I'll place a copy of the article in the engineering note book. If you would like a copy of your own, see Roger or your editor and we'll see you get a copy.....JJ



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