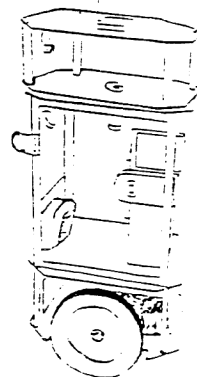


ROBOT BUILDER

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

June 1991

- | | |
|--------|---|
| Jun 4 | RSSC Meeting at MTI College: 7-9 pm
Topic: RF Data Link |
| Jun 8 | RSSC Robot Project Workshop, at Jerry Burton's Lab |
| Jun 27 | RSSC Board meeting, at Jerry Burton's Lab
(Note change of meeting place) |
| Jul 11 | RSSC Meeting at Orange Coast College: 7-9 pm
Topic: Robot Hand (Tentative) |
| Jul 13 | RSSC Robot Project Workshop, at Jerry Burton's Lab |
| Jul 25 | RSSC Board meeting, at Jerry Burton's Lab |
| Jul 28 | ACP Swap Meet |
| Aug 8 | RSSC Meeting at Orange Coast College: 7-9 pm
Topic: SHAN and 2nd Anniversary of RSSC |
| Aug 10 | RSSC Robot Project Workshop, at Jerry Burton's Lab |
| Aug 29 | RSSC Board meeting, at Jerry Burton's Lab |

President's Message

This month Roger will demonstrate the RF modem he constructed from a portable telephone and a couple of 1200 baud modems. Once this is completely integrated into RSSCy we will be able to remotely command him to perform functions without having a cord attached.

Mark added the Hero 2000 arm I loaned to the society, and he also added a 9" video monitor so we can 'see' what RSSCy is seeing as he moves around. We need to add a simple 12 volt regulator and perhaps a separate battery to run the video, running it off the existing supply causes the computer to crash.

I'll try to have a preliminary sonar display available for demonstration for the Lab at my office June 8th. We will also be testing the Covox voice board with Don Golding's new TSR to see if we can avoid the interrupt conflict that we experienced with the Newton HPC drivers.

The ACP swap was successful in that we got about 2 pages of names and addresses of people interested in the Society. This will be the last month that we meet at MTI. Starting in July we will be moving to Orange Coast College the 2nd Thursday of each month, with the Lab the following Saturday at my office. Maps will be available at the meeting as well as in the July newsletter.

Progress continues and RSSCy is getting to look more and more like a real robot. He now has all the necessary hardware to accomplish our goal, all we need is software. I was impressed by the number of people that say they can write programs in C, now is the time for you all to start getting into the programming mode and let's get this guy going. I can use some help in the Navigation area and we need a complete program to control the arm (this will be controlled via the parallel port(s)) - anyone out there interested in writing a program to control an arm ??

For you Forth writers among us, check with Don Golding on how to use his new TSR for control via Forth. I'll be working on developing a C interface to the TSR so that all programs will be consistent.

RSSC Board Meeting 23 Apr. 91

The Society monthly board meeting was held 23 Apr. 91 at Jerry Burton's Laboratory. This meeting is held regularly on the Tuesday before the monthly meeting at 7 P.M. at Jerry's lab. All members of the board were present at this meeting.

Old business included discussion of the following: (1) ACP Swap Meet. (2) Jerry polled the board members for how we were progressing on our individual goals. (3) The topic of the previous monthly meeting was discussed. (4) The engineering note book was reviewed. (5) The possible need for a local (714 area code) bulletin board was discussed.

Roger Ruszkowski's demonstration of an RF link between the robot and a second computer at the 7 May general meeting was discussed. Getting RSSCY off his keyboard and line power monitor are viewed as one of the near term projects that need attention. Roger reported that the current efforts are based on a wireless phone and modem design. Operating range will be limited to the range of the cordless phone. This approach also has a further advantage of not requiring any FCC licenses. It provides two way full duplex communication.

It was resolved that the secretary shall write a letter of thanks to John Monsonides for his effort in creating a TSR interface program for RSSCY.

Mike volunteered to create a letter head for the society.

It was reported that John Bedson has the COVAX voice board and is working on the interrupt problem.

Resolved hardware group will document the change procure for the engineering notebook and install larger FETS in RSSCY's Motor control board.

An effort will be made to contact Odetic's and invite them to demonstrate their robotic hand at some future General Meeting.

It was reported that Joe McCord is still working on an alternate meeting site. The Tuesday night main meeting is just getting too large for the MTI facility. We do like the MTI location and forever our thanks to them for accommodating us on the first Tuesday of each month.....RR

ACP Swap Meet 19 May 91.

The Robotic Society of Southern California was again represented at the ACP bimonthly swap meet. Our thanks to the fine people at ACP who provide us a space up front on the midway. Many of the regular hardware and software activist of the society who shop at the meet helped man the society's booth. Thanks to Tim Louis for going and getting some of his demonstration equipment. One was a talking bear mechanism (less bear skin) and proved to be a real show stopper. Every one wanted to know what made their teddy bear talk.

The Society's Robotics booth at the swap meet continues to attract a lot of interest. We have used a sign up sheet at the last two meets. This way we collect the names and addresses of people who have an interest but who in the past walked away with our flyer and we are unable to reach again. There were 78 names collected this time. We still need to generate a new introduction flyer for a handout at the table. Increasing public awareness of robotics is a society goal. The ACP swap meet has proven to be our best interface with an interested public.....RR

RSSC General Meeting 7 May. 91

The Societies general monthly meeting was held 7 May at the MTI College. The meeting is held on the first Tuesday of the month at 7 P.M. at the college in Orange. This months meeting was again a packed event. Attendance exceeded 30 people.

Jerry started the meeting with introductions and welcoming of new faces. The main topic for the evening was a discussion of the development of a future operating system for the RSSC robot. After the break old and new business was entertained in an orderly manner. Then things wandered a bit as formal procedures gave way to random access. The meeting adjourned at 9 P.M.

We had 4 new members this month who were attracted by the Orange County User Groups listing in Coast Compute. The listing runs in every issue of the magazine. The Coast Compute listing and the ACP swap meet are our leading avenues of new members. Thank you Coast Compute for your User Group column.

New business was limited and the Robot Laboratory was set for Sat 11 May. The next business meeting was set for 28 May. The next general meeting was set for 4 June at MTI College.

Don Golding talked about the Terminate Stay Resident (TSR) program that has been developed for RSSCY. This program is a major step forward in our software development. With this TSR, the programmers can devote there efforts to solving Robot problems as opposed to solving hardware interface problems. The TSR allows any language to be utilized as a control program without linking and maintaining the hardware interface routines in each control program.

Don also moderated some group discussion on the future of control programs. Program size

since the days of 64K memory machines has been and will still be a problem. Robot control programmers are still going to be maintaining and creating overlays. Learning to use other peoples code and methods will help improve our productivity.

Don envisions a dynamic learning robot. The control program is not going to store this new knowledge in random access memory but rather on hard disk. The control program will create new files and store things it has learned in file data records. The files will have data formats the control program can access and update. The file data arrangement (data structure) will have pointers to other files that contain related information. This yields a dynamic, learning, self modifying system. The control program itself does not change. However, the knowledge the system has can change and be updated, corrected or enlarged. Some disk space management routine, in the control program, will by heuristic rule, determine what old file knowledge should be deleted to make room for new knowledge. Another control program routine will create files and manage the file list. True control programs are not going to be a couple thousand line of code. Getting to the beer and back is going to be more work for RSSCY than play.

Jerry polled the group for language preference. Some liked "C", others liked FORTH and some even use BASIC. Some discussion of the bulletin board was conducted. The board offered us by Kevin is not proving to be exactly what the members need. The software programmers would like to use a board as a place to exchange information and create control software. Jerry has offered a phone line at his shop in the 714 area code. However, a dedicated machine and program is needed. Disk space is also a true problem and so is

multi line access. "C" is the language of today but FORTH will be the language of the future.....RR

EDITORS CONCERN

Hey gang, our Saturday's workshop attendance is low and I wonder why. I've had troubles in the past making all the workshops but I've been able to attend most of the meetings. There are quite a few of you that I don't see there. I feel that our society is not serving everyone properly. How can we as a society serve your needs. Please give us your suggestions on another time, another day, another place or what ever and we'll work on it.....JJ

ACTION ITEMS

These are some of the current items needed for the completion or expansion of the club ROBOT development.

1. The "DOCKING STATION" This station will be used for charging and must have an automatic interconnect. It also requires some type of identifier for the ROBOT as to its location.

2. "RF LAN". This requirement is needed to assist in the debugging and monitoring of the operation of the mobile ROBOT's computer program. Roger has developed an RF link for us and will demonstrate the LAN at our next general meeting.

3. Sonar beam focusing. The present Polaroid transducers have a rather wide (30 degrees) beam spread. This item has been worked on by your editor and now a few others are helping. Newest twist in focusing seems to be the pulsing of multiple transducers to reduce the acoustical beam width.

4. Sonar return signal amplitude.

Jerry B proposed this action item. He needs amplitude information from the sonar return to allow more exact determination of the pointing angle to the reflector or obstacle. He is going to use a board out of a HERO ROBOT that will allow the recording of the return amplitude.

5 New alternate for the HPC board. The source for additional HPC and motor control boards seem to be exhausted. The other members and new members starting a ROBOT project need the HPC functionally. The design of this functionally and the selection of a common processor is needed. A special Special Interest Group (SIG) will be set up to pursue this item.

6. Valid replacement for the TI board. There is additional effort needed to thoroughly evaluate the COVOX concept and to integrate it into the ROBOT's functionally.

7. Heading sensor. Heading sensor is required as part of the design of our autonomous ROBOT system.

These are the currently identified needs of the RSSC. There is more than enough to keep us busy for the rest of the year. As you have ideas and potential solutions to any of these problems, call Jerry B and bring it to the general meeting.....JJ

RF Land

I saw in a trade journal, an interesting review of a R.F. Lan connection. I thought to my self, this is what we need for the R. F. interconnect from the ROBOT to the control terminal.

This device is a 243 Kbaud spread spectrum FM system operating in the 902 to 930 MHz band. The RF output was 100 mv and has a range up to 1500 ft. Nice system but the cost is quite high. I called the company and got some literature, information and pricing. In small quantities the cost was quoted as \$1600 for a pair of stations.

I think Roger R. is doing a great job generating an RF link with the use of a wireless telephone and some modem chips. The present wireless telephones operate in the 49 or 75 megHz channels and the modem chip operates at 1200 Baud.

I feel, however that a system could be implemented on a smaller scale or more compact design for the second generation link useful to other ROBOTS within the club membership.

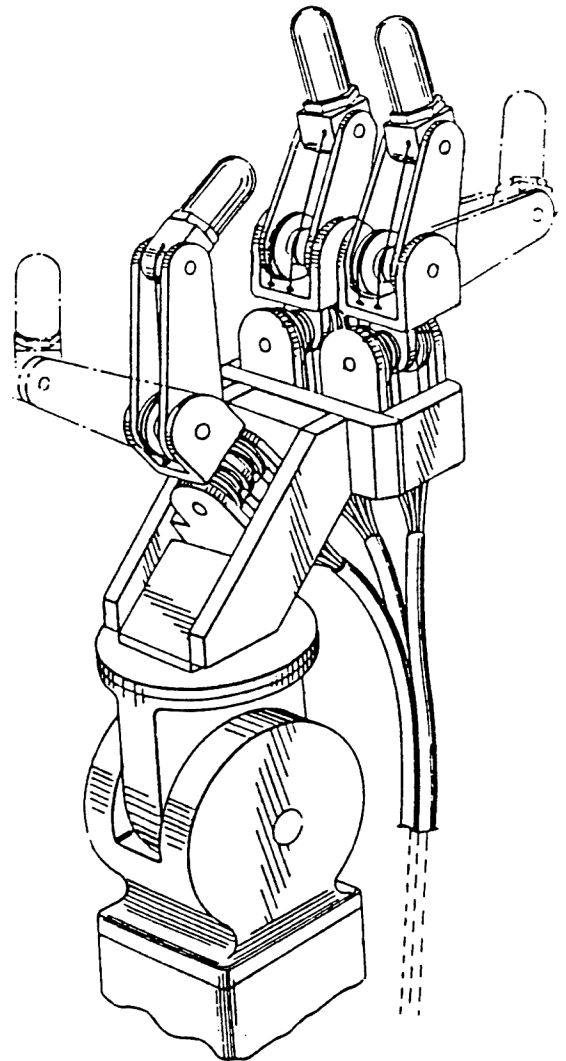
The spread spectrum technique allows a wide distribution of the RF output power across the band. This reduces potential interference because of a lower average power distribution vs frequency.

After reading again, the Part 15 of the FCC regulations that discusses low R.F. power unlicensed transmissions, I feel that RSSC could develop a miniature FM Lan connection system for communications between computers. Any thing with an "input" to the final RF stage of 100 milliwatts or less can operate without a license. The 100 MW limit would allow us to communicate the short distances needed between ROBOT and local computer.

I looked in some linear device books and identified a couple of wide band FM chips to consider. The FM transmit chips also have a matching receiver chips. This would seem to be a good choice as the circuits are almost self contained, needing very few external parts to make the chips work. Maybe Roger R. would lead the second generation SIG if we asked him?JJ

END EFFECTOR

I have been researching literature in support of the training classes that the RSSC is developing and I came across a hand design that I thought was rather unusual. This hand has the normal bending joints needed to make a fist or grab something but it also has some vertical joints that will allow the wiggling of the fingers from side to side. This hand can twist a small object like a screw or a nut without having to rotate at the wrist like all the rest of the end effectors. I pass it along for your information.....JJ



Mobile robots tackle the wide world

From bartending to nuclear cleanup, mechanical 'men' find jobs beyond the factory

Newton, MA—When automation giant Cincinnati Milacron announced last fall that it would quit making factory robots, analysts saw it as one more sign of a deeply troubled U.S. robotics industry.

Yet beyond the factory work cell are new breeds of mobile robots that perform tasks ranging from hospital care to weather forecasting. These robots often far exceed factory robots in computing power, communications capabilities, sensing, and manipulation skills.

In all, says Vincent Altamuro, a New Jersey-based robot expert and member of the *Design News* Engineers Council, companies have developed about 100 models of mobile robots. He predicts enormous growth in the technology if designers tailor hospitals, homes, restaurants, and other environments to use these mechanical servants.

His view is shared by William "Red" Whittaker, director of the Field Robotics Center at Carnegie Mellon University, Pittsburgh. He envisions expanding uses for mobile robots in applications dangerous to humans, such as toxic waste disposal and repair of oil rigs and space structures.

Hospital helpmate. No one is more excited about the potential of these "robots on the go" than Joseph Engelberger, one of the original pioneers of industrial robots in America. His Transitions Research Corp., Danbury, CT, has developed the \$55,000 HelpMate™ robot, now being used in Danbury Hospital to bring food and medicine to patients, carry medical records and blood samples, and dispose of contagious wastes.

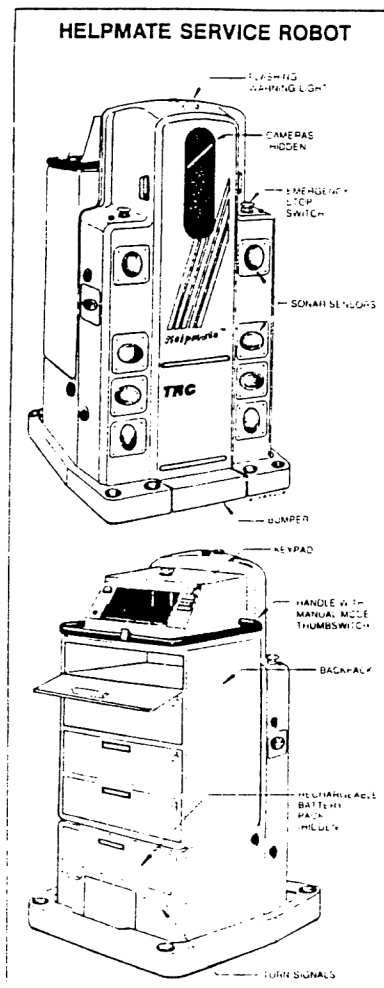
Powered by four 12-V batteries, the 350-lb, 4-ft-tall robot cruises hospital floors on pre-programmed routes. It navigates with the help of 18 sonar sensors, four infrared sensors, and two cameras. Touch sensitive bumpers automatically stop HelpMate if it strikes an object. Authorized users log in instructions on a simple keypad located on the robot.

TRC will build 25 HelpMates in its next release, says Engelberger. Six companies, including 3M, Maytag, and Black & Decker, are funding a study with TRC on household robots. Marriott has asked the company to explore use of robots to clean hotel rooms.

"Since 75% of our economy is service related, it stands to reason that the market for service robots could potentially be very much larger than the market for factory robots," says Engelberger.

Music to pizza. Among others now developing such robots:

- Robot Aided Manufacturing Center, Red Wing, MN, designed a robot that dispenses compact discs in a music store (See *Design News* 3/26/90). It also has produced a robot French-fry maker being tested by McDonald's.
- Carnegie Mellon's Center for Human Service Robots has developed a robot that makes pizza and can be operated by a handicapped or elderly person through a Macintosh user interface.
- Honeybee Robotics, New York City, took a state-of-the-art, 750-lb industrial robot and transformed it into RoboTender™, an interactive bartending system that operates within a circular enclosure. Patrons order drinks manually on a computer keyboard or touchscreen or verbally through interactive software. The one-armed RoboTender, the



HelpMate, a 4-ft-tall mobile robot, helps with delivery chores at a Danbury, CT, hospital. Robot depends on 23 sensors.

customized hand of which is equipped with weight and pressure sensors, mixes a cocktail in 25 seconds.

Space chores. Honeybee's work goes well beyond novelty robots. The company has garnered 18 NASA-sponsored contracts, including the design of the hands, feet, and tool system for the \$300 million Flight Telerobotic Servicer (FTS) that will assemble Space Station Freedom. Among the challenges: Engineers must equip each

hand with two backup parts to insure that the robot never drops anything in space. The hands also will feature a gripper drive and a rotary device to interface with a screw-driver or other tool.

Carnegie Mellon's researchers also are busy on space robotics projects, including the Self Mobile Space Manipulator, a sensor-laden, five-joint robot. It is designed to anchor one of its two gripper-type feet into the nodes of a space structure, while another appendage manipulates tools.

Another major CMU effort: "Ambler," a six-legged, 12-ft-tall autonomous robot designed to traverse the rough surfaces of the Moon and Mars, while providing a stable platform for sensors, scientific equipment, and sample tools.

CMU's Field Robotics Center has set up a spinoff company, the Pittsburgh-based RedZone Robotics, Inc. Among its first designs: a teleoperated system for remote, non-destructive inspection of nuclear reactor vessels.

Other programs to develop mobile robots cover a wide span of applications:

- Researchers at Sandia National Labs, Albuquerque, NM, have developed techniques that enable robots to map and remove radioactive wastes from underground storage tanks.
- Foster-Miller, Waltham, MA, a veteran maker of bomb-disposal robots, is working on the "pipe mouse," a mobile platform with sophisticated sensors to spot natural gas leaks in pipes as small as 3.5 inches diameter.
- Aurora Flight Services, Alexandria, VA, will conduct its first engineering tests this year on Perseus, a new drone that gathers data on the high-altitude atmosphere, including studies of ozone. Patterned after the Daedalus, a human-powered craft that set distance records in 1988, the drone's wings and airframe

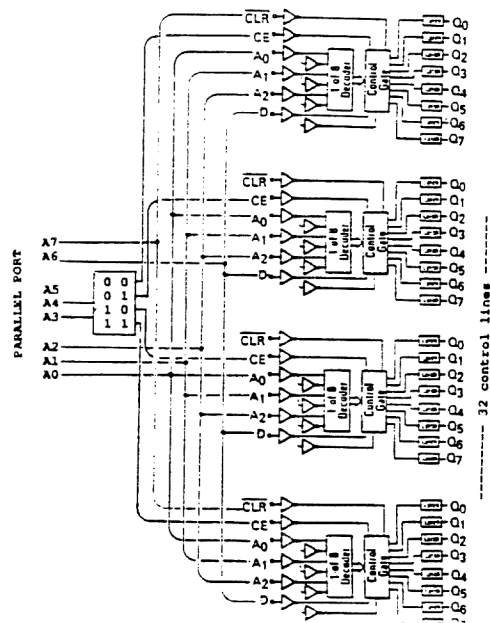
are fashioned from ultra-light carbon-epoxy fibers. Propelled by a small piston engine, Perseus will fly a 110-lb payload of instruments for an hour at altitudes up to 100,000 ft.

In the coming decade, these and many other mobile robots will present exciting opportunities for de-

sign engineers and vendors that supply them. Says Whittaker of Carnegie Mellon: "It's a very fast-moving field that depends a great deal on the components that contribute to it—computers, software, sensors. The technology has demonstrated its competence. Now, it's time to capitalize on it." □

INTERFACE CIRCUIT

This is a suggested interface circuit to implement 32 independent outputs from a parallel port of any computer. It requires 4 control chips, 1 select chip, perhaps a 5 volt regulator and some decoupling capacitors. A0, A1 and A2 are the chip select lines driving the 1 of 8 decoders. A3 and A4 are used to drive the 1 of 4 decoder for chip select. A5 is an expansion line. A6 is used for disabling each individually selected chip. A7 is used to clear all 32 lines.





Microwave Sensors Offer:

- Non Contact Measurements
- Superior Performance in Harsh Environments
- Velocity, Presence and Motion Sensing Capability
- Low Cost/High Performance

Put our ALPHASENSORS' microwave technology to the test—order our MSM 10200 Motion Sensor Evaluation Kit—\$195, delivered from stock. For more information, call or write:

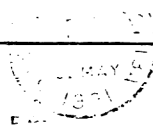
Alpha Industries, Inc.
20 Sylvan Rd., Woburn, MA 01801
Tel: (617) 935-5150 • Fax: (617) 935-4939

SENSORS

This section of the ROBOT BUILDER is to cover various sensors required by an autonomous machine. This microwave unit is being identified this month in this column because it is showing up on many of the autonomous ROBOTS and it was carried on the ROBART II machine reviewed last month. I'm sending for literature and pricing so we'll have the information to make the discussion to pursue the application of this type of sensor to supplement the acoustical sensors. This information will become part of the engineering notebook to remain available to all members that may have a need for the data.

If any of you identify an interesting sensor that you think may be applicable to the general category of autonomous robotics bring it to the clubs attention. We may even want to include it in the resource data file/book.

Robotics Society of Southern California
P.O. Box 3227
Seal Beach, CA 90740



Roger Ruskowski
18409 Renault
La Puente, CA 91744

064