Robot Builder

The Official Publication of the ROBOTICS SOCIETY OF SOUTHERN CALIFORNIA
Post Office Box 26044, Santa Ana, CA 92799-6044

PRESIDENTS MESSAGE

by Jess Jackson

Sojourner, the little robot now operating on Mars is continuing to turn in outstanding performances. It has proven that it can recover from the nippy nights as it warms the following day. It has been scurrying about the Martian landscape at the direction of the JPL operators. Of concern are the two times that it has collided with rocks and the onboard tilt sensor/computer had to terminate the move before the rover got into trouble.

The Sojourner has now exceeded its design life by many times. I hope the JPL operators don't get over confident in their many successes and make a disastrous mistake that disables or gets the rover hopelessly stuck.

But in the mean time, our hats off to a little machine toiling on a remote planet millions of miles from home. It displays the grit, the nerve and the spirit of a great warrior as it shakes off each frigid night and struggles to return to work the following day. May the FORCE be with you, little explorer.

SPECIAL NOTICE: FAIRE97

The Fair is Saturday, September 6, Cal State Fullerton, University Center, 10:00 AM to 4:00 PM. The University Center is located on the east side of the campus and can be reached from the Dorothy Lane entrance off of State College. As you turn on Dorothy Lane the University Center is the big building in front of you. Turn left and use parking lots B or K to the north of the building. Parking permits are not required on Saturdays.

Our society is supporting the RSSC student chapter this year. So be there at 8:30 or 9:00 to set up everything and we'll host the public and have fun at 10:00. We're located in the FIRESIDE LOUNGE room for our competitions and exhibitions. They have provided the ONTIVEROS room for our speakers. University center is an outstanding facility and it is busy that weekend.

Bring your robot projects for all to see and to compete in the games. Tables will be supplied for displaying robots and projects. This should be a fun time to show off our projects to the students and the general public. (continues on page 2)

In This Issue

Faire Committee Meeting

Date: September 13

Time: 11:30 a.m.

Place: CSUF EE 321

Debriefing

ROBOT FAIRE
SATURDAY SEPTEMBER 6, 1997
CALIFORNIA STATE UNIVERSITY FULLERTON
UNIVERSITY CENTER
10:00 AM TO 4:00 PM

Presidents Message (from page 1)

MONTHLY RSSC MEETING – September 13

I am writing this message about three weeks early to give our editor time to publish, print, fold, address and mail your ROBOT BUILDER to you before the ROBOT FAIRE97. At this time the program is not complete but the tentative schedule for the September 13 meeting will be as follows:

12:30 RSSC business meeting (short one)

1:00 General meeting (needs to start immediately)

Topics (tentative)

Welcome new members(from the fair)

Open forum discussion of problems and membership projects.

New product items

Thermal imaging

Recent Small Robot developments

3:30 adjourn

ROBOT WARS 97

It was estimated that 1500 people attended Robot Wars 97 at HERBST PAVILION at Fort Mason center, San Francisco three weeks ago, Aug 15/16/17. The LA TIMES had a good review in the Wed Aug 20, Life & Style section.

This is the forth year for the event created by Mark Thorpe. He stated that their will be another contest in London in December97 and an East Coast tournament is in the planning stage. It sure has come a long way from the 1994 one day event with 18 contestants to the 1997 three day event with over 100 robots with 70 contestants. The tickets for all seven events over three days were about $80.00. It's almost cheaper to enter a robot because tickets are included as part of the entry fee.

Some of the highlights of the contest are as follows: Blendo, a returning entry is a 150# machine that rotates an outer cutting ring at about 400rpm. This machine is dangerous, as it stores more energy for quick release than any other competitor that I have seen. Looking at it up close, I estimated that the rotating ring, about four foot in diameter, weighed a minimum of 60#. When the gas engine accelerates this weighted flat ring with cutting teeth to full rotational speed, it stores massive quantities of energy. This machine was ultimately disqualified as being too dangerous after it ripped metal pieces off a competing robot and shot it across the arena like a cannon ball into the plexiglass safety wall.

A very unique robot showed up, a Snake – a huge metal serpent created by Mark Setrakian. He competed with a mechanized scorpion and it was not a spectacular match but it was interesting as the serpent wound itself around a SCORPION bot for the win.

In the heavy weight division, a very low & fast robot named Biohazard built by Carlo Bertocchini of Belmont, Ca, defeated La Machine and was a $2000 winner for his trouble

Our member, Dan Danknick entered a robot named ALEXANDER. Its predecessor AGAMEMNON was a 6mph tractor. Alexander flies with a top speed of 20 mph. Alexander fought its way through six battles to qualify for the championship showdown against VICIOUS 1, a creation of Mike Reagan of Los Angelus.

Dan had to forfeit the final match as Alexander needed a motor replaced before competing in the final bout. The Judges ruled against giving Danknick the 45 minutes to replace the motor. The mechanical problems possibly robbed Alexander of a first place win. Although beaten but unbowed, this machine was awarded a second place prize. Knowing Dan, I'm sure this bot will be represented in next years ROBOT WARS competition

Alexander had as weaponry, a pneumatically driven punch, a saw arm with an 8-inch carbide-steel blade named the edger, and a rear mounted cable, releasable from a compartment to entangle and trip up less balanced adversaries when needed.

See you at the fair... Jess

What is an Agent?

Lynn Andrea Stein
Artificial Intelligence Laboratory
Massachusetts Institute of Technology

"The fault, dear Brutus,
lies not in our stars
but in ourselves,
that we are agents"
Shakespeare, Julius Caesar

What is an agent?

This special issue of IEEE Expert is full of articles and arguments about different kinds of agents. There have been similar special issues of other magazines and journals, as well as numerous workshops and conferences all organized around variations on this same topic. In each of these venues, people talk about agents as though the term had a single universally agreed-upon definition.

Surely, if agents are a coherent enough research area to have generated all of this research -- not to mention the significant popular attention that the topic has received -- we should all be able to agree on what we mean when we say the word.

I would argue not.

As evidence, I offer three observations: First, you can find almost any piece of software called an agent somewhere, by someone. There are calendar agents and locator agents and even document-formatting agents -- which in another lifetime might have been called word- processing programs. Second, two programs which seem equally deserving of the "agent" title may share few if any properties, and certainly none that are obviously necessary or sufficient for the bestowing of agency. For example, a program that advises you which musical recordings you are likely to enjoy and another that routes your faxes might both be (and have both been) called agents, but share little in the way of architecture, interface, or functionality. Finally, a definition that

includes only those programs possessed of every possible "agent-like" property is so narrow as to be ludicrous (if not vacuous), while a definition broad enough to encompass most things we're inclined to call agents necessarily admits a whole host of things that don't seem very agent-like at all.

In short, there isn't a viable definition of agency. Neither the research community nor the software (or hardware) developers nor the popular press nor anyone else really has a reasonable working definition of what it takes for some particular program or artifact to be qualified as an "agent". Further, I don't believe that we will ever -- or should ever expect to -- be able to come up with a satisfactory definition which allows us to determine whether a particular system, in and of itself, is or is not an agent.

Nor, I will argue, is this entirely a bad thing.

You see, I believe that whether something is an agent is not an objective property of that thing. Instead, agency is a subjective judgement made by an external observer: this program is an agent for me in this particular context.

Of course, this means that one particular program -- say my text-layout agent, aka my word processor -- might be something that *I* regard as an agent and *you* don't. And it means that I can pretty much regard anything I want as an agent, though you're under no obligation to share in my view.

Doesn't this make the whole notion of agency useless?

No, I don't think so. Here's why: My regarding something as an agent does mean something, it just doesn't mean that thing about the artifact in a vacuum. Saying that this particular program is acting as an agent for me means that I'm entrusting some responsibility to that program. It says that I allow and expect it to act on my behalf, in my interests, and in ways that I can not or do not or at least am not doing for myself. It means that, rather than treating the program as a *tool* that I use and control, I am treating it as an *assistant* (for a while the term *associate* was popular) empowered to act at least semi-autonomously.

Of course, one man's autonomy is another woman's tool, or vice versa. What I choose to regard as a successful case of delegation -- the program takes care of the responsibility for me -- may be what you think of as merely the intended functionality of the particular software device at hand. It means that my word processor is thoughtfully taking care of rearranging the bits of the characters I type in to make visually pleasing word-images appear on the screen, while yours is merely putting the letters where you tell it to. It also means that my mailer may be an intelligent automaton capable of ensuring that my missives traverse the interconnected highways and byways of cyberspace, while yours merely piggybacks on a series of dumb network protocols. To each his own.

When it comes to robotic agents, we're a bit more forgiving. It's easier to see that a robot is doing something on its own, though in fact it may do quite a bit less and certainly less for anyone. This means that, by and large, anything with enough get-up-and-go to get up and go on its own has a good chance of receiving general regard as an agent. There are certainly exceptions, though. A teleoperated robot doesn't necessarily seem so agent-like, nor does a robot that performs the same repetitive assembly line part placement over and over again.

What makes a program an agent, then? My regarding it as one. And I'm more inclined to regard it as one if it's relatively more autonomous, trustworthy, intelligent, encapsulated, functionally complete, mobile, intentional, active. This means that each of these should be -- and is -- an issue for agent research. They are rightfully the domain of this community. But none of these properties in and of itself makes the program an agent: it is my relationship to the program, rather than objective properties it might possess, that qualifies it for agency.

In short, the emergence of the term AGENT represents a fundamental shift, not in our programs themselves, but in our relationships with -- and expectations of -- our programs. It is not an all-or-none transformation, nor did it happen overnight. But it has unquestionably happened, and continues to happen, as we increasingly regard our programs as helpmates rather than tools, agents rather than instruments to our hand.

Battery System Design

Staff

In a battery powered system, time is the critical parameter. Unlike ac powered systems, a battery can only supply power for a finite time before it requires recharging or replacement. In addition, as the battery discharges, the greater the current drain, the greater the drop in battery voltage (or supply rail).

The key to designing an efficient battery operated system, then, is (a) to maximize battery life by minimizing the current drain, especially the continuous "quiescent current"; and (b) to maintain the voltage supplied to the load at a constant level during discharge by using some form of regulating circuit between the battery and the load. For example, a battery with a capacity of 100 mA hour powering a circuit that draws 1 mA will operate for approximately 100 hours before recharging or replacement is required. If this quiescent current is reduced to 100 uA, the battery life increases to about 1,000 hours.

Why Use Voltage Regulators?

Before designing any battery operated system, it is important to understand the basics of regulating a battery's output. A voltage regulator between the battery and the load keeps the supply rail constant during battery discharge. This can be important for several reasons. Among them:

- With op amps and other linear devices, changes in power supply voltage can unbalance the dc input offset voltage from its pre-trimmed value. In some cases, this slight change in offset can affect the accuracy of the system. Most precision op amps exhibit a power supply rejection (PSR) at dc on the order of 120 to 100 dB. this is equivalent to 1 to 10 microvolts per volt of supply change. If the supply (battery) voltage were to drop from 5.0 V to 3.0 V, then the shift in input offset voltage would be

$$DE_{os} = \frac{DV\ supply}{PSRR}$$

For a supply rejection of 100 dB (0.001%), this equates to an offset change of 20 uV, representing a substantial number of degrees in a temperature monitoring system using sensitive B, R, and S type thermocouples, with temperature sensitivities on the order of 10 uV/C or less.

- Some designers may use the supply rail as the reference for analog to digital and /or digital to analog converters. Unless the measurement is ratiometric, the use of raw battery output as a voltage reference can lead to accuracy problems. For example, a two volt shift in battery voltage can cause a 40% drop in the scale factor of a data converter. An n-bit converter (A/D or D/A) has a least significant bit (LSB) weight of Vref/2n. Comparing 5 V with 3 V of supply voltage, used as a reference,

2^n	5 V	3 V
2^{-12}	1220 uV	732 uV
2^{-16}	7600 uV	46 uV

Voltage regulator devices are useful in stabilizing supply or reference voltages. They hold output voltage at a constant level until the regulator reaches its "drop-out" voltage, i.e., the value at which the regulator can no longer hold its output constant. Using a regulator does, of course, require somewhat higher battery voltage, but a low drop-out voltage can minimize the use of additional cells.

Extending Battery Life

Three ways to extend battery operation are:

- minimize the quiescent current if continuous operation is needed;
- pulse the load on and off so that the battery operates on a lower duty cycle;
- power down the circuit when not in use.

Minimizing quiescent current

The overall quiescent current in the system can be minimized by either proportionately increasing the values of all the bias resistors in the circuit (not always a good idea, since it can lead to higher levels of resistor noise) or using monolithic devices, such as op amps and data converters designed to operate from a single 3 V to 5V supply rail at low power (>1 mA) or micropower (<100 uA) levels.

Pulsing the load on and off

This is a useful approach when sampled measurements are required. Some op amps have a TTL "sleep" control input, which permits a load drawing, say 15 mA, to be periodically switched on and off, with a residual quiescent current drain of 5 uA.

Powering down the circuit

Powering down the circuitry (the general case of pulsing the load on and off) is another way to conserve battery power. Like the pulsed case, it has some potential problems that need to be understood before it is implemented.

RSSC History - Five Years Ago

Tom Thornton

"Well we did it! Sunday August 2nd the First Annual Robot Faire of RSSC became a reality and it was incredible! - Jerry Burton, RSSC president commenting on the fair.

(Editor's Note: As you read this the Sixth Annual Robot Faire of RSSC will be only a fond memory, having occurred on the 6th.)

Jess Jackson is the new editor of The Robot Builder.

Jess Jackson authors a column on Sensors including "whisker" detectors and LED/PhotoTransistor pairs.

A Robot Vacuum cleaner industrial version is estimated to sell for 15-20 thousand dollars.

The "Idea Forum" is founded by Jess Jackson wherein he proposes a fish following 'bot to assist commercial fishers track fish schools at sea.

RSSCy (You do remember RSSCy don't you?) The original club robot was under repair by Roger Ruskowski, having suffered a dead battery at the Faire.

SuperCharger Alkaline Battery Rejuvenator

Staff

From: brett@micromed.com (brett miller)

Subject: SuperCharger Alkaline charger RVW

Review of the SUPER CHARGER Alkaline battery re-charger

You may have seen the info-mercial on TV staring Dick Clarke, which advertises a product called Super Charger, by Buddy L. It claims that this charger will recharge ordinary, alkaline batteries, such as Eveready, Duracell etc. The product is not related to Rayovac's new rechargeable alkaline system.

I ordered the portable model 8001 in early July, and it arrived in late October. I have heard much debate over whether alkaline chemistry can be recharged, and I was very skeptical about this product. It cost around $40. Construction: The device is made in China. It appears to be fairly well made. It has a switch on the side to select either Alkaline or NiCad charging. I opened the unit up and found a 28-pin custom IC, that bears the name of Buddy L. There are some other common passive components and 4 transistors. There are 4 LEDs on the unit to tell you when each battery is finished charging ON = charging, SLOW BLINK = done FAST BLINK = battery can't be recharged The charging scheme seems to be constant current at 14 mA. No AC component was observed on the DC output.

HOW DOES IT WORK?

TEST #1

My first test was to take some slightly used AA Energizer batteries with a starting no-load voltage of 1.4v. I put these in a 2-cell flashlight and ran it for 1 hour. The resting no-load voltage was now 1.23v. I put them in the charger and charged them up. One of cells stopped charging after 30 minutes, while the other took over an hour. The final no-load voltage of the 2

"recharged" cells was 1.27v for one of the cells and 1.33v for the other. Recharging the cells a second time did not raise the voltage any. In fact, it caused one of the cells to drop in voltage. The manual says that 1 hour in a flashlight is a pretty heavy drain, but the batteries could last "0 to 2 times longer". So maybe my test was too tough for the charger. I think the increased voltage after the charge may be no more than the natural recovery process of the batteries.

TEST #2

I took 2 AA Energizer Alkaline batteries with an initial voltage of 1.59 v. each, and placed them in my Sony portable CD player. The manual states that the batteries should last 5-8 times as long if I recharge them after each 1 hour of use. After 1 hour in the CD player they each measured 1.39v. I also put another set of batteries in the CD player and ran them for 1 hour. This second set is my control set. Instead of recharging the control set, I just let them recover on their own, for the same time as the other cells took to recharge. I repeated this process until the batteries were dead. (all batteries were from same mfg. lot)

Super Charger set	Control Set	Fresh Batteries ..... 1.59 v	1.59 v		
After 1 Hr. in CD player	1.39 v	1.37 v	Recharge/self-recovery (55 min)	1.44 v.	1.43 v
Second hour in CD player	1.30 v	1.30 v	Recharge/self-recovery (200min)	1.44 v	1.40 v
Third hour in CD player	1.27 v	1.25 v	Recharge/self-recovery.(20 min)	1.33 v	1.33 v
Fourth hour in CD player	1.26 v	1.26 v	Recharge/self-recovery.(120min)	1.35 v	1.34 v
Fifth hour in CD player	1.21 v	1.18 v	Recharge/self-recovery.(125min)	1.33 v	1.31 v
Sixth hour in CD player	25 min (died)	14 min (died)	Recharge/self-recovery.(120min)	1.30 v	1.29 v
last run in CD player	8 min (died)	6 min (died)			

THE BOTTOM LINE

Send it back! As you can see, the charger made no real difference in how long the batteries lasted. Alkaline batteries normally go up in voltage slightly when they are taken out of use (load removed). It seems that this Super Charger does nothing that the batteries won't do by themselves. Battery operated devices are normally used for portable applications. If you follow the manual, you would need to remove the batteries every few hours (or every 15 minutes for some devices) and recharge them! The inconvenience of this makes using the Super Charger a real waste of time (not to mention trying to keep track of how long you run each battery operated device). I did not test this for Nicads. $40 for a NiCad charger is a bit steep. Please distribute to expose this fraud

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AI - History and Definitions

Staff

In any presentation about artificial intelligence (AI), it is important to start out with some information that can help in providing a perspective for the field. AI as a discipline is less than forty years old; however, a central study within the field has perplexed mankind for thousands of years. The ancient Greeks were very concerned with developing a theory of knowledge and many of the questions they tried to answer are still key to the field of AI today.

First of all, what is knowledge? Is there any strict, dictionary-like way to define this notion that everyone is comfortable with in everyday usage? Is there a definition that does not rely on intuitive notions? Secondly, what is it that people have in their heads (or wherever) when they know something, what does knowledge look like, can it be replicated, and how should we relate to it? Finally, is all knowledge expressible in words and if not, what kinds of knowledge can not be adequately expressed? As an example, everyone "knows" how to move their arms up and down but how could one tell someone else how to perform such a simple movement? Most people can only provide something like "Just move your arm up". However, directions such as these are not adequate to allow someone to actually move a limb.

Questions about the nature of knowledge are all very old in that they have intrigued mankind for thousands of years. Clearly, the ancients were not interested in modern automation issues, so there is no direct link form them to today's artificial intelligence efforts. However, a theory of knowledge is central to most endeavors in AI because of a great concern for the representation, categorization, transference, and usage of knowledge.

In many ways, AI itself cannot be discussed without a reference to such a theory and progress in many areas of AI depends on progress towards answering many of these age-old questions.

Some say that AI has been "oversold", that many promises were made by those in the field and that these promises have not been fulfilled. However, understanding the nature of the questions addressed by those working in AI makes this "slow" rate of progress more comprehensible. AI researchers have wrestled with questions about knowledge for only minute amount of time when compared to all the great philosophers who have examined these issues. In the light of this comparison, AI progress is moving very fast indeed. A primary contribution of AI is that it provides a new way and a new set of tools to explore questions about the nature of knowledge.

to be continued. ed.

Cheap Speech for Your Robot

Gary Croll

Cheap speech for your robot with no microprocessor needed.

Those of you who know me know I'm incredibly cheap. I shop thrift stores, swap meets, and garage sales, looking for parts for my robots. Every once in a while I strike gold and this was one of those times.

While I was rummaging through the shelves of my favorite thrift store, I found it. An educational toy shaped like a small computer with an LCD display and a plug-in cartridge labeled VOICE! It was called The Learning Window and was made by V-Tech Educational Electronics back in the mid 80's. For less than $5.00 I took a chance.

The toy worked and sounded pretty good so it was time to go to work. The voice module was only about two inches square and came apart easily. Inside was an SPO256-012 speech chip, SPR128A ROM, a TA7368 audio amp, and a 74LS367 hex bus driver.

By removing the edge connector I had solder pads to wire to. The pinouts were easy to follow and are listed below. By merely placing an address across A1 through A8 and applying power, it would speak the word or phrase. Oh, did I forget to mention, it not only speaks numbers and letters, but words and phrases as well.

If you want to interface to a microprocessor, strobe the ALD line low with a valid address on A1 through A8. The LRQ line goes high while the unit is speaking and can be used as a busy signal back to the micro.

Another way to use this module is to tie pin 19 on the SPO256 low. This is the Strobe Enable pin and tying it low puts the chip in a unique mode. In this mode the chip will speak with any low to high transition on the address bus.

By wiring a simple diode matrix to produce an address, you can generate unlimited speech with simple switch closures and no computer. The on-board amp easily drives an 8 ohm speaker with sufficient volume for most applications.

The pinouts on the edge connector are:

1. SBY	13. pin 14 of 74LS367
2. ALD	14. A8
3. pin 15 of 74LS367	15. A7
4. A4	16. A6
5. A3	17. A5
6. pin 9 of 74LS367	18. VCC 5 volts (will run on 6)
7. A2	19. VCC 5 volts (will run on 6)
8. A1	20. pin 7 of 74LS367
9. audio out (8 ohms)	21. pin 5 of 74LS367
10. gnd	22. pin 3 of 74LS367
11. gnd	23. gnd
12. pin 11 of 74LS367	24. gnd

Some samples are given below with A1-A8 given left to right

L L H L L L H L	What is it?
L L L L L L L H	You are right
H L H H H H L L	Found me
L L L H L H H L	Follow you
H L H H L H L L	What is the answer?
H H L H L H L L	Too high
H L L H L H H L	Please choose an activity
H H L L H H L L	Three
L H H L H H L L	Six
H L L H H H L L	Nine
H H L H H H L L	Eleven
L L L L L L L L	A
H L L L L L L L	B
L H L L L L L L	C
L L H L L L L L	D

These toys are fairly easy to find at garage sales, swapmeets, and thrift stores. You may even find one in your kid's closet.

I used an 8 position dip switch with pull-up resistors to figure out the truth table. I've given you some addresses to start with, but I don't want to give you all of them. That would spoil the fun of figuring out everything this little module is capable of saying.

Good luck from Gary Croll
Riverside Chapter of R.S.S.C.

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mandtsys@ix.netcom.com
Tom Thornton - Editor

The Robotics Society of Southern California was originally formed in 1989 as a non-profit experimental robotics association. The goal was to establish a co-operative association among associated industries, educational institutions, professionals and particularly robot enthusiasts. membership in the society is open to all with an interest in this exciting field.

The primary goal of the society is to promote public awareness of the field of experimental robotics and encourage the development of personal and home based robots. We meet on the 2nd Saturday of each month at California State University at Fullerton.

The RSSC publishes this monthly newsletter, Robot Builder, that discusses various society activities, robot construction projects, and other information of interest to members.

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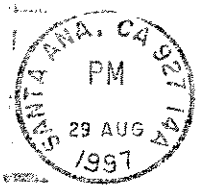

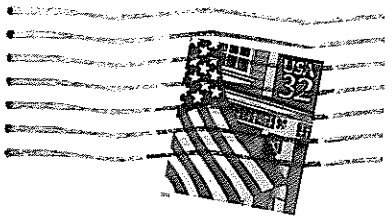

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