

## FEBRUARY 1997 ISSUE OF THE DPRG NEWSLETTER

### Standing Room Only



Check out the crowd at the January 18th meeting. We had 30 officially, and a few more walked in later. Many new members joined this month. I received 7 people's dues this month, which nearly doubles our paid-up membership.

The Dallas Personal Robotics Group is one of the nation's oldest special interest groups dedicated to the development and use of personal robotics and has been around since 1984.

### Keil Software Donates 3 PK51-C Compilers!

[Keil](#) has graciously donated three (3) PK51-C Compilers. These compilers are the best C compilers on the market for the 8051 and derivatives. It produces highly compact output and has many features. It comes with an IDE (integrated development environment) called MicroVision that has enhanced editing features such as color coded editing and project building (automated make file). Also, the PK51-C comes with a multitasking operating system that may be used, and assembler, a debugger and a linker that will automatically handle page banking up to 2 meg!

Many of the designs that the DPRG has for its robotics use the 8051 so this donation will be a tremendous help to the group. Many thanks to Keil for their most generous donation. Many in the group were anxious to get a chance to take home and try out this software this month. These three packages will not be given away, but will remain property of the DPRG to be checked out by members only. The software comes with a parallel port connector "key" so that the software will not function without this special key present, so don't even think about pirating. The software donation is in addition to the two evaluation boards that Keil Software donated last month. We are very fortunate to have received these generous donations, and we should honor their donation by using them as best we can. [Chris Nelson](#) is our new Software and Hardware Librarian and would be glad to schedule a time to check out this software to members of the DPRG. Please note, that one of things the DPRG voted on was that any software written with these development packages are to be made public to the group and posted to the web pages (please add good remarks to your code too).



### DPRG T-Shirts

DPRG's gonna get T-Shirts!!!!> During the January meeting DPRG voted to get 48 T-Shirts in Gray (a few white ones too) with the picture (see right) on the back and "DPRG/Dallas Personal Robotics Group" small and on the front where a pocket would be. This is your chance to get a DPRG T-Shirt. Please send \$15. Be sure to include the size you want and if you'd like gray or white material.

### Robotics Going Over Our Heads



[Wayne Parrott](#) brought a down to earth speech about a subject over our heads: blimps!. He brought in his blimp RC controller (In the picture to the left, if you look really hard, you can see that he's holding it in his left hand, and working the RC controller on the table with his right hand). It has two fan motors that he can control the pitch and independently he can control the speed and forward or reverse. He also spoke of the bag that he is planning to make out of mylar which he plans to purchase from [West Coast Blimps & Electronics at <http://www1.ridgecrest.ca.us/~jpiri/>](#). He stated that The mylar bag needs to have one cubic foot of helium to lift one ounce. He said that it's easy to need a 5 foot bag just to carry his little controller. He mentioned that the reason he is building his RC blimp is for a trade show for his employer. What an attraction that will be! It was a very impressive demonstration.

### **A Great Robotics Base**



Charlie Youngblood brought a snowmobile truck that he plans to convert to a robot. He purchased it at a thrift store for less than \$3.93 (he talked them down), and it looks like it'll make a really impressive robot base. It has two independent track drives like a tank. Also, Charlie donated a really nice looking TI 16 gang EPROM programmer. It has a place to put a master EPROM and then 16 places to put the EPROMS you want to burn from that master. Thanks so much to Charlie for his donation to the DPRG.

### **Roger Brings His 8051 Board**



[Roger Arrick](#) of [Arrick Robotics](#) brought in his 8051 robot controller board that he has been designing. It has an 8032, battery backed static ram, serial eprom, 16 channels of a/d and 8751 used for smart i/o and a bunch of other stuff. He soldered the proto board with point to point with knynar wire in three hours, he said (at 3 in the morning with jambox cranked to 10 he states!). If DPRG decides to make a 8051 board, this design would be the ultimate design to replicate. It has many great features for robotics!

### **There's no Time like the President**

I would like to thank all of those who submitted articles to the newsletter and have helped out during the past month. DPRG is really kicking in some steam, and we're really getting going.

Have you ever felt like you don't have enough time to build robots? Do you feel like you don't have enough space to build a robot. I've been running into the same predicament, and here's my solution: build shelves. What? Build Shelves, you say? I don't have time for robots, how will I have time for shelves. It seemed that most of my time was spent going through boxes and digging junk out of closets and the garage and never finding what I wanted. My computer/robotics room was a rat's nest, and I couldn't find anything. Finally I got some Home Depot gift certificates for Christmas, and I decided to buy wood, stain and varnish to make shelves. I feel that it was a wise investment because now all of my robotics and electronics (and religious) books are all nice and neat and accessible. Also I had space to neatly organize my electronics bug boxes, and was able to clean off my workbench. Anyway, after I've built these shelves, I quickly realize that I'll need more shelves. Anyway, my idea worked, because soon after they were built and stuff put on them, I built a robotic arm. Take the "shelves challenge": Does your room look like a rat's nest? Can you access all of your gear? Do you feel that you'd save time if you weren't digging through boxes looking for a desired gizmo? If you answered "yes", do yourself a favor and get some shelves. Don't forget to send your favorite robot a valentine.

### **Postcard Campaign**

A one-time postcard campaign was sent out to those on the old newsletter list. This was done in an effort to draw in those people who used to be on the Postal mailing list for the newsletters to now be on the email list since newsletters are now sent out by email. I sent out 300 postcards to would-be DPRGers. (That means the postage cost us \$60 to get 300 \$0.20 cent stamps.) Hopefully our email list will grow substantially, and also our meetings may grow substantially also, as well as our membership, and maybe our bank account! This one-time postcard campaign was voted on and approved in the December meeting. We have received many new people on the email list due to this campaign, and some returned post cards of unknown addresses (it cleans up our snail mail list). Overall I believe the campaign was a tremendous success.

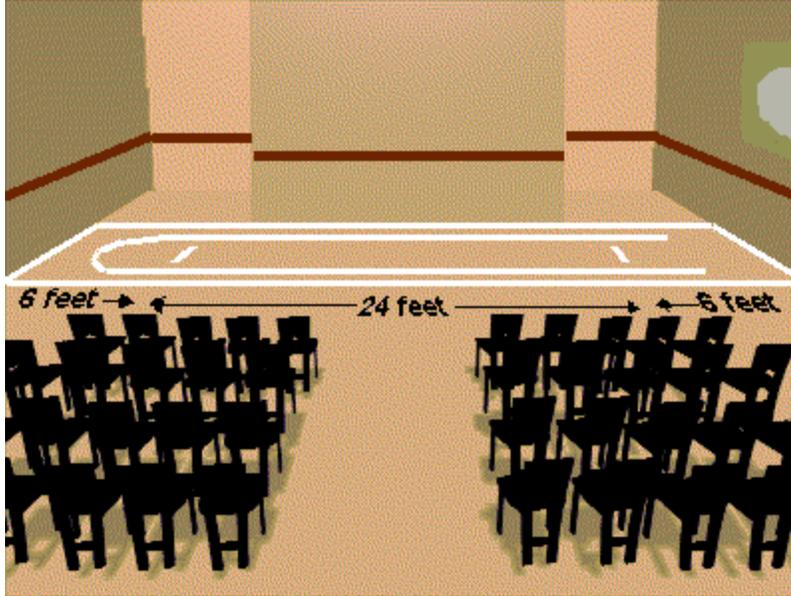
### **Listserv Almost Up**

[Steve Rainwater](#) of [Network Cybernetics Corporation](#) is working feverously to get a listserv up for us. (Steve is the owner of the computers that host the DPRG web page, and he is the one who sponsors the domain name for us.) A listserv will benefit us in that all will be able to chat about robotics without having to send them to me first. Also, this will take a great load off of me in that I won't have to keep a list of email addresses - the listserv will automatically do it. Let's give Steve a big round of applause for all of his generous donations of time and effort to make the DPRG a real success. Keep an eye on the email list for more info.

### **DPRG's Upcoming Contest**

DPRG will be having a robotics contest in May with trials to start in April. The purpose of the contest is to raise participation in the group. Hopefully this will inspire those who have half-built robots to get them built so that they can do the course. Last time (Nov 93) we had the contest many said they'd have a robot, but only 4 actually tried (although there seemed to be some dispute about that number). Roger Arrick's D-Bot won. Anyway, we watched the '93 contest video at the December meeting. After the watching the DPRG contest video and some other group's contest videos at the December meeting, everyone was enthusiastic about having another contest and we had much discussion about it. We had 30 people show up at the January and it looked like interest and potential participation was very high.

The last contest we had was in [November of '93](#). Everyone I spoke to said that we should have contests on a more regular basis (than every 3-4 years). Some mentioned that they'd like to see a contest every 3-4 months. At the meeting everyone seemed to be really hyped about having another contest in May, and many wanted to have it in April, but we left stating that April would be for trial runs.



The simple premise for the contest is for a robot to autonomously go from the start area (on the right) to the end area (on the left), and back in the best time. Although this seems like a simple task, it's amazing how few were able to come up with a robot that could do it for the last contest.

The contest area will be the length of the current room we are meeting in. There's no guarantee of side walls (It's a little less ideal than the last room we were in because we don't have a complete back wall to hug for those wall hugging robots), but we do expect to have walls on the ends. The length is roughly 36 feet total: 6 feet on each end and 24 feet in the middle. Also the contest area will be 6 feet wide. The bounds of the contest area will be marked with 1 inch masking tape. For line following robots, a 1 inch piece of masking tape 1 foot from any bounds will run the back side of the course, will have a turning radius (about 4 feet in diameter) end the end area, and will run the front side of the course back to the start area (again 1 foot from the bounds). The tape designating the start of the end area will not interfere with the line following tape 6 inches on either side.

## DPRG Robot Contest Rules and Regulations

### Reasons for the Contest:

- To encourage homebrew robot builders
- To increase interest in personal robotics
- To increase participation in the Dallas Personal Robotics Group

### Robots:

- Robots must be self-controlled, human-build machines, submitted by DPRG members. (You can pay your dues the day of the meeting.)
- Robots must not rely on human intervention except for starting and stopping.
- Robots can have on-board or off-board controllers.
- Line following robots can follow a 1" tape line that will go the course, but may not use any other guide lines or tracks.
- Robots must not be more than 48" length, 48" width, 96" height and 300 lbs.

### Goal:

- To create a robot that will begin at the START AREA, travel to the END AREA (completely over the line) then return to the START AREA in the shortest time possible.

## Scoring:

- The winner will be judged by applause. More recognition should be given:
- If the number of seconds to complete the course is low.
- If the robot is completely self-contained (no tether).
- If the robot starts by receiving a sound command (voice or tone).
- If the robot makes computer generated sounds during the course.
- If the robot does not touch any wall.
- if the robot turns around in the END AREA.
- Each robot will have 3 tries to complete the course.
- If no robot completes the course, we'll try again at the next meeting until we get one.

## Setting:

- The contest will begin at 12:00pm during the May DPRG meeting at the Dallas Infomart - trial runs to be held in April.

## Prizes:

- AI CD Roms from [Network Cybernetics Corporation](#), two ricochet cars bought at a thrift store (they make great robotics bases), and more.

To be sure, these rules will probably be changed before the actual contest so be sure to keep up on the email list.

## The Everchanging Website

Much has been changing with the website. The list of past newsletters has grown, the list of library books is now in table form, there's more pictures in the pictures section, there's now a list of local retailers, the finances page, the T-Shirts page, and so much more. If you haven't been to the web pages in a while, it may be time you did.

(<http://www.dprg.org> )

## Philips Semiconductors to donate 8051 data books

I talked to Brian (sales rep) at Philip Semiconductors again today, and he said we're still on for getting the databooks. He had 5 in house, and when I mentioned that we usually have 15-20 at the meetings and about 40 on the email list, he noted that he could get more for us, like 10 or a couple of cases (however many that is). They're last years data books (1995), but probably 8051 stuff hasn't changed that much. <grin> He said he'd also throw in some data books on some other stuff as well. We may either have them for the Jan 18th or the Feb 8th meeting. I'll keep ya posted. I doubt we'll get any of the 20 pin 8751s, but that's a possibility too.

## A Review of the New Micro NMIY-0031 8051 CPU Board

by [Chris Nelson](#)

Before you go off and build another board please let me submit my review of the New Micro NMIY-0031.

### Part 1: Purchase and Physical Review

"\$39.00 Board and Software!" the ad in the Circuit Cellar magazine screamed out to me. For the last couple of months I had been wanting to get a small microcontroller kit to use for robotics. I have other kits and various other boards in the house, but I really wanted to use a good 8051 board that had software available. Having a tight budget, with Christmas coming up, the thought of a inexpensive small system was attractive. I showed ad this to my housemate, Kevin, who was busy wire wrapping a 8052 Basic board up for another project. He said, "Give them a call".

So I decide to call New Micro and torment who ever mistyped the price on the board. I got a hold of Dennis, who assured me that the the price was real. "It's just the core parts on a really good board", he said and, "You might want to get a serial cable also." When I asked about availability, he replied, "We have over 3,000 of these in stock, the

standard configuration allows us to be flexible with customers needs." We spent the rest of the conversation discussing product details, the robotics group, and web sites.

Kevin went ahead and bought the kit. He had been trying to get me interested in the 8031 for a couple of years. We opened the box that had arrived, we were a bit underwhelmed. Inclosed was a board, a cable and a diskette. Careful inspection revealed this was a very nice board. The core componets were there, and there is a very nice prototyping area. The board has places for three headers for accessory boards which New Micro calls Vertical Stacking Componets or VSC's. There are about twenty or more of these for various functions. There is space on board for the power supply and RS-422/RS-485 circuitry, and almost every thing is configurable via jumpers. There is support for a keypad and LCD.

The diskette held all the documentation, code examples, EPROM images, and languages. You can print out manual which is Word format, or puruse the various text files. Basic and Forth are EPROM based and there is a simple C cross compiler. There are exaples plenty and there is a full parts list as well as a good schematic. Very good documentation, well worth printing out.

As the laser print spewed its load of pages, Kevin and I discussed the work ahead of us. I went ahead and installed the power supply componets, (rectifer, caps and 7805) replaced the wire jumpers with headers, and soldered in the interface connectors. I also replaced the EPROM socket with a ZIF socket, so we could try out all languages with out prying a chip out. Instead of getting the nice green ZIF sockets I had to "melt modify" a blue Aries ZIF socket to fit. The pcb withstands the heat of a iron quite well and now damage resulted from replacing the socket. Kevin went to work on an enclosure and we should have a nice 8031 development system ready to demo by the next meeting.

### **Talks of making an 8031/32 PC Board**

Recently there have been talks of making an 8051 style board for the DPRG. The board would probably have the following specs:

- 80c31/32 etc.
- crystal, caps, & reset parts
- max232, caps, rj11/de9 connector
- 28 pin socket for 32k,64k eprom
- 28 pin socket for 8k,32k ram
- As small as possible (3.5x3.5) with 4 mounting holes .150 dia.
- 82c55 24 pin I/O port
- adc0848ccn 8-bit, 8-channel A/D (24 pin x .3" part)
- 50 pin dual row header for all these pins
- 7805 or 2940 3 terminal regulator with 2 10uf caps & diode
- Power in connector (2.5mm)
- reset switch
- 8 pin serial eeprom 24lc16b

The New Micro board review above sort of squelches the idea, but if the board is feasible, it could either be funded by individuals of the group and would be made available to the DPRG at a low cost, or be funded by the group itself and then DPRG members should get the boards at cost. If there is still interest in making a group 8051 board or any other type PC board, please speak up.

At the January 18th meeting talks shifted more toward making motor controller boards rather than a DPRG board. Keep up on the email list to find out what's gonna happen and to input your two cents worth.

### **The Beginnings of a Group Robot?**

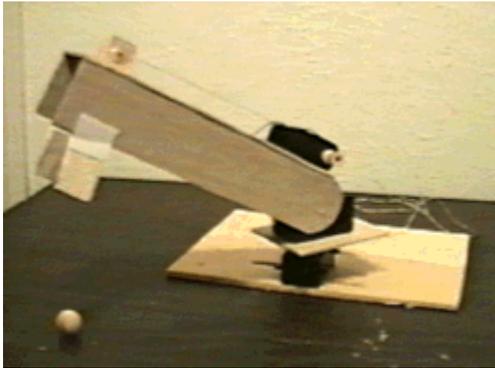


I've been conversing with a guy up in New Jersey that works at a Medical Supply Store. They sometimes get old electric wheelchairs, some that are in good condition they fix up and resell, others they just scrap. Usually all that's wrong with them is the controll unit, but the motors and such are still good. This guy, who wishes to remain anomoyous and doesn't wanna be hasseled about getting more bases, says he can get us one. However, being in New Jersey he'd have to ship it. What would yall guess the cost of shipping that thing from NJ would be? Anyway, he seems reputable enough. He didn't really bring it up, I did, so I doubt it's a scam. Maybe someone who might have family in NJ could somehow get it for us and bring it when they just by coincedence have a family reunion with someone in Dallas! ;)

## Armed and Dangerous

by **Jim Brown**

I'm super cheap. Anyone who knows me, knows that. That's my problem when it comes to building something. Instead of just saving up my money to buy something worthwhile, I end up going to junk sales, and buying junk in hopes of someday using that junk. From my experience, it doesn't work well that way. And believe me I've had plenty of experience in building something from junk. It just doesn't pay to be cheap, as you find out if you read on.



That brings me to my latest robotics idea, a robotic arm. I usually do nothing for months, and then all in one day, I'll have this kick where I'll spend all day devoted to doing robotics. That was the case this day. I start going through boxes and boxes of my junk that I have saved up for just this purpose - to build some robotic "thing," and I find three good geared motors. These three geared motors I use to control spin, tip, and grip. All of these motors came from toy trucks or R/C cars that died. I bought a lot of them in the First Saturday sale in downtown Dallas for about a buck a piece. Some of them didn't work right because the gears were stripped, but most of them seemed to be ok. After digging through boxes and boxes, my motors found, my balsa wood by my side, and my table cleaned off, I was ready to begin.

Or so I thought I was ready to begin. Isn't it always the way: just when you're ready to build something, the phone rings, or someone comes over, or any number of things. It was my dad wanting me to type up a resume for him. I didn't mind, and I always enjoy my dad's company. I mentioned what I was about to do, but he didn't seem interested.



After he left, I got into building. I glued two balsa boards together to make a base. I glued one of the geared motors to the middle back and the motor was perfect to be the "spin" motor because it had a gear sticking right out of the top of it. To the gear sticking out of the top, I applied loads of hot glue and a 3 inch square base. To the base, I applied the second motor which would be for raising and lowering the arm. To the second motor I attached a balsa wood arm that was about 10 inches long. To the top and back of the arm (right at the fulcrum) I applied the third motor which would be used to close the grippers. To the end and top of the arm I applied a wooden pulley that would guide a string from the third motor to the grippers. I then cut out two wooden pieces about 1 inch by 2 inches to be the grippers. For springs, I just used a heavy card paper (about 60# paper) and glued them to the sides. I then attached strings to the grippers, routed the string over the pulley, and glued it to a pulley I attached to the third motor.

I used a couple of D cells, and the thing worked quite nicely. I was able to make the arm rotate left and right, raise and lower the arm, and make the grippers open and close. (A real dream of any robotics builder.) My wife came in about that time, and sneered at it, but was slightly interested to see it pick up the ball. I maneuvered the wires and the couple of D cells, and was quite talented at being a human battery clip. All in all, I was quite pleased at what I'd built in only about a half a day.

I dug through some more boxes looking for some buttons to build an interface (that I could also easily convert into a computer interface some day). I figured that the best way would be to build a sort of H-bridge for each motor. After starting, I was beside myself at seeing the millions of wires that I'd have to wire together and solder just to make three H-bridges. It would have been a big bowl of spaghetti for just the three motors. There's gotta be a better way than that. A better solution would be to use servo motors. They would definitely be worth the price just for the ease of wiring.



Then it happened. Sort of like in a movie. It totally disintegrated right before my eyes. I suppose I should have expected it since I built it out of balsa wood and old geared motors cannibalized from junk toys, but I just didn't expect it to happen so quickly. The whole thing only cost me about \$5 to build, so I can't complain. Next time I try to build something, I'd like to go all out, spend the hundreds of dollars and have something that I can be proud of and that will last. (But my instinct tells me I'm hopelessly doomed to use my junk that I've saved over the years.)

My other idea for a robotic arm came when I went to a church garage sale (that wasn't in a garage, but in a Minyard's parking lot). It was one of those positionable desk lamps. It was a little rickety, but when I got it home, I tightened it up, and it was fine. I figure that with just a few servos, I can have a really nice robotic arm in no time. Maybe, after months of not doing anything again, I'll have another robotics kick and actually build another robotic arm. If nothing

else, all of my playing recently with a balsa wood arm is a great inexpensive education that might pay off when I go to build that high priced, steel reinforced, fancy schmancy robotic arm.

## A Couple of words about CUPL

by [Kevin Carter](#)



I have been going over the CUPL package that we purchased to go with the PROMAX device programmer that I have made available to the DPRG members. First of all, it is a very good, and very advanced package that will definately do what we wanted, and then some. This particular package was selected for its ability to program EPLD's, as well as regular PAL's, as the programmer only handles the EPLD type devices. In addition, I have found that this package will also do the basic variets of FPGA's, in case one of us comes up with a programmer that will handle them.

The package comes with both a DOS based version, and also a windows version, which also appears to run under Win95. It does not appear to be copy protected, which will be a major advantage to us (grin). To set up to make a PLD fuse map, you fill in a template, using a text editor, by specifying the input and output pins and give the logic equations for them. The package has the ability to do both straight logic circuits and also state machines, using the register sets that are built into the PLD that you want to use. After compiling a design, you can either burn a PLD, or simulate the design, which will certainly keep some of us, me included (grin) from burning the wrong design into a PLD! This just touches on the features, after all this monster has a manual of over 400 pages!

There are also upgrades available, which would give more features, such as schematic capture, but they are rather expensive. The next higher leval package is about \$1400! I definately think that we got our moneys worth, since we paid \$200, rather than the normal \$400 for it.