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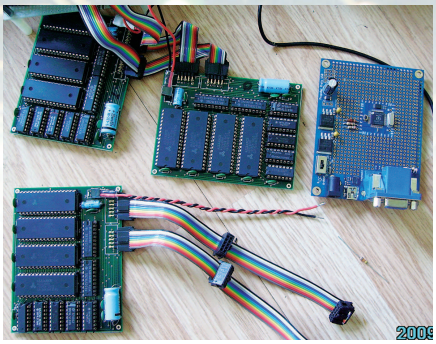
We received several letters requesting continued details of Dr. Jim's android project (see "Machine Intelligence," in the July-August issue, and "Robot Feed" in this issue for reader feedback). Here's an update as we go to press.
—Tom Atwood



ROBOT: Dr. Jim, can you catch us up on the history and where you are today with the android project?

DR. JIM: I took several months in 2008 to evaluate what processor to use. It had to be suitable and affordable for the hobbyist researcher. In December, I decided on the Parallax Propeller chip, mainly because of the eight simultaneous processing streams, and its low cost, around $10 per chip. In 2009, I began to evaluate the software. The first thing I did was to create the KISS Debugger [reviewed in this issue]. A debugger is necessary to develop larger scale software. You have to be able to see the code in real time while it executes and see what takes place. I've learned that simplicity makes for ease of use and understanding—hence, my minimalist approach.

Next was the hardware. We needed at least four independent Propeller boards. One is generating and evaluating neural structures. Each neural element totals 32 bits, and with only 32KB of internal centrally shared RAM per Propeller—other than the COG memory—that would equate to only 1,000 neural elements in that Propeller. Each COG has 496 locations of RAM for executing small routines, but that's not enough. Memory expansion was essential.

ROBOT: What are the next steps?

DR. JIM: A thumb drive's serial interface is too slow for our needs. We designed an expandable expanded memory with a maximum of eight boards and a minimum of 1 board. One of the new boards will give you 2 million locations, which is well in excess of the 100,000 neural elements typical of a bee's brain. The eight boards give you 16 million locations—2 million per board.

ROBOT: What are the challenges for hobbyist researchers?

DR. JIM: Most hobbyists cannot easily deal with surface-mount chips, although there are tools to help, such as the Schmartboard products. This has to be built by hobbyists in a kitchen-table environment. Accordingly, I have used a Dual Inline Package [DIP] device approach. That makes the board a pretty tight fit to be the same form factor as a USB Protoboard from Parallax. Yet the boards will all stack together nicely.

You can feel no perceptible rise in temperature because the current is less than 30 milliamps, very low, for the Expanded Random Access Memory [ERAM[board. This is static RAM; we cannot use dynamic memory owing to the overhead required to refresh rows of memory inside the chip every 2 milliseconds. Each board includes 2 megabytes of static RAM memory. Eight boards give us 16MB, which provides enough neural elements, in my opinion, to potentially achieve brain capabilities well beyond that of insects.

ROBOT: How do you conceptualize a brain and the mind?

DR. JIM: In the mammal brain, there is short-term and long-term memory. I use the static RAM up to 16MB for short-term memory. I use a USB thumb drive for long-term memory and permanent storage.

ROBOT: How will you manage this in practical terms?

DR. JIM: We have written an operating system to control the functions that will be running in all these propeller chips. It is called the "KISS OS." We have four Propellers and 8 COGS each. The basic system shell is now running. It supports file structures that are compatible with Windows. So the KISS OS files run on your PC and the Propeller. You can read, write and edit KISS OS files on a Windows PC and run them on a USB Parallax Propeller Protoboard.

Robot: How is this done?

DR. JIM: We are making available a USB Prototype Board mod kit that has to be installed on each of the four Parallax Protoboards. It will work on just one of these boards. The user will have a completely operational system with one Parallax USB Protoboard and one or two of our expanded RAM boards. The idea is to provide the hobbyist with enough to get going at minimal expense in the next generation of machine intelligence.

ROBOT: What are the next steps?

DR. JIM: Next is voice-recognition hardware and software to eliminate the keyboard. I have tested this in the past; it is running now, and we are debugging and refining it. This has more implications than we can discuss today, but the idea is verbal interaction. The next step is sensory perception. That will be a Propeller USB board and some additional hardware to hook up all the sensors. Next comes motor control functions—motors for the arms and hands, for example. Following that are servos for lower power movement. Then comes the heart of the project: teaching the robot. It will take a considerable time to teach the system what to do. It will start with just Pidgin speech, like a person learning the simplest utterances in a language lab. We will start posting video clips on YouTube and at our website to show you how to build this thing. Stay tuned!