

MACHINE INTELLIGENCE

DR. JIM: I have made some inroads in this. I have developed software that runs on PCs and some mainframes. I am now porting this over to a Parallax Propeller-based “hobby research super computer” setup. I cannot predetermine the internal interconnections it makes between its neuronal groups, and it can make mistakes and learn by correcting them. I’ve already achieved this goal with intelligent image-analysis software used by national agencies.

ROBOT: How does this learning process proceed?

DR. JIM: Mistakes have to be corrected either by some external mechanism, a reward/reprimand system, or a teacher. As it learns, it requires fewer and fewer new interconnections to learn new material because instead of interconnecting individual neurons or small groups of neurons, you are interconnecting larger and larger neuronal groups. As an example of this, the simplest geometric shape could be a line. A triangle would be learning the neuronal interconnections to describe three lines, therefore, requiring fewer additional synaptic interconnections. The concept “line” is already known and does not have to be redefined. I can’t predetermine which connections are necessary to accomplish this, just as I cannot predict how many or which rat or human brain synaptic interconnections will be necessary for the same learning to occur. This software already has the ability to interact with someone, and it can even learn to read a language, but, as with a human, it’s one step at a time.

ROBOT: How will it read and act on the sentence “The cow goes out of the barn”?

DR. JIM: You start out with an alphabet, words, phrases, (parts of thoughts) and then complete sentences. What it learns is the syntax and structure of the language, and then what is being described, piece by piece. It forms the logical structures to understand that and then the motor structures. It may also say “I don’t understand this because this is in conflict with something else.” Then an instructor or teacher must explain where the conflict is and how to resolve it.

ROBOT: Can you expand on your comment that this is a highly visually based system?

DR. JIM: You have to get into sighted sentient beings before you see learning take place that is on a level that is practical and useful for replication in a robotic platform. A sighted, sentient being uses

its eyes to perceive the world. Let’s talk about three-dimensional space and the synthetic brain’s ability to understand and identify objects and the relationships in a scene between objects. We can do that and begin to understand objects, for example, in a friend-or-foe context—a typical requirement in military applications. There’s a difference between visual perception and making logical abstractions about the visual image. If I take a picture and show you a scene, I can write about the abstract concepts contained in the scene, such as bigger, smaller, farther, or closer all I want, and you, the reader, can read this and still not understand what the picture looks like.

THE NEW APPROACH

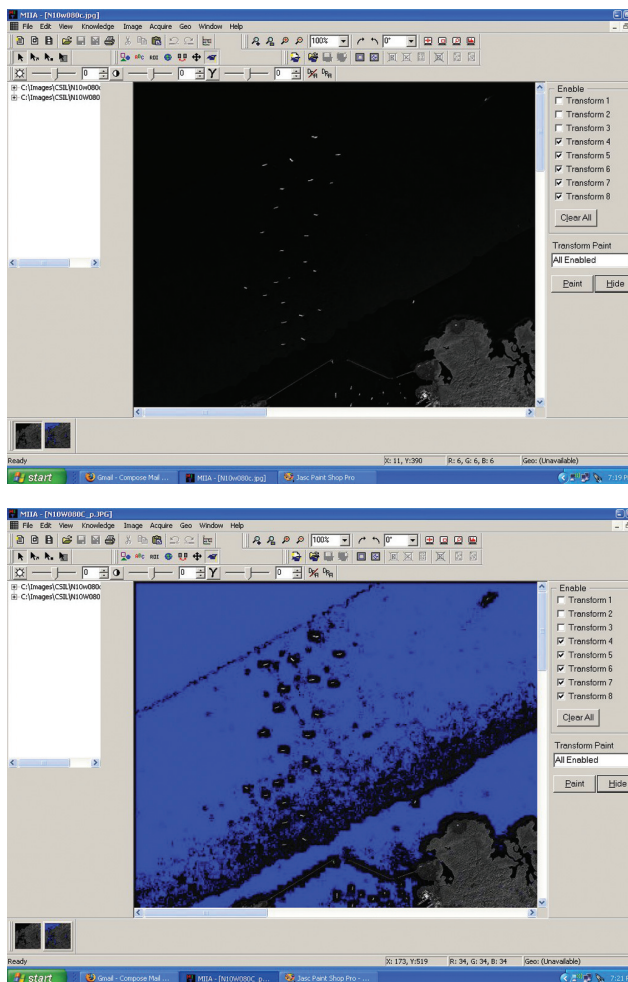
Based on an empirical study of the brain and available research, I came up with an approach that allows the machine to form its own synaptic interconnections that are not predetermined.

I believe that the approach I have taken is not the only approach, but it is a good first step out of the mainstream. On the question of original thinking, groups don’t make breakthroughs; individuals make breakthroughs. In small groups, it is the leader—a single person. I can say I have been doggedly following this track to create such a synthetic cortex for decades, and I have done it already in other contexts. The major question for me is how best to convey this technology to other hobbyists, and I invite their input. I am offering pieces of the new platform as products at my website to help fund my long-range goal of bringing this to the hobby world.

I believe that there are many other people out there who would wish to get a working platform and research this further. I am creating a platform that is expandable and that can provide the necessary flexibility to allow further machine intelligence research at an affordable cost to hobbyists and researchers.

ROBOT: Can you tell us more about the platform you are assembling to make this technology available?

DR. JIM: The human brain is a massively parallel processing device, and it has almost unlimited memory. On the hobby side, there has been nothing out there with a cost performance capability that will allow true experimental work in machine intelligence and that is affordable. The limitations in processing and memory are like brick walls. My goal is to change that. The initial pieces can be seen



“Before” and “after” non-classified satellite images of the coast of South America. According to Dr. Jim, the second image was colorized using his intelligent image analysis software. That image shows vessels, harbors, underwater features and submerged pipelines separated from image clutter.