Engineering Breakthrough Develops Artificial Neuron that 'Learns'

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University of Idaho's Richard Wells and his microelectronics research team are helping usher in the age of **real electronic brains**.

UI researchers envision computers one day built from artificial neurons bundled together into networks that can perform tasks onerous to humans, such as dangerous military tactics, automated traffic and emergency dispatching, smart cars that drive themselves and eventually bio-medical applications and prosthetics.

"Our fundamental research on artificial neurons mimics biology and lays the foundation for a complete departure in computing from today's chip design," says Wells. Information is carried by trains of electrical pulses and codes superior in performance to traditional analog-digital integrated circuitry.

"The low-power technology is miniaturized to a scale approximately the size of a few animal cells per neuron and performs sensing, information processing, routing and actuation, much like the brain or spinal cord." In fact, Wells' "biomimic artificial neuron" is the basic building block for machines that learn on their own, without the need of programming.

The way this works is through special kinds of interconnections linking groups of biomimic neurons, called "performance feedback signals." These connections cause other types of connections to become modified in response to these signals. Basically, these signals measure the "goodness" or "badness" of the machine's output responses to input

stimuli. This kind of machine is “trained” instead of programmed.

Wells’ team includes UI engineering faculty members James Frenzel, Terry Soule, James Foster and many of their students. The team has been developing this technology for neuro-fuzzy logic over the past 2 ½ years. This type of “neurocomputer” deals with uncertainty, the missing function of traditional programmed integrated circuitry.

A patent is pending on the biomimic artificial neuron, and the Idaho Research Foundation offers it to interested industry by way of a license agreement. Wells believes it will have special appeal to manufacturing, computing, electronics, space and transportation industries.

"This is a radically different turn in computing hardware technology that will enable companies to design and fabricate their own chip solutions for developing market needs," adds Wells.

Interested industries may contact the IRF, the technology transfer agent of UI. It facilitates commercial and public use of technology developed by UI researchers, patents and licenses UI technologies to private industry in return for royalties, and distributes the royalties to inventors and their colleges. IRF licensees include companies worldwide, and a growing number of ventures in and around the Pacific Northwest.

The Idaho Research Foundation, Inc. is a not-for-profit corporation chartered in Idaho in 1947 to support scientific research and education at the University of Idaho. UI appointed the IRF as its exclusive agent for technical intellectual property and licensing. The IRF fosters and promotes scientific research and inventions and their timely commercial transfer. It also seeks maximum returns to the inventors and the UI, in sound, ethical, legal, and academic fashions.

Source: University of Idaho