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## OU student and professor develop 'electronic nose'

By **Jeff Samoray**, *OU Web Writer*

A research project that emerged from an Oakland University electrical engineering class may have a large impact on future environmental safety and protection measures.

Master's student Jacob Allen and Associate Professor of Engineering Hoda Abdel-Aty-Zohdy teamed with Robert Ewing of the Wright-Patterson Air Force Base in Ohio to develop the prototype of an "electronic nose," which can detect eight possible odors and read 1,024 inputs.

Research on the "Spiking Neural Network Architecture for Biochemical Pattern Recognition," as the electronic nose is formally known, was funded by a grant by the U.S. Air Force, which also applied for a patent. If the patent is approved, the Air Force can license the technology, which could lead to devices capable of detecting environmental toxins or explosives. Such a system could approximate the sensors of a bloodhound's nose, which is capable of detecting more odors than a human nose.

"The prototype operates in parallel," said Allen, who's integrating the project into his master's thesis. "It samples all the inputs and attempts to learn the most prominent order. Then it stores the data in a neuron-like cell and gives real-time detection. It works similar to biological systems with possible higher accuracy. Right now it can detect eight possible smells, but can read 1,024 inputs. The prototype also is expandable, like adding memory to a computer."

Abdel-Aty-Zohdy said other electronic noses previously have been developed, but the present prototype is a breakthrough in part because of its real-time detection capabilities.

"A human nose cannot detect ppb (parts per billion), but sensors can," said Abdel-Aty-Zohdy, who also directs OU's Microelectronic Systems Design Lab. "The next step is to integrate the entire system, including the sensors and the architecture, to an Integrated System on a Chip. This algorithm also has other applications for any other system that has to sift through large volumes of data."

Allen began working on the project during the winter 2002 semester as a student in Abdel-Aty-Zohdy's Integrated Circuits and Devices class. Allen applied existing research on neuron networks and spiking neuron networks to the project and continued to work on it as a student intern with the Air Force last summer and in 2002.

"The approach I've taken toward developing the electronic nose is a new one," said Allen, who's also pursuing a law degree at Michigan State and plans on becoming a patent attorney. "As other students from the Microelectronic Systems Design Lab continue the research, we can further compress the system and a lot more can be accomplished."

For more information on the electronic nose, see item No. 21 on the [Air Force Research Laboratory September 2003 Accomplishment Report](#) Web site.

### SUMMARY

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