

## Sentry System Combines a Human Brain with Computer Vision

A DARPA project suggests a mix of man and machine may be the most efficient way to spot danger.

By [Lucas Laursen](#) on November 27, 2012



Mind meld: DARPA tested its human-in-the-loop sentry system in a simulated setting.

Sentry duty is a tough assignment. Most of the time there's nothing to see, and when a threat does pop up, it can be hard to spot. In some military studies, humans are shown to detect only 47 percent of visible dangers.

A project run by the [Defense Advanced Research Projects Agency \(DARPA\)](#) suggests that combining the abilities of human sentries with those of machine-vision systems could be a better way to identify danger. It also uses electroencephalography to identify spikes in brain activity that can correspond to subconscious recognition of an object.

An experimental system developed by DARPA sandwiches a human observer between layers of computer

vision and has been shown to outperform either machines or humans used in isolation.

The so-called Cognitive Technology Threat Warning System consists of a wide-angle camera and radar, which collects imagery for humans to review on a screen, and a wearable electroencephalogram device that measures the reviewer's brain activity. This allows the system to detect unconscious recognition of changes in a scene—called a P300 event.

In experiments, a participant was asked to review test footage shot at military test sites in the desert and rain forest. The system caught 91 percent of incidents (such as humans on foot or approaching vehicles) in the simulation. It also widened the field of view that could effectively be monitored. False alarms were raised only 0.2 percent of the time, down from 35 percent when a computer vision system was used on its own. When combined with radar, which detects things invisible to the naked eye, the accuracy of the system was close to 100 percent, DARPA says.

"The DARPA project is different from other 'human-in-the-loop' projects because it takes advantage of the human visual system without having the humans do any 'work,' " says computer scientist Devi Parikh of the Toyota Technological Institute at Chicago. Parikh researches vision systems that combine human and machine expertise.

While electroencephalogram-measuring caps are commercially available for a few hundred dollars, Parikh warns that the technology is still in its infancy. Furthermore, she notes, the P300 signals may vary enough to require training or personalized processing, which could make it harder to scale up such a system for widespread use.



Lucas Laursen Guest Contributor

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