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The old countermeasures just aren't cutting it anymore.

Getty + Mohammed al-Shaikh

By Eric Tegler Sep 13, 2016

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Electronic warfare ain't what it used to be.

Modern radar and communications systems can subtly and quickly change their character, making them harder for U.S. aircraft and other platforms to jam or spoof. That reality is prompting DARPA to lead industry teams to apply artificial intelligence to electronic warfare. It's called "cognitive EW."

The U.S. military developed its current approach to EW in the 1960s and 70s when it studied enemy systems to identify their vulnerabilities. It then came up with countermeasures to disrupt them, which went into a sort of tactical EW "playbook."

"COGNITIVE EW IS BEING DEVELOPED TO DEAL WITH THE UNEXPECTED."

"If you see radar X, use countermeasure Y," says Paul Tilghman, cognitive

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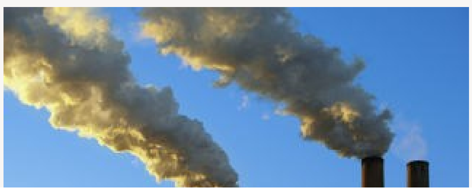

EW program director at DARPA's Micro Technologies Office (MTO). "A typical 1970s radar system was predominantly an analog system with components assembled in a specific, fixed manner limiting the radar to defined operating boundaries. Once a system was created, it was a relatively static, known quantity."

Not anymore. The difference between today's tech and that of the 1970s lies in the adoption of readily available digital processing. Such processing effectively allows operators to change aspects of the waveforms that radar and communications systems use. "The problem now is that if we continue to rely on that [old] approach, the radar waveforms we're expecting could be rapidly changed," Tilghman says. "Cognitive EW is being developed to deal with the unexpected."

DARPA's new approach uses machine learning algorithms to assess and characterize radar and communications emitters in real time. It learns their characteristics in the moment and then produces a countermeasure. It's not that the system is inventing new countermeasures on the fly. Rather, Tilghman says, cognitive EW "deduces the right set of countermeasures to employ." Of course, the secretive agency won't say how quickly the AI can assess and respond, only that the "time frame is sufficient to meet the needs of countering that radar."

This cognitive EW effort began in 2010 and is broken into two parts: Adaptive Radar Countermeasures (ARC) and Behavioral Learning for Adaptive Electronic Warfare (BLADE). The two tracks exist because of the differing nature of thwarting an enemy's radar and its communications.

"You are basically the object of interest to the radar," Tilghman says. "It is keenly interested in you. You're trying to prevent the radar from being able to track you effectively. The difference with counter-communications is that in that space you are basically a third party. There's communication going on between two endpoints that you may or may not be privy to. As an EW system, you're trying to make that a much harder set of points to close."

When cognitive EW makes its debut, possibly within a decade, observers speculate that it will function alongside modern systems like the Navy's Next Generation Jammer (used on the EA-18G Growler EW aircraft) or as an adjunct to the jamming capability of the F-35's active electronically scanned array radar (AESA). DARPA won't specify. "We're focused on the algorithms, the AI," Tilghman says. "The actual EW system we use is meant to potentially be anything."

The application of artificial intelligence to a variety of tangential areas is almost certain to follow. DARPA kicked off its Spectrum Collaboration Challenge earlier this year, challenging competitors to develop collaborative autonomous spectrum systems that work together to optimize bandwidth in dense communications environments.

"We're trying to tackle this problem of spectrum scarcity," Tilghman says. "Cognitive EW has spurred us to realize how valuable AI is to the wireless world."

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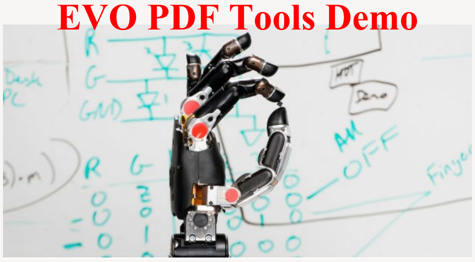

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