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## USC Engineered Anti-Terrorism System Deployed at Ports of Los Angeles and Long Beach

The ARMOR-PROTECT system randomizes Coast Guard patrols to thwart would-be terrorists and increase security

BY MAREX



A USC-designed computer application has been deployed at the ports of Los Angeles and Long Beach (POLA/LB) to make the local waterways safer.

Funded by the [National Center for Risk and Economic Analysis of Terrorist Events \(CREATE\)](#) through a contract from the USCG Research and Development Center and created by USC computer scientist and CREATE researcher, Milind Tambe, the Port Resilience Operational / Tactical Enforcement to Combat Terrorism system

(ARMOR-PROTECT) uses complex algorithms to randomize U.S. Coast Guard boat patrol schedules to stymie would-be terrorists and increase security. ARMOR-PROTECT extends to the maritime domain the Assistant for Randomized Monitoring Over Routes (ARMOR) software that was successfully deployed at LAX to schedule vehicle checkpoints and canine patrols.

“The goal is to make patrol patterns unpredictable for an enemy that is trying to conduct surveillance to plan an attack, and yet simultaneously ensure that patrol time is used effectively to ensure maximum protection of high value targets in the port,” said Tambe.

The Coast Guard deployed ARMOR-PROTECT on Feb. 1 at the ports, which together rank No. 8 in the world by container traffic. The Coast Guard is currently vetting the software program with the hope of eventually rolling it out nationally, said Craig Baldwin, the Coast Guard’s program manager for ARMOR-PROTECT. The U.S. has 361 ports.

ARMOR-PROTECT’s randomization optimizes the use of the limited security patrols by making it impossible for would-be attackers to determine when a particular target will be protected. Intelligent randomization, a core ARMOR-PROTECT feature, means that the program’s recommended patrol schedules ensure that high value locations, such as critical bridges, ferry terminals and crowded piers are visited most often.

The Coast Guard began using the ARMOR-PROTECT system in Boston in April 2011. Its success there led New York to follow suit in early 2012, leading to the decision to extend its use to POLA/LB. "Coast Guard men and women work throughout the ports performing maritime safety and security, law enforcement, emergency response, environmental protection and regulatory duties," said Capt. Jim Jenkins, commander of Sector Los Angeles - Long Beach. "With these tremendous responsibilities, we welcome the ARMOR-PROTECT model, which is designed to better optimize the use of Coast Guard and partner resources, thereby, strengthening our overall security operations."

Tambe's research is rooted in mathematical game theory, which predicts how conflict might play out between adversaries. According to Bayesian Stackelberg game theory, the attackers observe the defenders to identify and exploit any possible security patterns. ARMOR-PROTECT's rigorous game-theoretic modeling and algorithms prevent that from happening.

In 2007, Tambe and his team implemented ARMOR, a randomized scheduling of police checkpoints for the six inbound roads to LAX. The project's success led to the creation of the ARMOR-IRIS software system to randomize schedules for the Federal Air Marshalls. The Transportation Security Administration also has deployed a Tambe-created system of intelligently randomized airport patrols, ARMOR-GUARDS at an unidentified airport.

More recently, Tambe and his team worked with the Los Angeles County Sheriff and the L.A. Metro system to create randomized police transit patrols to thwart fare evasion. As a result, deputies have nabbed an increasing number of fare jumpers. The plan is to extend Tambe's software on the rail system to suppress crime and counter terrorism.

Last year, ARMOR-PROTECT received the prestigious Wagner Prize for Excellence in Operations Research. "This technology is spreading out into many different areas, from air to sea to land," said Tambe, a 2012 recipient of the prestigious IBM Faculty Award and the Columbus Foundation 2010 Homeland Security Award for Border and Transportation Security. "There are so many tremendous possibilities for this technology. It's really very exciting."



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