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Naval Postgraduate School (U.S.). Maritime Defense and Security Research Program

"To dissuade and defeat threats as early and as far from U.S. borders as possible."

SITREP

THE NPS MARITIME DEFENSE AND SECURITY RESEARCH PROGRAM NEWSLETTER

http://www.nps.edu/Research/mdsr/index.html

Volume 49
September 2010

Dear Readers,

PLEASE submit a short 200-300-word article introducing your organization's Maritime Security and Defense-related mission and activities or add an event to our calendar.

Contact Ms. Rita Painter at rpainte@nps.edu.

Mid-Wave Infrared Sensor Improvements

Introduction. In my memory is a deep disappointment. After standing on the test range for nearly an hour waiting for the fog to lift, I concluded that the residual haze layer had precluded my test mission. Even so, in other conditions the 10-micron band FLIR pod had performed well! Many years later, I would look at video taken on a foggy day in Los Angeles and capture the comparison between a 10 micron FLIR and the new mid-wave IR technology. To my amazement, you could see right through the fog!

Mid-wave IR sensors have become common. But in some ways this technology is still new. Specifications had figures of merit such as noise equivalent delta temperature (NEDT) and dynamic range. They made sense at the time. In the eighties, background limited IR photodetector (BLIP) performance seemed unattainable. Progress continued as mid-wave staring arrays were developed. But mid-wave sensors were not optimized from an operator point of view. They lacked usable contrast for certain conditions.

Current Progress. Beginning in late 2005, investigations spawned by aircrew comments regarding the lack of contrast have confirmed the squawks and yielded a specific list of design improvements having potentially large gains for war-fighters operating in a large range of background temperatures. As a result, in 2009, progress was forecast in the form of six recommendations to be implemented via a small business innovative research (SBIR) program over the next 3 years. Five of these performance goals have thus far been attained in a prototype sensor, and the sixth is in-process for demonstration by early 2012.

Described in a series of papers, the latest to be presented at MSS Passive Sensors in 2011 by the 412 Electronic Warfare Group at Edwards AFB, is the effort that has resulted in dramatic NEDT improvement over varying background temperatures with the potential for more performance, with the addition of the first ever BLIP performance detector array, by early 2012. The investigation has examined quantization errors, background noise, non-uniformity correction (NUC) methods, fixed pattern noise, and electronic noise in various operating modes. While there are many benefits to all war-fighters, we think this means there will be improved IR imagery for Navy Maritime Domain Awareness in the near future.

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Ibid, p.198.
"Measured NEDT Performance of a Midwave Staring FLIR", January 2009, AFFTC-PA-09043
Also, reference the following:
1. Crawford, F., Diebel D., Hatfield, D., Louton, K., Massie, M., Pham, H., Sendall, R.; "Progress Toward a Background Limited Midwave Staring FLIR," MSS Passive Sensors, 2011.
2. Cicchi, T., Hatfield, D., Massie, M., McCarley, P. Pham, H., Woodbury, E.; "Optimizing and Automating FLIRs for Low Contrast, Low Noise Operation", MSS Passive Sensors, February 2010.
3. Crawford, F., Hatfield, D., Mele, M., Pham, H.; "Measured Contrast Performance of a Midwave Staring FLIR", MSS Passive Sensors, February 2008.

The following is the abstract from a paper presented at the NATO WaterSide Security Conference, held last week in Marina di Carrara, Italy. http://wss2010.org

Maritime Surveillance in the Intracoastal Waterway using Networked Underwater Acoustic Sensors Integrated with a Regional Command Center

Abstract—Underwater passive acoustic directional sensors and Seaweb through-water networked acoustic communications are implemented in the Intracoastal Waterway at Morehead City, North Carolina on the U.S. eastern seaboard. The objective is to demonstrate capability for first-alert protection of a high-value port facility against asymmetric threats that intelligence sources indicate are arriving via watercraft. Battery-powered acoustic sensors are rapidly deployed at widely separated chokepoint locations in shallow 5-10 meter water. These sensors autonomously detect the passage of a maritime vessel and generate a contact report indicating time, location and heading of the target. Seaweb through-water acoustic communications delivers the contact report via a scalable wide-area underwater network including multiple acoustic repeater nodes and a radio/acoustic communications (Racom) gateway buoy. The Racom gateway telemeters the contact report via Iridium satellite communications to an ashore command center with low latency. The in situ acoustic detection is corroborated using shore-based video surveillance to classify the contact as friendly or actionable.

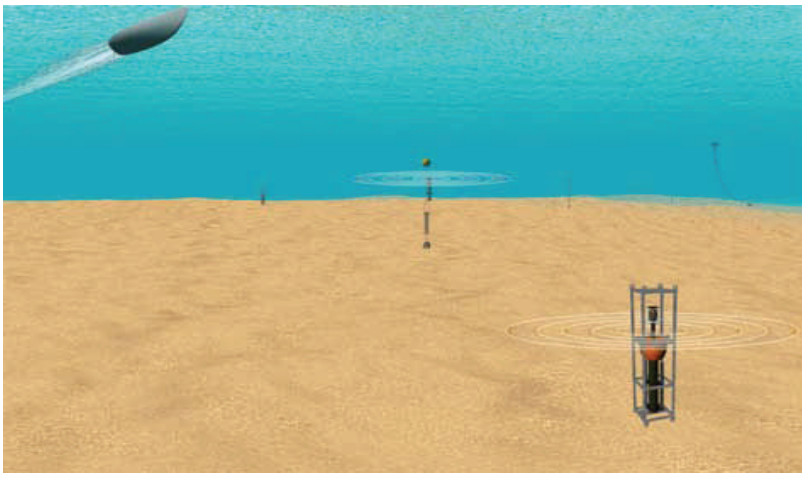

Figure 1. In the foreground is an underwater networked acoustic sensor on the seabed detecting the passage of a surface vessel. In the background are additional distributed network nodes including a Racom gateway buoy providing for near-real-time exfiltration of contact reports.

For additional information please contact:

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(CONTROL +click, to follow links)

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Arky, Aaron S. Trading Nets for Guns: The Impact of Illegal Fishing on Piracy in Somalia. Naval Postgraduate School, September 2010. http://edocs.nps.edu/npspubs/scholarly/theses/2010/Sep/10Sep_Arky.pdf

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Schnars, Brenna L. The Idle Threat? An Assessment of the Economic, Military, and Strategic Consequences of an Iranian Closure of the Strait of Hormuz. Naval Postgraduate School, September 2010. http://edocs.nps.edu/npspubs/scholarly/theses/2010/Sep/10Sep_Schnars.pdf

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ARTICLES

Chalk, Peter. "Piracy in the Horn of Africa: A Growing Maritime Security Threat" CTC Sentinel, September 2010, v. 3, no. 9, p. 11-14 http://www.ctc.usma.edu/sentinel/CTCSentinel-Vol3Iss9.pdf

Howe, Jim. "The Forgotten Threat." US Naval Institute Proceedings, October 2010, v. 136, no. 10, p. 34-38. [small-boat threat]

Future Events:

Nov 8-10 IEEE Homeland Security Conference, Westin Waltham Boston in Waltham, Mass

Nov 15-17 Collaboration in Space for International Global Maritime Awareness (C-SIGMA) at National Defense University

Nov 16-18 USC - USCG Academic Maritime Risk Symposium, USC Los Angeles

2011

Feb 9-10 Small Vessel Security Threat Conference to Address New DHS SVSS Implementation and Impact http://svstconference.com

May 4-5 9th Maritime & Transportation Security Expo, Baltimore Convention Center, MD http://www.maritimesecurityexpo.com

Jun 20-23 79th MORS Symposium, Naval Postgraduate School http://www.mors.org