2010 CNR Challenge

Next Generation Technologies for Today's Warfighter

Seedling Research Funding

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Code 31

Compressive Sensing for Urban Warfare

This proposed research focuses on developing advanced signal processing techniques, based on compressed sensing (CS), to extend the operational range and sensitivity of radar systems, specifically those deployed for urban missions and operations.

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Code 31 Guidelines:

Title: Compressive Sensing for Urban Warfare

Objective: This proposed research focuses on developing advanced signal processing techniques, based on compressed sensing (CS), to extend the operational range and sensitivity of radar systems, specifically those deployed for urban missions and operations. The advantage of CS is that it enables the reconstruction of a sparse or compressible signal from far fewer measurements than required by the Shannon-Nyquist sampling theorem. The main objective is to investigate CS in the design of low cost, portable imaging systems that support a) real-time target detection and tracking, b) automatic target recognition and identification, c) improved target resolution and localization, d) removal of clutters (objects that cause unwanted radar returns), ghosts and shadows, e) accurate image fusion and segmentation, and imaging from multiple views. To achieve the main objective, we expect CS to lead to novel signal and image processing techniques and machine learning algorithms to a) enhance the signal-to-clutter ratio, b) improve two-dimensional and three-dimensional imaging resolution, c) remove blurring and resolve ambiguities, d) detect and segment moving targets, e) distinguish targets of interest (human beings, anomalies, etc.) from others (animals, furniture, etc.), and f) identify and classify targets (stationary objects, moving persons, oscillating fans, etc.).

Description: Advances in sensing and information processing technologies over the past decades have led to the generation of massive amounts of data, which presents a major challenge for data capturing, processing, search and storage. This trend is set to continue with the ubiquitous usage of sensors and wide deployment of sensor networks. Current radar data acquisition systems first acquire samples of the signal or image, and then apply compression to reduce the amount of stored information. This approach has three inherent inefficiencies. First, as the demand for high resolution and more accurate information increases, so does the number of data samples to be recorded and stored. Second, there are significant data redundancies not exploited by the traditional sampling process. Third, it is wasteful to acquire and process data samples that will be discarded later!

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The 2010 CNR Challenge will award up to 10 awards, each totaling up to $100K, to open funding opportunities for a larger pool of participants. Before submitting your white paper, take time over the course of the 2010 Naval Science & Technology Partnership Conference to meet ONR subject matter experts at the Information Exchange and in breakout rooms to discuss their needs. Submit your idea on site at the Director of Innovation's break-out room (must be on CD). Once received on site, ONR will provide you with a receipt acknowledging your submission. Entries will be reviewed after the conference with all submissions evaluated based on individual merit, applicability, relation to naval energy and research needs.

Specific white paper guidelines and the Award Timeline are available in the Director of Innovation's break-out room.