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DIRT

Distributed Imaging Radar Technology

Summary

- Wide field of view continuous imaging
- Enhance distributed array radar imaging system in support of the Future Combat System (FCS)
- Technology transition to reconnaissance, surveillance, and target acquisition for FCS
- Use of innovative algorithms to handle signal and data processing

Distributed Imaging Radar Technology (DIRT) provides the capability to "see" the battlefield in near real time, with high-resolution images, unique target identification, and the ability to mitigate jamming.

The capability to track and identify moving and stationary targets in near real time is provided to the Army Future Force through technology developed by the Distributed Imaging Radar Technology program. Accurate images of targets with unique target identification allow for mitigation of clutter and jamming, providing the Soldier a clear view of the battlefield. Through the use of radars mounted on distributed platforms, a field of regard (FOR) can be imaged to illuminate the area of interest. The precise location and motion of the targets can be accurately identified and tracked. A precise image of the entire FOR can be constructed and updated in near real time.

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Overview

The Distributed Imaging Radar Technology (DIRT) program develops technology to continuously track and identify a variety of moving and stationary battlefield targets for the U.S. Army Future Force. These targets include close-combat vehicles and weapons (tanks, artillery, and rockets), deep targets (missile transporter erector launchers), Battle Management Command, Control, Computer, Communications and Intelligence nodes, and weapon stockpiles.

Benefits for Tomorrow's Defense

DIRT will provide the capability for the Army to "see" the width and breadth of the battlefield in near real time, with high-resolution images of targets, with unique target identification, and with the ability to mitigate clutter and jamming. DIRT will also provide wide area coverage of the battlefield, continuous tracking of moving and stationary targets, no single point of failure, precision tracking for targeting, and the capability of direct handover to defensive weapons.

The DIRT program demonstrates the feasibility of continuous imaging over a wide field of view with a Distributed Aperture Radar System. It develops, plans, and designs a Distributed Aperture Radar Battlefield Imaging System and provides for technology transition to Reconnaissance, Surveillance, and Target Acquisition for the Future Combat System.

Technical Concept

A field of regard (FOR) will be imaged by steering subapertures to illuminate the area of interest. The radar system(s) will transmit orthogonal waveforms (nearly simultaneously) from subapertures. The DIRT processing will precisely measure the location and motion of the subapertures phase centers at time of transmission. The radar return is then received at each subaperture. The central DIRT processing node will receive the subaperture returns, location, and time of transmission. These returns will be processed and distributed in near real time for use on the battlefield. To select target locations (e.g. range cells) in the FOR, the synchronized time and phase of deconvolution of the waveforms must be performed. The moving target indicator processing and compensation for the Doppler shift must then be taken into account. An image will be constructed over the selected FOR. Within the image, ground benchmarks/reflectors can be located. Updated subaperture locations and motion, and compensated time and phase of deconvolved waveforms for location errors, can be combined to provide an accurate picture of the FOR. The image can be reconstructed with updated subaperture locations and waveform returns to provide even higher resolution images of the area of interest.

The DIRT program is made up of three primary technologies: Space Time Coded Aperture consists of waveforms transmitted and recovered simultaneously from distributed subapertures; precision time and phase synchronization of transmissions from separate subapertures; and nearly instantaneous images reconstructed from a single set of transmissions from distributed radar apertures.

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