Synthesis of False Target Radar Images Using a Reconfigurable Computer

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Modern shipboard and airborne wideband inverse synthetic aperture radars (ISARs) are capable of generating images of target objects. Such imaging capability is an advantage over previous technology because it improves the ability to identify the specific type of target, distinguish friend from foe, and accurately guide weaponry. It can also defeat electronic protection such as false target decoys because an electronic protection system cannot synthesize a false target by just transmitting a signal that emulates a radar return off a single or a few scattering surfaces. Instead, false target signals must emulate a coherent sequence of reflections with the proper delay, phase, and amplitude that is similar to what would come from the multiple scattering surfaces at multiple ranges (distances from the radar) of an actual ship.

The equations and algorithms needed to digitally synthesize a false target radar image have been developed at the Naval Postgraduate School. This paper documents research to implement these equations and algorithms on an SRC-6E reconfigurable computer in an effort to synthesize realistic false target images of large decoy targets in real time. The paper also reviews the current state of the art of electronic protection systems and false target synthesis and describes how a reconfigurable computer can be interfaced to existing digital radio frequency memories (DRFMs), thus allowing the reconfigurable computer to become a key component in the electronic protection system. This allows the reconfigurable computer to synthesize a wide variety of waveforms and even create false target images with realistic motion. A reconfigurable computer interfaced to a DRFM that is part of an electronic protection system can also perform a wide variety of real time and near-real time signal analysis tasks for detection and classification of threat signals.

USS Crockett

Image of USS Crockett from a U.S. Navy AN/APS-137 inverse synthetic aperture radar.