SYNTHETIC APERTURE RADAR IMAGE RESOLUTION EFFECT ON TARGET DISCRIMINATION

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Technical Commission VII Symposium 2010

KEY WORDS: Image, Imagery, MISR, RADARSAT, Radar, Resolution, SAR, Scene

ABSTRACT:

This research details the effect of spatial resolution on target discrimination in Synthetic Aperture Radar (SAR) images. Multiple SAR image chips containing targets and non-targets are used to test a baseline Automatic Target Recognition (ATR) system, with reduced spatial resolution obtained by lowering the pixel count, or synthesizing a degraded image. The pixel count is lowered by averaging groups of adjoining pixels to form a new single value. The degraded image is synthesized by low-pass filtering the image frequency space, and then lowering the pixel count. A two parameter Constant False Alarm Rate (CFAR) detector is tested, and three different types of feature spaces (size, contrast, and texture) are used to train a linear classifier. The results are scored using the Area Under the Receiver Operator Characteristic (AUROC) curve. The CFAR detector is shown to perform better at lower resolution. All three feature sets together performed well, with the degradation of resolution. Separately the sets had different performances. The texture features performed best because they do not rely on the number of pixels on the target, while the size features performed worst for the same reason. The contrast features yielded improved performance when the resolution was slightly reduced. The views expressed in this article are those of the authors and do not reflect the official policy of the U.S. Air Force, U.S. Department of Defense, or the U.S. Government.

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