Virtual Array Radar (VAR) Processing

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Technology description

Invention

This invention involves the use of angle and joint angle-range manifolds along with sparse reconstruction methods to obtain high-resolution images of man-made targets. Assuming that man-made targets are dominated by few strong scatterers, the invention sets up a reconstruction manifold based on phase histories of scatterers at different points within the illumination beam. The invention then uses a sparse reconstruction technique to obtain images of higher resolution than would typically be possible using SAR processing on the same data. The image allows better estimation of angle to the target than what is usually obtained via monopulse techniques.

Background

Synthetic-aperture radar (SAR) is a form of radar whose defining characteristic is its use of relative motion between an antenna and its target region. It provides distinctive long-term coherent-signal variations that are exploited to obtain finer spatial resolution than is possible with conventional beam-scanning means.

Application area

High resolution radar

Provide displacement maps for terrain or structure monitoring

Techniques like Capon beamforming and/or the MUSIC algorithm provide superresolution but usually require 1) training data for estimating covariance matrices, and 2) an estimate of the number of scattering points. Monopulse techniques provide angle estimates but not an image and can be fooled by complicated target scattering.

Advantages

Provides better imaging resolution in aperture-limited systems than existing approaches.

Provides an image rather than a single angle estimate as in monopulse processing or similar angle estimation approaches.

Institution

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