ARRAY SYSTEMS COMPUTING INC.

Radar and Remote Sensing
Synthetic Aperture Radar Simulation Toolbox

Key Features

Realistic radar simulation for the generation of synthetic raw data

Simulation of effects of turbulence on platform motion

Scenes may be specified using point targets or by using a GeoTIFF image

Radar clutter model

Motion compensation model simulates the performance of INS / GPS device and Kalman filter

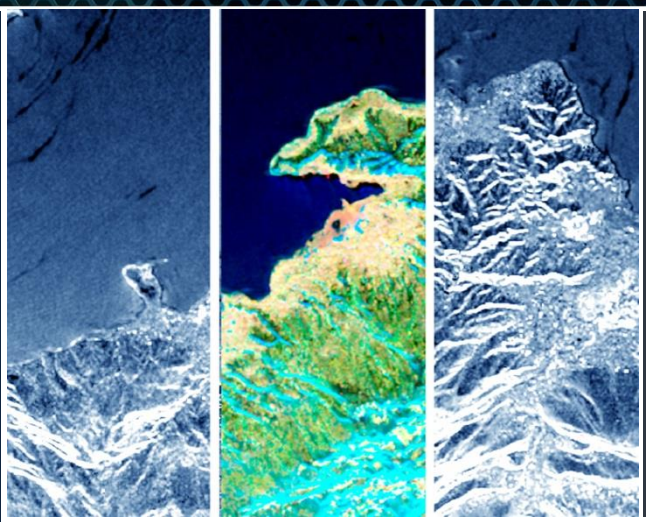
Image formation algorithms including:

- Stripmap
- Spotlight
- Inverse-SAR

Ground Moving Target Indicator (GMTI)

Image analysis tool for the quantitative measurement of product quality

Leverages the familiar MATLAB environment to provide powerful analysis and visualization capabilities.



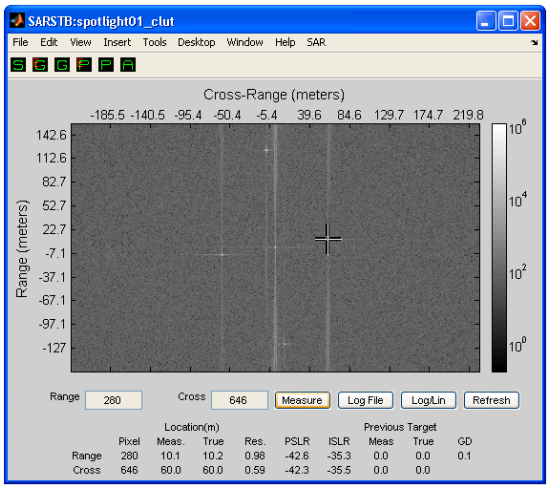
Tap into Array's World – Class Remote Sensing Expertise

Array Systems Computing Inc.
1120 Finch Avenue West, 7th Floor
Toronto, Ontario Canada M3J 3H7

Phone: +1 416 736 0900
Fax: +1 416 736 4715

Synthetic Aperture Radar Simulation Toolbox

Array's SAR Simulation Toolbox is implemented using MATLAB®, allowing scientists to leverage familiar tools for algorithm prototyping and data visualization. The toolbox consists of a complete set of tools for simulating the SAR data acquisition and image formation process from end-to-end.



Array has been involved in a number of Synthetic Aperture Radar (SAR) programs beginning with the development of an airborne SAR processor for the Canadian Department of National Defence in 1990. Over the last 20 years, we have designed and implemented a number of SAR image formation processors for both airborne and satellite applications. During the course of these projects, we have developed a comprehensive radar imaging test-bed platform to support our in-house development activities. We have successfully exploited this test-bed in support of the design of new SAR processors and to perform qualification testing in a controlled environment. Array is proud to offer the fruits of our accumulated experience in the form of the SAR Simulation Toolbox.

Featured Tools

DATA GENERATION TOOL

Data Generation Tool simulates the transmission and reception of radar pulses and models the synthetic aperture data acquisition geometry. The Data Generation Tool simulates the effects of turbulence on the platform, allowing synthetic data sets to be computed which include a controlled amount of non-ideal motion, resulting in phase shifts in the data. Typical test scenes are constructed from a number of point targets, which permits the SAR imaging system to be characterized by measuring its Impulse Response Function (IRF). A module is also available that allows radar data to be synthesized based on an optical GeoTIFF image of a scene. Simulated radar clutter may be computed and added to the synthetic raw radar data.

MOTION COMPENSATION

For airborne SAR applications, Motion Compensation is a vitally important aspect of the data acquisition. The SAR Toolbox simulates an INS / GPS motion sensor mounted close to the antenna pedestal. The precision of the INS / GPS position, velocity and angle measurements, together with the Kalman filter processing latency and the lever arm offset between the Antenna Phase Centre and the motion sensor may all be specified using GUI controls. The simulated motion sensor forms an estimate of the platform motion which is used to predict the position of the platform at the time of the next radar pulse. The estimated platform motion is used to compute antenna targeting and to perform phase correction of the collected data. Once motion-compensated synthetic data has been acquired, a SAR image may be formed.

IMAGING MODES

A selection of different imaging modes are provided, including:

- Stripmap area mapping using the Range-Doppler or Chirp-Scaling Algorithms
- Spotlight high-resolution surveillance using the Polar Format Algorithm
- Inverse-SAR imaging for maritime targets using the Polar Format Algorithm together with target motion and rotation tracking and correction

Additional image formation algorithms can be easily added to support your particular mission requirements.

QUALITY ANALYSIS TOOL

It is important to be able to quantitatively measure the performance of the SAR imaging system. This is normally performed by characterizing the focused image obtained from synthetic point target data. The SAR Toolbox incorporates an Image Quality Analysis Tool which allows scientists to measure a point target's 3dB resolution, peak and integrated sidelobe ratio and also to assess geometric distortion in the image plane.

GROUND MOVING TARGET INDICATOR

The Toolbox also offers support for prototyping of Ground Moving Target Indicator (GMTI) modes. GMTI processing detects moving targets in a SAR data set and estimates their position and velocity. This information may be displayed as a vector overlay on a SAR image. The toolbox includes both a simple single channel GMTI implementation and a two-channel method based on the Displaced Phase Centre Algorithm (DPCA).

COHERENT CHANGE DETECTION

The toolbox's Coherent Change Detection (CCD) tools are used to enhance the capability of the AS Op to detect the existence of or some change to such features such as large structures, buildings, roads, bridges, large encampments, large concentrations of vehicles/equipment, large aircraft crash sites, austere runways, geographical physical land feature changes, and active trails.

Reduce Risk

Often when a SAR processor is developed in parallel with a new radar system or a new aircraft, only trivial testing is performed prior to the availability of the prototype radar or aircraft. Incorporating the SAR Toolbox into your development program early on allows comprehensive testing to be performed prior to the finalization of the high-level design.

Contact Us

Accelerate your programme while reducing development risk by harnessing the benefits of Array's 30 years of experience in the development of synthetic aperture radar image processors.

1120 Finch Avenue West,
Suite 700, Toronto, Ontario,
Canada, M3J 3H7

Phone: +1 416 736 0900
Fax: +1 416 736 4715
Email: marketing@array.ca