SYNTHETIC APERTURE RADAR IMAGES SIMULATION

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ABSTRACT

The Synthetic Aperture Radar (SAR) is an active microwave sensor installed in aircrafts and satellites. It produces high resolution images that can be used in remote sensing activities.

The SAR images are influenced mainly by the geometry of antenna illumination (incidence angle), by the parameters of the radar (polarization, frequency, pulse width, antenna pattern) and by the electromagnetics properties of the scene.

It has some advantages in comparison with optical sensors. Some of them are the capability of imaging through clouds and at night. An example of this is the Pioneer mission in Venus. With the SAR it is possible to obtain a image of forest trees or the soil of that forest.

The SAR is a coherent device and as all coherent processes such as laser or sonar its image is obtained with speckle noise. The speckle is a multiplicative noise caused by the roughness of the scene when the roughness is comparable with the electromagnetic radiation wavelength. The speckle makes difficult the visualization and the automatic interpretation of the images.

There are several techniques for speckle reduction. A difficult problem in the test of speckle reduction algorithms is the simulation of realistic images with particularities that can be used to infer the ability of the algorithm in preserve the edges and the resolution of the image.

It is showed in this work how realistic SAR images can be simulated through the SAR Point Spread Function. The Point Spread Function represents the image of a point target observed by the SAR and it defines the image resolution and the pixels correlation.

Some examples of simulated images are showed for the E-SAR from German Space Agency, DLR.

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