

Synthetic Aperture Radar Imagery using SOCET GXP[®]

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Abstract

Synthetic Aperture Radar (SAR) provides high resolution images for a multitude of applications. The main purpose of this work is to provide the reader to get accustomed to application oriented SAR data processing and visualization. This goal is achieved using BAE SYSTEMS SOCET GXP[®] software tool. The obtained results present a solid approach by using the tool for the exploitation of SAR images as a source for geospatial information and data regarding water resource detection, terrain feature extraction, vegetation health assessment among other applications.

1. Introduction

In this work, we will be addressing SOCET GXP[®] in an attempt to expose the capabilities of such tool as well as the kind of information that can be extracted using it when working with SAR imagery from any kind of source. A few use cases will also be presented with the intent of providing a good starting point for anyone interested in beginning to work with SAR data, particularly when it comes to processing, visualization and feature extraction.

2. Synthetic Aperture Radar

SAR systems allow us to acquire imagery in the most challenging of circumstances and scenarios such as at night or under harsh atmospheric conditions. The aim is always to achieve a finer resolution whether we are airborne or spaceborne. Thanks to SAR, we can now take advantage of the long-range propagation characteristics of radar signals and the complex information processing capability of modern digital electronics to provide high resolution imagery.

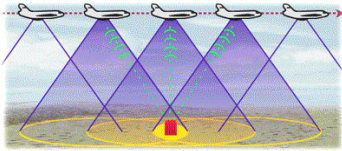


Figure 1: Example of an antenna on a moving platform.

3. SAR Tools

When it comes to the format of the acquired data, for every piece of energy sent to the ground, two values are received: magnitude which is the amount of energy that gets reflected and phase which expresses

the time that that energy took to return to the sensor. Next, these values come off the sensor as I and Q which represent complex numbers. SOCET GXP[®] then converts the sensor independent complex data into magnitude and phase when the data is loaded.

4. Applications

SAR images can also be extremely useful when detecting oil spills. Oil is a major threat to the sea ecosystems and SAR is of very great use in mitigating this issue. The possibility of detecting an oil spill in a SAR image relies on the fact that the oil film decreases the backscattering of the sea surface resulting in a dark formation that contrasts with the brightness of the surrounding spill-free water.

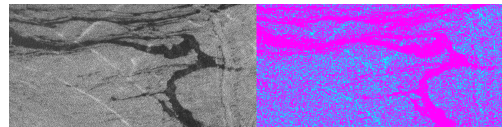


Figure 2: Original oil spill SAR image (left) and post-classification SAR image (right).

5. Conclusion

Throughout the course of this work we sought to achieve two main goals: Find a SAR imagery analysis tool that could deliver prompt and useful results from virtually any relevant imagery source; Provide a hands-on approach to SAR imagery analysis with the aid of the aforementioned tool.

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