SHIP DETECTION IN THE BRAZILIAN COAST USING TERRASAR-X SAR IMAGES

Rafael L. Paes [1,2], João A. Lorenzzetti [2], Douglas F. M. Gherardi [2]
[1] Instituto de Estudos Avançados – IEAv
Rodovia dos Tamoios Km 5,5 – 12228-840 – São José dos Campos – SP, Brasil
[2] Instituto Nacional de Pesquisas Espaciais – INPE
Divisão de Sensoriamento Remoto
Jardim da Granja - 12201-970 - São José dos Campos - SP, Brasil

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1. Introduction

Brazil has a huge legal sea area named as Blue Amazon. Such term was created by Brazilian Navy to reinforce its extent and your importance. The purpose to monitor efficiently these waters is due to necessity to protect natural resources (biological and mineral). Another purpose is to achieve international duties as safety of life at sea. Difficulties to survey such huge area only with ships and aircrafts from Brazilian Armed Forces leads toward to a search for new efficient methods. The monitoring together with satellite images has shown very effective and has support in the scientific literature. Recent terrorism acts and maritime piracy around the world strengthen this kind of application.

For this work, TerraSAR-X satellite images was used to detect targets on sea environment. ScanSAR mode was required for imaging such broad region. Images with VV and HH polarizations were acquired. TerraSAR's ScanSAR mode has 100x150km of swath coverage and resolution of 16 meters [1]. Ground truth data was obtained from Brazilian Navy's Automatic Information System (AIS) data and from Brazilian Air Force maritime patrol aircrafts sea traffic information.

2. Metodology and results

CFAR approach was used as detection algorithm. We followed the steps similarly as suggested in [2], [3] and [4] which are presented in the Figure 1.

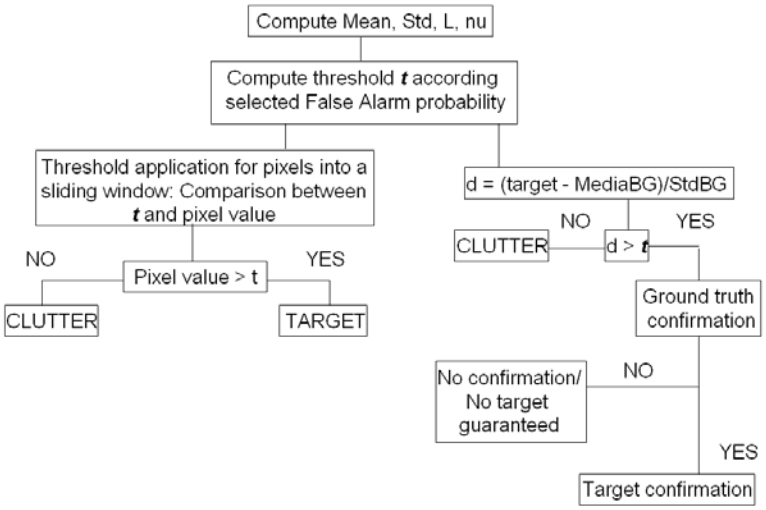

Figure 1 – Metodology scheme.

Equation 1 shows the two-parameter CFAR technique applied and Equation 2 shows probability distribution function (pdf) threshold cutout point technique. As pdf, K-distribution was chosen. Equation 3 shows K-distribution pdf.

$$\mu_t > \mu_b + \sigma_b t \quad \Leftrightarrow \text{target} \tag{1}$$

$$Pfa = \int_t^{\infty} P_{background}(x)dx \tag{2}$$

$$p(x) = \frac{2}{x\Gamma(\nu)\Gamma(L)}\left(\frac{L\nu x}{\mu}\right)^{\frac{(L+\nu)}{2}} K_{L-\nu}\left(2\sqrt{\frac{L\nu x}{\mu}}\right) \tag{3}$$

At the end, we present detections results performances. Figure 2 shows original image (a) and detected image (b).

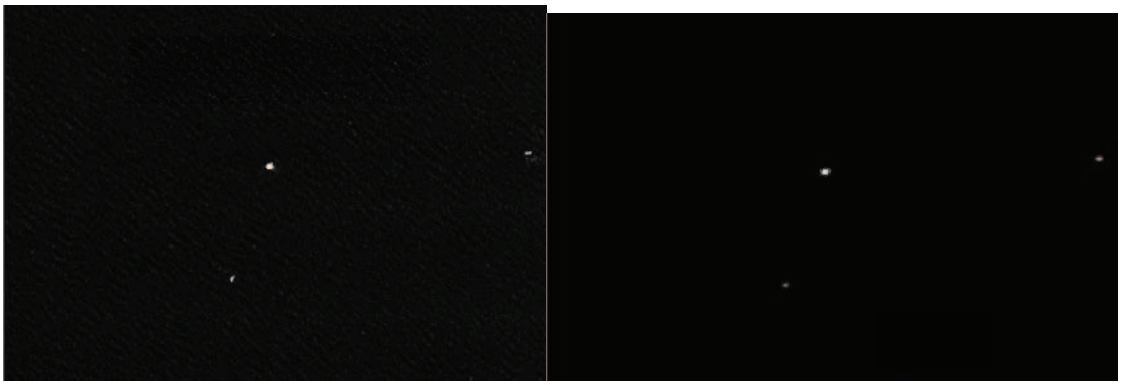

Figure 2.a – Original image.

Figure 2.b – Detected image.

3. References

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