A PRELIMINARY STUDY OF TARGET CONTOUR EXTRACTION BASED ON SCATTERING MECHANISM USING POLARIMETRIC SAR IMAGES

Lu Zhang; Huadong Guo; Xinwu Li; Qizhong Lin; Yubao Qiu

Laboratory of Digital Earth Sciences,
Center for Earth Observation and Digital Earth, Chinese Academy of Sciences

Email: luzhang@ceode.ac.cn

1. INTRODUCTION

Finding the target contour information is important for image analysis. Conventional target contour detection methods are usually based on the statistics information of image. With the accelerative development of Polarimetric Synthetic Aperture Radar (PolSAR) systems and theories, the physical scattering mechanism of scatterers can be acquired from PolSAR image. Utilizing the scattering mechanism, this paper proposed a novel target contour information extraction method.

2. METHOD

The maximum return of the normalized scattering matrix of dominant scattering type of the ground scatterer is used to extract the target contour information in this new method. Table 1 shows normalized maximum return of the six basic symmetric scattering types, which are trihedral, dihedral, dipole, cylinder, narrow dihedral and quarter wave scattering types respectively. The spans of them are all normalized to one.

Table 1: The normalized maximum return of the six basic symmetric scattering types

Scattering type	trihedral	Dihedral	Dipole	Cylinder	narrow dihedral	quarter wave
Normalized maximum return	0.5	0.5	1	0.8	0.8	0.5

As seen in Table 1, the maximum returns of the trihedral, dihedral and quarter wave scattering types are equal to 0.5, small than the other scattering types. Considering the characteristic of target contour structure, it is no problem that trihedral and dihedral scattering types usually stand for the target contour. The quarter wave scattering is complex, which do not discuss here. So, a fixed threshold can be set to separate these contour sensitive scattering types from others. The new method includes three steps.

Step1. Get normalized dominant scattering component by using Cloude's Incoherent Target Decomposition technique[1];

Step2. Get the maximum return of the dominant scattering component by using Huynen decomposition[2] or Grave's matrix decomposition;

Step3. Choose a fixed threshold to extract the pixels which belong to target contour region.

.

3. RESULTS AND CONCLUSIONS

A PolSAR image collected with German's experimental airborne SAR (E-SAR) of Foulum, Denmark is used as researching images which covers farm field and village area. The Sinclair image is presented in Figure 1a. The normalized maximum return obtained from the dominant scattering component is shown in Figure 1b. From the figure, the target contour with blacker color can be seen clearly. For example, the contours of trees are shown as circles. A fixed threshold of 0.65 is suggested in this paper. The extracting result is shown in Figure 1c. The result shows that this method has a good capability to extract the target contour information.
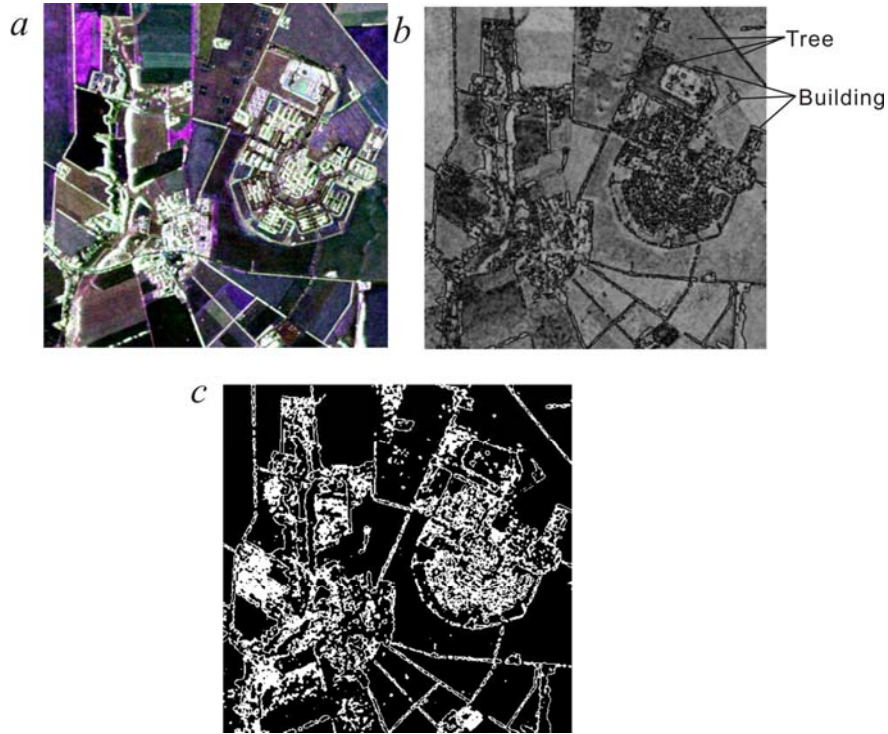

Figure 2 Foulum of Denmark
(a. Sinclair image, b. Maximum return image, c. Target contour image)

4. REFERENCES

[1] S.R. Cloude and E.Pottier, "A review of target decomposition theorems in radar polarimetry," *IEEE Transactions on Geoscience and Remote Sensing*, Vol. 34, pp. 498-518, 1996.

[2] J.R. Huynen, "Measurement of the target scattering matrix, " *Proceedings*, Vol. 53, 1965.