

# Retrieving Textured Satellite Images

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**Abstract.** In this work we focus on the retrieval of complex images based on their textural content. We consider to retrieving textured satellite images from a thematic database, where the semantic content of the images is limited to a specific domain.

## 1 Introduction

Content-based retrieval with texture descriptors will be very useful in Remote Sensing and GIS database context [2]. In remotely sensed data, texture is defined to be the local scene heterogeneity and this property is used for classification of land use categories such as water, agricultural areas, forest areas, urban areas, etc [3]. This fact also can be used to perform segmentation, boundary detection and content-based image retrieval [1].

This work describes our approach for satellite image retrieval based in textures descriptors. These descriptors are second order statistics computed based on co-occurrence matrices [1].

## 2 Retrieving Satellite Textured Image

Landsat Thematic Mapper images are multispectral electromagnetic energy measured in seven spectral bands ranging from the visible to the thermal infrared. Each pixel represents an area 30 m by 30 m for six of the seven bands whereas pixels in the thermal infrared band represent an area 120 m by 120 m [1].

Each image on database is subdivided in a  $k \times k$  regular grid cells. The grid cells in main diagonal are selected to generate the vector  $\mathbf{f}$ , the feature vector based on co-occurrence texture descriptors. These vectors are grouped in a set  $\mathbf{F}$  that will be used to find an image in the database.

Queries can be submitted as a sample texture image (see Figure 1). The co-occurrence features are computed in the reference vector  $\mathbf{f}_r$  and then are used to find similarities. The similarity measurement  $S_i$  is given by the angle between nonzero vectors  $\mathbf{f}_r$  and  $\mathbf{f}_i$  by  $S_i = \langle \mathbf{f}_r, \mathbf{f}_i \rangle / \|\mathbf{f}_r\| \|\mathbf{f}_i\|$ .

Resulting retrieved image are indexed according to a growing distance score. Retrieval results are considered correct if the original image is retrieved in the

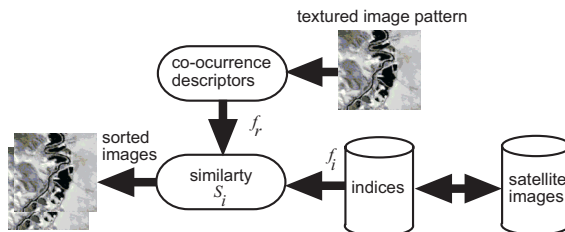


Figure 1: Texture-based query process

first three higher ranking in sorted set  $S'$ .

## 3 Final Remarks

Preliminary results for computing feature vectors takes 13.34 seconds of CPU time (in MatLab on a Pentium II - 200 MHz). The similarity between two feature vectors takes 0.009 seconds. A query takes 0.01 second on average. The results indicates that this approach are quite robust and maintaining a reasonable level of retrieval performance. Further work is in progress in two main directions: improvement of an automatic merging of similar texture areas and integration of the system with other feature extraction approaches.

## References

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