

DETECTION OF MAYA'S ARCHEOLOGICAL SITES USING HIGH RESOLUTION RADAR IMAGES

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ABSTRACT

Detection of archeological sites is increasingly being done by means of satellite image analysis. However, aerial photographs inspection combined with reconnaissance in the field are the basic tools for archeological prospecting. Digital image analysis has been restricted to visual inspection and transformations such as enhancement and filtering. On the other hand, the Yucatán peninsula in the Mexican republic harbors many archeological sites of the Maya civilization. Many of these sites are covered by dense vegetation, in areas of difficult access and high concentration of clouds all year around. Under these conditions, radar images present an option for archeological prospecting. In this research, an area in the eastern part of the Yucatan peninsula has been selected where many Maya sites are located. For such an area, a radar image of the Radarsat system was acquired. Based on mathematical morphology, the speckle in this image was reduced using a geometric filter. Once the reduction of speckle is achieved, the enhancement of archeological sites is accomplished by means of a series of transformations applied to the image. These transformations are designed on the grounds of the mathematical morphology scheme for gray scale images. One set of transformations is applied to the image to enhance the ancient Maya Roads (*Sacbes*), and another set to enhance the archeological sites. Due to the high density of vegetation, the backscattering of the radar signal by the foliage induces in the resulting image a clutter. Some bright spot of the clutter may be confounded with archeological sites. The aforementioned transformations are designed to suppress the clutter and to enhance the archeological sites at the same time. The roads enhanced image and the archeological sites enhanced image are encoded into a single image. In this final image, some confusion between modern buildings and ancient buildings prevails. Nonetheless, the confusion is solved on the grounds of the geometric arrangements of the buildings and the proximity of modern roads. The existence of archeological sites detected by our methodology, is confirmed with ancillary data collect in the field and published literature. A series of examples are presented in detail. With these results, the archeological prospecting by means of remote sensing techniques is fast and economic tool complementing fieldwork. All the algorithms for this research are developed using Delphi 6 on a Windows environment.