

Identification of Informal Settlement Clusters in a QuickBird Satellite Image Using Fractal Dimensions

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SUMMARY

Urban areas in the world are the most dynamic region on earth. They serve as the social and economic centers of our modern life promising a secured and much better life conditions. Urban migration is much experienced in less developed countries like the Philippines. The Metro Manila Urban Services for the Poor Project (MMUSP) reported in 2002 that Metro Manila has joined the small group of mega cities worldwide with populations of more than 10 million. This concentration of people in very dense populated urban areas presents tremendous challenge to managers and planners. It requires the introduction of sophisticated monitoring systems for planning purposes like the use of satellite data. High resolution satellite images offer abundance of information of the earth's surface for remote sensing applications. Although a number of experiments have been performed for urban areas, the number of applications dealing with informal settlements is very limited. The aim of this paper is to identify and map informal settlements using fractal dimensions. Fractals are characterized by self-repeating and irregular geometric objects with infinite nesting of structures at all scales. Similar previous studies involving fractals used dimension determination techniques (Falconer, 1990), analyzed surface coverage (Frankhauser, 1994), and focused on the spatial arrangement of the settlement structures (Thomas, 2007). The data used is the base map image of the University of the Philippines (UP) Diliman Campus. The UP Campus base map is from QuickBird satellite imagery with 0.61 meters ground resolution for the panchromatic (Pan) band and 2.44 meters for the four multispectral (XS) bands. The image was visually interpreted and categorized the identified settlement areas into three basic dwelling types for this study such as informal, semi-formal and formal settlements. Settlement clusters were formed throughout the image and individual structures for each cluster were digitized then evaluated via fractal analysis. The fractal analysis aims to determine the difference in the pattern of the settlements and the generated "pattern" was characterized by a measure called the fractal dimension. The output was then used to identify and characterize the settlement type particularly informal settlement clusters. The output compared to the similar previous studies showed very promising results and empirically, the initial results showed that the computed fractal dimension is a clear indicative of the variations in the morphology of informal and formal settlements.

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