Region-Based Road Extraction from High Resolution Satellite Imageries Based on Fuzzy Inference

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Roads are one of the most important man-made objects whose information is providing many different supports for human civilization. Accurate and up-to-date road network information is an essential part of geographic information system (GIS) databases, transportation and traffic management, urban planning, automated road navigation, industrial development and emergency response applications. Many GIS road network data layers are spatially inaccurate and/or out of date. In addition, rapidly changing urban environments precipitate the need for frequent updates or revisions [1], [2].

Road network extraction from high resolution satellite images has become a challenging and important research topic in recent decades. The availability of accurate, high-resolution satellite imaging sensors such as Ikonos, Quick-Bird and Worldview2 has provided the potential to discriminate very subtle details. These imageries provided us with rich spatial and spectral information and greatly facilitate the recognition and extraction of urban-related features such as road networks [1], [3], [2].

Fuzzy sets and fuzzy logic allow what is referred to as *approximate reasoning*. With fuzzy sets, an element belongs to a set to a certain degree of certainty. Fuzzy logic allows reasoning with these uncertain facts to infer new facts, with a degree of certainty associated with each fact. In a sense, fuzzy sets and logic allow the modeling of common sense [4].

In this paper, a region-based approach for Road Extraction from High Resolution Satellite Imageries has been presented which is based on a fuzzy inference system and takes into account the basic road characteristics such as Directional rectangularity, Bounded width, Contrast and anti-parallelism.

Our various experimental results, confirmed the feasibility of the proposed approach and the analysis of the obtained results was promising. Also, from the extraction results we considered that most errors occur due to disturbances from neighbouring objects. For examples, trees and tall may cast shadow or occlude some road segment.

Keywords: Road extraction, Fuzzy Inference System, VHR Imageries