

Abstract

Title

Automatic Extraction of Road Intersections from Aerial Images driven by an External Cartographic Database.

Key words

Road extraction, road intersection models, aerial image interpretation, Hough transform, auto-evaluation and quantitative results analysis.

Abstract

The need of accurate topographic databases is increasing and specially, in road network. In order to help and reduce the manual stereoplotting, we are looking for methods based on automatic image interpretation system.

This study demonstrates the necessity to propose a dedicated road intersections extraction. Through the state of the art, most existing methods first focus on road extraction to create the road network. Then, the extraction of road intersections is usually realized by perceptual grouping on road hypotheses. On that account, their local behavior depends on road geometric quality and a small planimetric mistake can introduce a large modification of intersection shape. Beside, the existence of typical structures in the center of the intersection poses a problem to the perceptual grouping. The different conclusions established that road network extraction quality could be improved in the intersection areas.

The analysis of 1:30 000 aerial images (0,5m of ground pixel resolution) requires a complex reasoning due to the inherent complexity of images and of man made objects. In order to facilitate this analysis, we introduce a low-resolution external database (~10m), to draw up a simple intersection model, to focus our attention on an image area and to drive the extraction of features. Then, a high-resolution intersection (~0,5m) is fashioned with a refined description respecting the cartographic requirements: readability and accuracy. The external database is a right information, up to date and we will not doing any change detection between the two descriptions.

To complete this description, a complex auto-evaluation process assigns a trust measure to each features. The goal is to evaluate the quality and the confidence of the final description. This measure is obtained by fuzzy functions and fusion operators. A local and global decision-making process are considered to propose in every situation a list of possible solutions. The final reconstruction of each road intersection eliminates the uncertain solution by continuity criteria (radiometric and geometric) and pull-up the correct feature.

A statistical evaluation of roundabout intersections has been done to analyze the behavior of the system on a large set of images. The integration in an existing road network extraction system demonstrates the operational goal of this work.