Automated Extraction Methods Of Linear Features For Map Revision Using High Resolution Imagery

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Periodic and accurate map revision is essential for many purposes, including emergency management and infrastructure maintenance on the national level. The cost associated with such a process is enormous, attributed primarily to the lack of skillful labor.
Automated methods for map revision may facilitate efficient exploitation of available skills, by shifting processing tasks from man to machine. These tasks include extraction of new features; detection of changes in existing features; and monitoring of work in progress. The primary source of data for these tasks is remotely sensed imagery. The goal of this research work is to take advantage of remote sensing technology to advance map revision through development of specific automated extraction and monitoring methods. The initial objective is the implementation of automated methods that allow for the extraction of linear features with minimal human interaction. The target application is national infrastructure, roads and highways.

Image data sources used in this project are selected to provide resolution that is compatible with the level of map details to be extracted. These sources include scanned aerial photography, digital orthophotos, Landsat data, and high-resolution satellite imagery. Orthophotos are generated using the US National Aerial Photography Program, NAPP, acquired in advance. Landsat imagery and the digital orthophotos are then used to automatically detect and map changes in linear features over extended period of time. The orthophotos provide spatial accuracy that is compatible with this task. The automated methods are specifically used to extract such features as road segments, overpasses, and intersections. Techniques, such as edge detection, template matching, and filtering, are used for this purpose. The outcome is evaluated in terms of accuracy, efficiency, and cost. These aspects are tested against other traditional methods of map revision.