COMPARISON OF CAR EXTRACTION TECHNIQUES FOR HIGH RESOLUTION AIRBORNE IMAGES

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Vehicle detection in airborne images is very important in civilian and military applications. It can be used by transportation department to gather traffic information to make transportation more fluent. It also can be used for military operations to gain intelligence over an area, for applications such as site monitoring and ATD/ATR (assisted target detection/assisted target recognition). A lot of research about vehicle extraction has been done in two main research areas: One is the computer vision community, which first builds an ideal car model according to geometric information, then uses the car model to identify whether the target is car or not. This has been mainly used for processing gray image. The second research area is the remote sensing community, which uses classification methods to differentiate cars from other objects in color images. Compared with the techniques used in both research areas, the latter is easier than the former, because it does not require auxiliary information except the image itself, while the former requires auxiliary information, such as viewpoint, view angle, etc, to build ideal car model, which makes the whole image processing more complicated. Thus, this research will only limit car extraction in remote sensing community.

Although individual cars could be detected in high resolution imagery, traditional image classification methods still have problems to classify cars, because vehicles have different colors and some are similar to surrounding background. To date, there has been a lack of effective commercial software to resolve this non-trivial problem.

In this research, two kinds of algorithms are compared in terms of performance in extracting cars from high resolution airborne images. The first algorithm is based on a pixel-based machine learning scheme that learns how image analysts extract object –specifics. The spatial context information of objects is considered in the machine learning algorithm. The process is a supervised classification technique because the user needs to supply training samples of interested objects. The algorithm then uses these samples to find similar pixel-based objects in the image. The second algorithm is based on object-oriented image processing techniques, which could overcome difficulties caused by the pixel-based image processing technique. The basic processing units of object-oriented image analysis are image objects or polygons, but not individual pixels. It first segments the image into spectrally homogenous objects, using a fuzzy classification scheme. The classification is then performed based on the basic processing units. By segmenting an image into polygons aggregated in objects, geographical features such as shape, length and topological entities can also be considered in the classification process. A colorful air photo with resolution 0.056m will be used to test those two techniques. The final extraction results will be compared visually and quantitatively.