



Apply the high resolution satellite images on the investigation of the slope protection structures of the superhighway of Taiwan

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Most of the slopes along the important highways of Taiwan are protected by engineering structures and vegetative method. This research studied the possibility of employing the high resolutions satellite images to do the quick investigation job on the condition of the slope surfaces. The images of QuickBirds and IKONOS were used to study the slopes of some road sections of the southern part of the 2nd superhighway of Taiwan (No. 3 national highway). The digital aerial images and the simulated FORMOSAT-2 images were also used for comparison purpose. The ground data of the engineering structures were also measured for comparison.

The conditions of the slopes were interpreted visually on the images. For satellite images, the multiple spectral bands must be first pan-sharpened to improve their spatial resolution. Four different pan-sharpening methods were tested, and it is found that PCI Advanced Pansharpening software can give the best result. After all the satellite images were treated by this method, then the various slope protection structures were observed on the images, and the result of visual observation were compared with the dimensions of the structures.

Due to their linear shape, the anchored cribs with a width of 0.3m or 0.4m are clearly shown on the pan-sharpened QuickBird image with spatial resolution of 0.7m. However the concrete blocks with 0.3m by 0.3 m size are hardly identified on the images due to their square shape. Certainly the larger linear structures such as ditches and maintenance man way can be more easily identified on the images. In one case, the mesh for vegetation purpose can be identified on the pan-sharpened QuickBird image due to its special spectral signal. However, in the cases of smaller structures or dense vegetation area, the aerial digital images with spatial resolution of 0.35m have a much better ability to identify the structures. The pan-sharpened IKONOS images with 1m spatial resolution were tested in the different area of the superhighway, they can identify the large area of mesh for vegetation purpose but hardly recognize the 0.6m wide ditches. In our conclusion, the pan-sharpened QuickBird images with 0.7m spatial resolution can identify most of the slope protection structures along the superhighway. Though the simulated FORMOSAT-2 images, which have 2m spatial resolution, do not recognize most of the engineering structures, but they can still identify the small scale slope failures. They shall be used for the purpose of quick slope failure investigation in future for their high temporal resolution and convenience for Taiwan users.