3D bathymetric mapping for inland water features using worldview-2 satellite images

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The bathymetric information of lakes and reservoirs are important when initiating different activities such as fisheries, voyages, recreation and many reservoir based constructions. Further, the water levels, volume, lake area, multi temporal comparison between bathymetries, are indicators of environmental changes such as sedimentation in lakes or reservoir. For studying such changes, a 3D bathymetric map can be used as a beneficial descriptor of different bathymetries.

Sounding techniques based on survey vessels are obviously time consuming and the cost of survey and the method to determine the bathymetry is based on specific equipment, which considerably limits frequent repetition. Nowadays, many remote sensing techniques which are based on multi spectral sensors are utilized to determine the depths of water column as an alternative. Calibration information by the energy attenuation due to the depth of the water column and the backscatter due to suspended loads in the water has contributed to create an image of shelf areas.

This work was aimed at utilizing the band combinations of WorldView-2 satellite images to identify the area of inland and its bathymetry. The study area was the swimming pool of the Sabaragamuwa University and verifications were applied for mini well area of the university. The features of water and its region were extracted using three normalized factors (NDWI, NF1 and NF2). Derived bathymetric heights were checked with the actual ground, using manual survey measures. Coastal blue-yellow combination was identified as the best band combination for extraction of bathymetric depth and blue-yellow, green-yellow, blue-green combinations also gave significantly high accuracy, indicating that those ratios are also important for the extraction of inland bathymetry. When the relative bathymetry to absolute bathymetry was found, accuracy checks were improved by different samples and a high correlation of nearly 0.9 for all samples tested were obtained. The resulting depths were converted to a 3D surface map affirming the shape of the bathymetries for further analysis of its episodic changes.

Keywords: bathymetry extraction, satellite images, water resources, World View 2, normalized factor

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