



## **Application of photogrammetric technique to measure water level and surface water velocity in streams**

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River discharge is a fundamental hydrologic quantity that can be calculated from the river velocity and river cross section. However an invasive method is popularly used to measure velocity in rivers during normal flow periods. During the high flow periods, the river discharge can be calculated from river velocity that only can be measured using the buoy method, or using discharge-water level rating curves method. There are great uncertainty and inaccuracy in the buoy method and the water level-discharge rating curve method. Photogrammetric technique possesses noncontact characteristic and is more secure and reliable compared to other measuring methods. Therefore the Large Scale Particle Image Velocimetry (LSPIV) is developed to measure surface velocity.

In this research, the study site is selected at the Yufeng gauging station where is in the upstream catchment of the Shihmen Reservoir, Taiwan. Firstly, the photogrammetric technique solving water level was compared with measured water level, and then the measured surface velocity was compared with the analyzing surface velocity using the applications of measured water level and photogrammetric technique solving water level. The results showed that the Root Mean Square Error (RMSE) using photogrammetric techniques to solve water level and measured water level was in the range of 0.007 m to 0.055 m. The difference of averaged Relative Error (RE) between the measured surface velocity and the analyzing surface velocity was 1.55%. It revealed that the approach with photogrammetric techniques solving water level was capable and available to analyze surface velocity.

Keywords: Water level, Surface velocity, Gauging station, Photogrammetry, Large Scale Particle Image Velocimetry (LSPIV).