

Acquiring underwater DSM using aerial imagery

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Abstract: The underwater digital surface model (DSM) is of great importance for the characterization of the water-submerged zones. It has been noted that the effects of refraction at the air/water interface would cause the depth-dependent bias in the underwater DSM. In this study, we employ the empirical method, which gives the correction function based on the regression relation between the elevation of the river bed determined from the aerial image and that obtained from in-situ measurement (total station surveying or single beam echo sounder). We use a medium frame camera, which attitude is determined by the onboard global positioning system and inertial measurement unit, with the pixel size of 6.8 μm to acquire the high resolution color aerial imagery at the Nan-Shih River, northern Taiwan (latitude of latitude and longitude of 24°54'11" and 121°33'22", respectively). The flying height is 600 meters, and the ground resolution is 3 centimeters. The SOCET GXP software is used to carry out aerial triangulation. The results are compared with the in-situ measurements that were obtained by total station surveying (for depth < 40 cm) and single beam sonar (for depth > 40cm). In addition, they are compared to underwater DSM generated using analytical solutions that correct the refraction effect without the assistance of in-situ measurements.

Keywords: Underwater Digital Surface Model, Aerial imagery, Aerial triangulation