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**Automatic Water-Level Detection Using Single-Camera Images with Varied Poses**

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**Abstract**

Monitoring of the water level of reservoirs, rivers, and lakes is an essential task for hydraulic facility management and disaster mitigation. Nowadays, although automated instruments for water-level detection have been widely applied, their reliability and robustness still need to be further improved. On the other hand, surveillance cameras are typically available at major rivers and hydraulic facilities and could provide opportune field observations of the water level. In this study, an automatic water-level detection approach based on single-camera images is developed. It employs digital image processing techniques to minimize the ambient noise and to detect the water level in real-time. The photogrammetric technique is also introduced to track the camera movements and accurately determine the water level in the object space in a rigorous manner. According to the results of real field experiments, it has been illustrated that the proposed approach is capable of overcoming interference due to changing weather conditions and unexpected movement of the camera and automatically identifying the water level. Consequently, it can provide an efficient and reliable water-level monitoring technique for hydraulic management authorities.

**Keywords:** water-level detection; digital image processing; real-time monitoring; hydraulic

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