

Innovative Camera-Based Flow Measurement in Streams and Wastewater Plant Outflow Channels

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Abstract

The quantitative monitoring of rivers and wastewater channels require providing plausible hydraulic parameters in their related areas in real time using reliable measuring methods. Some of these parameters are water level, flow velocity and discharge. However, conventional measurement methods, reach their limits precisely then, as they often rely on a sensor that is not contactless. This study presents an innovative solution to estimate all parameters mentioned using one camera-system by implementing different image processing methods. Image-based flow measurement systems offer a flexible non-intrusive alternative with real time measurement. Unlike conventional measurement methods, the ratio of measurement signal to measurement noise is optimal, especially for extreme events.

A camera-based discharge system developed by SEBA Hydrometrie and photrack AG, DischargeKeeper (DK), offers a continuous measurement of water level, velocity and discharge in real time. Furthermore, the images taken by the same DischargeKeeper cameras can be processed for rainfall measurement and water turbidity estimation. several case studies about the camera-based discharge, turbidity and rainfall measurement are presented in this paper.

The DischargeKeeper systems could continuously, edge processing, deliver reliable measured data water level, surface velocity, bulk velocity and discharge. The transmitted proof images with time stamp were very helpful for the optical verification of the measurement especially during flood events. Furthermore, the camera used can be installed at almost any position with respect to the flow, regardless of the presence of a bridge, as far as the flow is in the view of the camera with a good resolution.

The case studies, located in Europe, Asia and Africa, for camera-based flow measurement in streams and wastewater channels presented in this paper showed a very good applicability of image processing technologies for measuring the key hydraulic parameters under different flow and site conditions. The system installed in South Africa is within the research project ecReUse at the outflow of wastewater treatment plant in East London.

Keywords

Flow, discharge, water level, wastewater, image processing, measurement, monitoring.