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Camera based low-cost system to monitor hydrological parameters in small catchments

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Gauging stations in small catchments to measure hydrological parameters are usually solely installed at few selected locations. Thus, extreme events that can evolve rapidly, particularly in small catchments (especially in mountainous areas), potentially causing severe damage, are insufficiently documented eventually leading to difficulties of modeling and forecasting of these events.
A conceptual approach using a low-cost camera based alternative is introduced to measure water level, flow velocity and changing river cross sections. Synchronized cameras are used for 3D reconstruction of the water surface, enabling the location of flow velocity vectors measured in video sequences. Furthermore, water levels are measured automatically using an image based approach originally developed for smartphone applications. Additional integration of a thermal sensor can increase the speed and reliability of the water level extraction. Finally, the reconstruction of the water surface as well as the surrounding topography allows for the detection of changing morphology.
The introduced approach can help to increase the density of the monitoring system of hydrological parameters in (remote) small catchments and subsequently might be used as warning system for extreme events.