



Smartphone for measuring river discharge

Salvador Peña-Haro, Beat Lüthi, and Thomas Philippe
photrack ag, Zürich, Switzerland (pena@photrack.ch)

Smartphones have become powerful and have extended their capacities including different types of sensors. These capabilities make them very interesting for its applications in water management. We have developed a new mobile device application for open-channel flow measurements. This app can be used to determine the flow in e.g. rivers, artificial channels, irrigation ditches, furrows, etc. The smartphone app computes the runoff by analysing a few seconds of a movie that is recorded using the smartphone camera. The runoff is calculated from the estimated water level, surface velocity and from prior knowledge on the channel geometry. The water level is determined by the separation line of image segments with and without optical flow. Via calibration of the smartphone camera position this separation line is mapped to a water level. The surface velocity is calculated using a modified method of the standard Particle Image Velocimetry method. Among the key characteristics of the method is the fact that no tracer particles are needed. There are two flavours of the app. In the first one, all the measurements are taken using the available sensors in the mobile device and all the calculations are made making only use of the device. Three results are given back: the water level, the average surface velocity and discharge. This information can be sent via SMS. In the second one, the movie is send to a central computer where more detailed calculations are made, like fine camera calibration, camera stabilization tuning, definition of the region of interest, the sub-windows for the velocity analysis can be changed, different algorithms can be chosen, etc. It also generates more detailed results. Using smartphones, measurements can be made at much lower cost, since there is no need of permanent installations, which also makes it possible to take measurements in any place.