

## Low-Cost IoT Sensors for Flow Measurement in Open Channels: A Comparative Study of Laboratory and Field Performance

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The use of low-cost IoT sensors for flow measurement in open channels has gained significant attention due to their potential to provide continuous and real-time data at a low cost. However, the accuracy and reliability of these sensors in real-world scenarios are not well understood. This study aims to compare the performance of low-cost IoT sensors in the laboratory and real-world conditions to evaluate their accuracy and reliability. Firstly, a low-cost IoT sensor was integrated with an IoT platform to acquire real-time flow rate data. The IoT sensors were calibrated in the laboratory environment to optimize their accuracy, including different types of low-cost IoT sensors (HC-SR04 ultrasonic sensor & YF-S201 sensor) using an open channel prototype. After calibration, the IoT sensors were then applied to a real-world case study in the Dorim-cheon stream, where they were compared to traditional flow measurement methods to evaluate their accuracy. The results showed that the low-cost IoT sensors provided accurate and reliable flow rate data under laboratory conditions, with an error range of less than 5%. However, when applied to the real-world case study, the accuracy of the IoT sensors decreased, which could be attributed to several factors such as the effects of water turbulence, sensor drift, and environmental factors. Overall, this study highlights the potential of low-cost IoT sensors for flow measurement in open channels and provides insights into their limitations and challenges in real-world scenarios.

**Keywords:** IoT sensor; open-channel; flow rate; low-cost sensor.

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