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Implementation of a Real-Time Water Quality Monitoring System Using Raspberry Pi and IoT

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Abstract: *The availability of clean and safe water aids public health and environmental sustainability. Conventional water quality monitoring systems are generally time-consuming, costly, and non-real-time. This paper documents deploying an Internet of Things -based real-time water quality monitoring system based on Raspberry Pi 3B+, which can monitor vital water parameters like pH, turbidity, and flow rate. The system uses multiple sensors, such as pH, turbidity, and flow sensors. Analog sensor values are read through the ADS1115 ADC module, and real-time value is displayed on a 20x4 I2C LCD. Sensor reading is sent periodically to ThingSpeak cloud service for live monitoring, analysis, and history logging. Besides data logging, the system utilizes the Twilio API for SMS alerting registered users in the event of a drop in water quality parameters below safety levels (e.g., high turbidity or abnormal pH), initiating corrective action and timely alertness. The Python system computes water consumption and estimates billing based on flow measurements. The deployment displays cost-effective, portable, and scalable solution capability, which is enough for application in water distribution networks for urban and rural setups. The model can support forecasting analysis using a machine learning algorithm with additional sensor input (temperature, TDS). Overall, the innovative water quality monitoring system favors creating sustainable solutions to water management along the guidelines of innovative city initiatives.*

Keywords: IoT, Navigation, Mobility, Sensors, Machine Learning, Feedback