

ABSTRACT

Indonesia has a high diversity of fish species, including freshwater ornamental fish, which has garnered increasing interest among hobbyists. However, fish enthusiasts often face challenges in maintaining aquarium water quality regularly. Key factors such as timely feeding and poor water conditions can cause fish to experience stress, contract diseases, or even lead to fatalities. To address these issues, this research aims to design and develop an "Aquarium Water Replacement System Based on PH, Ammonia, and Water Temperature Levels and Automatic Feeding Using Internet of Things" as an embedded system prototype that operates automatically and integrates with a web-based application. The system was developed using the ICONIX Process method, which relies on use cases to produce an object-oriented software design. The primary hardware consists of a Wemos D1 R2 microcontroller connected to three sensors: a DS18B20 water temperature sensor, an MQ-135 ammonia gas sensor, and a PH-4502C water pH sensor. For actuation, the system utilizes two water pumps for automatic draining and refilling, alongside a Micro Servo 9g SG90 to control the mechanism for fish feeding. User can configure threshold values for temperature, ammonia, pH, and feeding schedules via a web application built using the CodeIgniter 4 framework. Based on testing results, all sensor components functioned correctly with calibration accuracy of pH sensor at 95,29% and water temperature sensor at 99,17%. The activity log checking interval was established at every 10 seconds to maintain microcontroller stability against sensor processing workloads. Web application testing using the black-box testing method indicated that all functional features operated according to design and 19 test results out of 19 planned test cases were fully accepted.

Keywords : Internet of Things (IoT), ICONIX Process, Aquarium, Water Quality Sensor, Automatic Fish Feeding.