Water Quality Monitoring System in Vaname Shrimp (Litopenaeus Vannamei) Ponds Using the Fuzzy Tsukamoto Method

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ABSTRACT

Vaname shrimp, or Litopenaeus vannamei, is a highly popular type of white shrimp in Indonesia. This species is unique in its ability to withstand low temperatures, making it a valuable asset in the aquaculture industry. In fact, the cultivation of Vaname shrimp is a key priority for Indonesia's fisheries sector, as it has the potential to significantly contribute to the nation's economic growth. To facilitate the monitoring and measurement of water quality in Vaname shrimp ponds, a team of researchers set out to develop a website-based water quality monitoring system. This system is intended to enable pond owners and technicians to easily measure and monitor water quality at any time, from any location. The system incorporates both hardware and software, and employs artificial intelligence through the Tsukamoto fuzzy method. The Tsukamoto fuzzy method involves four stages: fuzzification, fuzzy rules, fuzzy inference engine, and defuzzification. By inputting four key water quality parameters - pH, temperature, salinity, and dissolved oxygen - the system is able to calculate a water quality index on a scale of 0-100. The researchers used a combination of MongoDB database, PHP programming language, Laravel framework, and Bootstrap 5 for the front-end to build this system. The accuracy of the system was tested through a comparison between its calculations and manual calculations, resulting in an error difference of just 0.6%. White box testing with the end-to-end testing method was used to evaluate the program code structure, with an average execution time of 0.19 seconds across the 26 functions tested.

Keywords: Monitoring, Vannamei Shrimp, Water Quality, Fuzzy Tsukamoto, User Accepted Testing (UAT)