IMPLEMENTATION OF PID CONTROLLER TO CONTROL WATER PH IN IOT BASED HYDROPONIC SYSTEM

Yusuf Ilhamsyah

Electrical Engineering Study Program, Faculty of Science & Technology
University of Technology Yogyakarta
Jl. Ringroad Utara Jombor Sleman Yogyakarta
E-mail: yusufilham@gmail.com

ABSTRACT

In the NFT (Nutrient Film Technique) hydroponic system, water plays a major role as a nutrient as well as a planting medium that replaces the role of soil in conventional agriculture. One important parameter in the hydroponic system is the pH of the water. The pH value of the water needs to be monitored and controlled to maintain the sustainability and quality of the plants. Monitoring and controlling the pH value of traditional water is done manually by users of the hydroponic farming system every day, so it requires tenacity and patience in its implementation. So, by utilizing technology, a control system can be developed that makes it easier for users of the hydroponic system to do this. In this study, the author tried to implement a PID Controller to control the pH value of the water and add IoT (Internet of Things) features to the hydroponic system. The case study used several plants with pH values between 5.5 - 7 and a hydroponic system made using the NFT technique. The prototype uses ESP8266 as a microcontroller, a pH sensor as a sensor, and a peristaltic pump motor as an actuator. Through 28 pH sensor accuracy test scenarios, a pH sensor accuracy value of 99.22% was obtained. The implementation of PID Controller as a control system algorithm is able to show the average rise time duration for every difference of 1 value (either more basic or more acidic) from the setpoint is 47.55 seconds with an average SSE (Steady State Error) of 4.23%. While the average rise time duration for every difference of 2 values (either more basic or more acidic) from the setpoint is 109.66 seconds with an SSE (Steady State Error) of 0.86%.

Keywords: Hydroponics, pH, Control, PID, IoT