

RANCANG BANGUN SISTEM KONTROL MODUL PEMBELAJARAN BERBASIS PLC DAN HMI IOT HAIWELL

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ABSTRAK

Penelitian ini bertujuan untuk mengatasi kurangnya minat mahasiswa dalam bidang *programmable logic controller* (PLC), yang disebabkan oleh terbatasnya peralatan dan kurangnya pengembangan alat. Penelitian ini merancang modul pembelajaran berbasis PLC dan *human machine interface* (HMI) IoT Haiwell, yang dapat mengontrol dan memantau sistem melalui aplikasi *smartphone* berbasis *internet of things* (IoT). Modul ini melibatkan penerapan konsep IoT, studi sistem komunikasi Modbus RTU dengan RS-485 pada PLC dan HMI Haiwell, serta desain HMI yang sesuai dengan kondisi lapangan. Modul yang dirancang diuji melalui lima simulasi praktikum untuk mengevaluasi kinerjanya dalam berbagai konfigurasi. Hasil pengujian menunjukkan bahwa tegangan pada tombol *start* dan *stop* adalah 21,9 V saat ditekan dan 0 V saat tidak ditekan, sementara *pilot lamp* aktif menghasilkan tegangan rata-rata 23,9 V dan 0 V saat nonaktif. Sensor *proximity* menunjukkan tegangan 0 V saat tidak mendeteksi objek dan 22,08 V saat mendeteksi objek. Pengujian simulasi tiga motor DC dengan tiga *input* (dua *push button* dan satu sensor *proximity*) menunjukkan bahwa tegangan *input* pada motor DC berkisar antara 0-24 VDC atau 0-100 %, dan tegangan *output* bervariasi sesuai tegangan *input*. Selain itu, pengujian motor AC dengan rangkaian *direct on line* (DOL) menunjukkan arus *start* yang mendekati perhitungan teoritis dengan *error* kecil, seperti 0,4 % pada fasa R. Namun, pengujian arus nominal motor AC menunjukkan variasi performa dengan *error* lebih signifikan pada beberapa fasa, seperti 47 % pada motor 2.

Kata Kunci: Modul pembelajaran, PLC, HMI Haiwell, IoT.

DESIGN AND CONSTRUCTION OF HAIWELL'S PLC AND HMI IOT BASED LEARNING MODULE CONTROL SYSTEM

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ABSTRACT

This research aims to overcome the lack of student interest in the field of programmable logic controller (PLC), which is caused by limited equipment and lack of tool development. This research designs a PLC-based learning module and Haiwell IoT human machine interface (HMI), which can control and monitor the system through an internet of things (IoT)-based smartphone application. This module involves the application of the IoT concept, the study of the Modbus RTU communication system with RS-485 on Haiwell's PLC and HMI, as well as the design of an HMI in accordance with field conditions. The designed module was tested through five practical simulations to evaluate its performance in various configurations. The test results show that the voltage at the start and stop buttons is 21.9 V when pressed and 0 V when not pressed, while the active pilot lamp produces an average voltage of 23.9 V and 0 V when off. The proximity sensor shows a voltage of 0 V when not detecting objects and 22.08 V when detecting objects. Simulation testing of three DC motors with three inputs (two push buttons and one proximity sensor) showed that the input voltage to the DC motors ranged from 0-24 VDC or 0-100 %, and the output voltage varied according to the input voltage. In addition, testing the AC motor with a direct on line (DOL) circuit showed a starting current close to the theoretical calculation with a small error, such as 0.4% in phase R. However, testing the nominal current of the AC motor showed variations in performance with more significant errors in some phases, such as 47% in motor 2.

Keywords: *Learning module, PLC, HMI Haiwell, IoT*