

# Rancang bangun sistem kendali debit air berbasis PLC (Programmable Logic Controller) dengan menerapkan neural network controller = Design of Programmable Logic Controller (PLC) based for water flow control by implementing neural network controller / Burhanuddin Ahmad

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## Abstrak

Debit air (*flowrate*) yang bernilai konstan merupakan besaran fisis fundamental dalam sistem transportasi fluida dari satu tempat ke tempat lain. Untuk mencapai hal tersebut, dibutuhkan suatu sistem kendali yang mampu menghasilkan debit air bernilai konstan. Pada penelitian ini, transportasi fluida dibuat dalam sebuah rangkaian *plant* miniatur dengan menerapkan sistem kendali didalamnya. Pada *plant* tersebut terdapat actuator *control valve*, *flow transmitter*, dan *Programmable Logic Controller* (PLC). OPC Server merupakan perangkat lunak antarmuka menggunakan mode *client/server* berbasis COM/ DCOM yang memungkinkan MATLAB dapat berkomunikasi dengan PLC. Dalam proses komunikasi antara PLC dengan MATLAB digunakan OPC server yang berfungsi sebagai "jembatan" antara keduanya. Sistem kendali yang diterapkan berupa *PID-Controller* dan *soft computing Neural Network* (NN) dengan menggunakan MATLAB SIMULINK. Penerapan *soft computing Neural Network* (NN) bertujuan untuk mengoptimasi performa sistem kendali *PID-Controller* yang telah umum digunakan. Faktor-faktor performa yang dijadikan parameter pembanding adalah nilai *rise time*, *settling time*, *maximum overshoot*, dan *steady-state error*. Berdasarkan hasil percobaan, *Neural Network Controller* memiliki nilai performansi yang lebih baik daripada *PID-Controller*. Nilai performansi *Neural Network Controller* yang didapatkan yakni *maximum overshoot* = 5.36% dan *steady-state error* = 0.85%

Flowrate is a fundamental physical quantity in the fluid transportation system from one place to another. To achieve this, a control system is needed that is able to produce a constant flow of water. In this study, fluid transport was made in a miniature plant series by implementing a control system in it. At the plant there is a control valve actuator, flow transmitter, and Programmable Logic Controller (PLC). OPC Server is interface software using COM / DCOM-based client / server mode that allows MATLAB to communicate with the PLC. In the process of communication between PLC and MATLAB, the OPC server is used as a "bridge" between the two. The control system applied is in the form of *PID-Controller* and *soft computing Neural Network* (NN) using MATLAB SIMULINK. The application of *soft computing Neural Network* (NN) aims to optimize the performance of the *PID-Controller* control system that has been commonly used. Performance factors that are used as comparison parameters are the value of rise time, settling time, maximum overshoot, and steady-state error. Based on the results of the experiment, the *Neural Network Controller* has a better value of permformance than *PID-Controller*. The performance value of the *Neural Network Controller* obtained is *maximum overshoot* = 5.36% and *steady-state error* = 0.85%