Simulasi Pengendalian Temperatur dan Kelembaban pada Sistem HVAC Menggunakan Reinforcement Learning dengan Algoritma Proximal Optimization (PPO) = Simulation of Temperature and Humidity Control in HVAC System Using Reinforcement Learning with Proximal Policy Optimization (PPO) Algorithm

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Abstrak

Penelitian dilakukan dalam bentuk simulasi sistem pengendalian temperatur dan kelembaban relatif pada central air-conditioner pabrik tekstil. Pengendalian menggunakan Reinforcement Learning (RL) dengan algoritma Proximal Policy Optimization (PPO). RL dirancang dan diambil datanya menggunakan software RL Designer ToolBox di MATLAB. Dilakukan training pada agent PPO untuk mengendalikan sistem dengan range pengendalian temperatur 18 o C – 25 o C dan kelembaban relatif 55% - 85%. Hasil training agent diukur dan dibandingkan performanya terhadap PI controller menggunakan parameter step response yang terdiri dari rise time, settling time, error steady state, dan overshoot. Berdasarkan pengujian hasil training didapatkan secara keseluruhan iterasi pengendalian temperatur dan kelembaban relatif RL memiliki rise time dan settling time dibawah 90 detik, memiliki percent overshoot dalam rentang 0% s.d 150%, dan steady state error kurang dari 1%.

.....The research was conducted in the form of a simulation of the temperatur and relatif humidity control system in the central air-conditioner of a textile factory. The control uses Reinforcement Learning (RL) with Proximal Policy Optimization (PPO) algorithm. RL was designed and data was collected using RL Designer ToolBox software in MATLAB. PPO agent was trained to control the system with a temperatur control range of 18oC – 25oC and relative humidity of 55% - 85%. The results of agent training are measured and compared to PI controller performance using step response parameters consisting of rise time, settling time, steady state error, and overshoot. Based on testing the training results obtained overall iteration of temperatur control and relatif humidity RL has a rise time and settling time under 90 seconds, has a percent overshoot in the range of 0% to 150%, and steady state error less than 1%.