Aplikasi Reinforcement Learning berbasis Algoritma Soft Actor Critic dalam Pengendalian Ketinggian Air pada Coupled Tank System = Reinforcement Learning Application based on Soft Actor Critic Algorithm in Coupled Tank System Water Level Control

Ranya Andjani Khairunnisa Johan, author

Abstrak

Proses industri banyak melibatkan penggunaan coupled tank, salah satu proses yang dilakukan adalah pengendalian ketinggian cairan. Pada penelitian ini dilakukan pengendalian ketinggian air pada sistem coupled tank menggunakan Reinforcement Learning berbasis algoritma Soft Actor Critic (SAC) menggunakan MATLAB dan Simulink. Sebelum diimplementasikan ke dalam sistem coupled tank dilakukan serangkaian proses training pada algoritma SAC. Hasil dari proses training ini merupakan action dalam bentuk besar bukaan control valve. Kinerja pengendali dievaluasi menggunakan nilai rise time, settling time, overshoot, dan steady state error. Berdasarkan parameter ini, algoritma SAC dapat mengendalikan sistem dengan baik dengan rise time kurang dari 47 sekon, settling time kurang dari 62 sekon, overshoot dibawah 10%, dan steady state error kurang dari 1%. Ketika diberikan gangguan algoritma SAC dapat kembali ke keadaan stabil dalam waktu kurang dari 45 sekon.
.....A lot of industrial processes utilize the use of coupled tanks, with one of the processes being liquid level control. In this study, Reinforcement Learning is implemented to control the water level in the coupled tank system using Soft Actor Critic (SAC) algorithm through MATLAB and Simulink. Before being implemented into the coupled tank system, the SAC algorithm went through a series of training processes. The result of this training process is an action in the form of adjusting control valve opening percentage. The controller performance is evaluated using parameters such as rise time, settling time, overshoot, and steady state error. Based on these parameters, the SAC algorithm manages to perform well in controlling the system with a rise time of less than 47 seconds, a settling time of less than 62 seconds, overshoot of less than 10%, and steady state error below 1%. When the system received a disturbance the SAC algorithm can return to a steady state in less than 45 seconds.