Disain Pengendali Prediktif pada Sistem HVAC Berbasis Model Hammerstein Bilinear = Design of Hammerstein-Bilinear Model Based Predictive Controller for HVAC Systems

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Abstrak

Pemanasan global dan meningkatnya standar hidup manusia merupakan faktor pendorong yang menyebabkan naiknya konsumsi energi untuk sistem HVAC. Peningkatan teknologi HVAC yang mampu mengurangi konsumsi energi sektor bangunan, meskipun kecil akan memberikan dampak yang signifikan bagi konsumsi energi secara agregat absolut. Pendekatan bilinier dalam pemodelan dan kendali sistem HVAC sudah banyak dilakukan baik secara teori maupun praktis dan terbukti memiliki banyak kelebihan.
Sistem HVAC berbasis Hammerstein-bilinear diturunkan secara matematis dan berhasil diidentifikasi dengan struktur model linier OE sebagai dua buah sistem MISO dalam tesis ini. Metode identifikasi yang penulis gunakan adalah algoritma pseudo-linear regression dan least-square. Model linier tersebut kemudian digunakan sebagai plant model pada disain kendali model prediktif. Kinerja pengendali prediktif memberikan hasil yang memuaskan dan terbukti mampu memenuhi tujuan pengendalian yang diinginkan. Kinerja pengendali prediktif lebih baik daripada pengendali PI pada kasus lup kendali suhu, sebaliknya untuk kendali kelembaban kinerja pengendali PI lebih memuaskan.
.....Global warming and increasing human standard of living are the driving factors leading to increased energy consumption for HVAC systems. Enhanced HVAC technology that can reduce energy consumption in the building sector, despite of small amount, it will have a significant impact on energy consumption’s absolute aggregate. The bilinear approach to modeling and control of HVAC systems has been done both theoretically and practically and has proven to have many advantages.
An HVAC system based on Hammerstein-bilinear was derived mathematically and was identified using an OE linear model structure as two MISO systems in this thesis. The identification methods adopted by the author were pseudo-linear regression and least-square algorithm. The linear models were subsequently used as plant models in the predictive model control design. The predictive controllers’ performance gave satisfying results and was proven being able to meet the desired control objectives. The predictive controller gave better performance than the PI controller in the case of temperature control loop, on the contrary, for humidity control the PI’s performance was more satisfying.