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SYSTEM ENGINEERING

基于MLD模型的CSTR建模和控制

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摘要 A novel control strategy for a continuous stirred tank reactor (CSTR) system, which has the
typical characteristic of strongly pronounced nonlinearity, multiple operating points, and
a wide operating range, is initiated from the point of hybrid systems. The proposed scheme
makes full use of the modeling power of mixed logical dy-namical (MLD) systems to describe
the highly nonlinear dynamics and multiple operating points in a unified framework as a
hybrid system, and takes advantage of the good control quality of model predictive control
(MPC) to design a controller. Thus, this approach avoids oscillation during switching
between sub-systems, helps to relieve shaking in transition, and augments the stability
robustness of the whole system, and finally achieves optimal (i.e. fast and smooth)
transition between operating points. The simulation results demonstrate that the presented
ap-proach has a satisfactory performance.

关键词 continuous stirred tank reactor mixed logical dynamical model multiple-operating point
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Modeling and control of a continuous stirred tank reactor based on a mixed logical dynamical model

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Abstract A novel control strategy for a continuous stirred tank reactor (CSTR) system, which has the typical characteristic of strongly pronounced nonlinearity, multiple operating points, and a wide operating range, is initiated from the point of hybrid systems. The proposed scheme makes full use of the modeling power of mixed logical dy-namical (MLD) systems to describe the highly nonlinear dynamics and multiple operating points in a unified framework as a hybrid system, and takes advantage of the good control quality of model predictive control (MPC) to design a controller. Thus, this approach avoids oscillation during switching between sub-systems, helps to relieve shaking in transition, and augments the stability robustness of the whole system, and finally achieves optimal (i.e. fast and smooth) transition between operating points. The simulation results demonstrate that the presented ap-proach has a satisfactory performance.

Key words continuous stirred tank reactor; mixed logical dynamical model; multiple-operating point; state transi-tion; hybrid system

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