

SIMULATION OF ADAPTIVE CONTROL OF CONTINUOUS STIRRED TANK REACTOR

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Abstract

Chemical reactors are often characterized by highly nonlinear behaviour. In such cases, the use of conventional control strategies where controllers have fixed parameters can result in poor performance. Knowledge about the static and dynamic properties is a necessary condition for the design of a controller. Unfortunately, measurements on the real system are not always feasible. The only way as to how to obtain static and dynamic behaviour of these systems is through the use of simulations, i.e. experiments on their mathematical model. Steady-state analysis shows the behaviour of the system in the steady state, which can help with the choice of the optimal working point, i.e. the appropriate combination of the input variables, which results in maximal production with minimal cost. On the other hand, the dynamic analysis results in the suitable control strategy. The adaptive approach in this work uses the recursive identification and the polynomial synthesis with the pole-placement method. 20 refs.

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Key Words: *Adaptive Control, Polynomial Approach, Pole-Placement Method, Continuous Stirred Tank Reactor*

MODELLING OF CONTINUOUS STIRRED TANK REACTOR USING ARTIFICIAL INTELLIGENCE TECHNIQUES

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Abstract

Continuous Stirred Tank Reactor System (CSTR) is a typical chemical reactor system with complex nonlinear dynamic characteristics. There has been considerable interest in its state estimation and real time control based on mathematical modelling. However, the lack of understanding of the dynamics of the process, the highly sensitive and nonlinear behaviour of the reactor, has made difficult to develop the precise mathematical modelling of the system. An efficient control of the product concentration in CSTR can be achieved only through accurate model. In this paper, attempts are made to alleviate the modelling difficulties using "Artificial Intelligence" (AI) techniques such as neural, fuzzy and neuro-fuzzy. Simulation results demonstrate the effectiveness of Artificial Intelligence modelling techniques. The performance comparison of different modelling techniques has been given in terms of root mean square error. 15 refs.

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Key Words: *CSTR, Modelling, Neural Networks, Fuzzy, Neuro-Fuzzy*

SIMULATION STUDY OF THE OPTIMAL APPOINTMENT NUMBER FOR OUTPATIENT CLINICS

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Abstract

This paper analyzes the appointment scheduling systems in specialist outpatient clinics (SOC) to determine the optimal number of appointments to be planned in one session under different performance indicators and consult room configurations. A discrete event simulation model is constructed to model the workflow of a SOC considering three consult room configurations. Ground data are collected to generate model parameters including consult time, no-show rate and lateness rate. An appointment rule based on Bailey's rule is proposed to generate appointments with various numbers of planned appointments in one session. Simulation results are measured by performance indicators including patient queue, patient waiting time, doctor utilization and doctor overtime. Simulation results show that the optimal number of planned appointments varies according to different operational requirements and consult room configurations. Study in this paper provides a guideline to choose the optimal number of planned appointments according to specific requirements. 21 refs.

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Key Words: *Appointment Scheduling, Discrete Event Simulation, Outpatient Clinics*

USING SIMULATION FOR REDUCING RISK OF A MINING OPTIMIZATION PROJECT

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Abstract

The use of simulation in a project management can illustrate visual display of the project objective and the process virtually but realistically. This paper investigates the valid benefits of using simulation technique for a Mining and Iron Production Factory (MIPF) project. It is believed by the author that mining activity is particularly subject to more risks than other business activities because of its uncertainty, complexity and high cost. One of the first things to consider before starting mining projects is the risk factor. Some project risks can be reduced by visualizing and understanding the process before the actual initiation process. The paper illustrated the advantages of using computer aided simulation for an optimization project of a MIPF in a real life case study. 15 refs.

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Key Words: *Project Risk Management, Mining Optimization, Simulation Analysis*