Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
February 2015, Volume 40, Issue 2, pp 627-632

Economic Order Quantity, Process Quality Level, Warranty Period, and Production Run Length Settings

- Chung-Ho Chen , Chao-Yu Chou , Wei-Chen Lee

Abstract:

In the present paper, a modified optimal profit model with settings of production and process parameters is proposed, where the larger-the-better product characteristic with the one-sided lower specification limit is considered. The product characteristic is assumed to be normally distributed with unknown mean and known standard deviation. The selling price of product is assumed to be linearly proportional to its warranty period. We also assume that the retailer's order quantity is negatively correlated with the wholesale selling price and is positively correlated with the warranty period. The single sampling rectifying inspection plan is adopted for determining the quality of product lot. The Taguchi's quadratic quality loss function is addressed for measuring the used cost of customer for product. The optimal manufacturer's process quality level, production run length, warranty period, and retailer's order quantity can then be simultaneously determined by maximizing the expected total profit of society including both the manufacturer and the retailer. Numerical results show that the longer warranty period and the higher product quality level will lead to the larger expected total profit of society.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
February 2015, Volume 40, Issue 2, pp 645-658

A New Kernel-Based Classification Algorithm for Systems Monitoring: Comparison with Statistical Process Control Methods

- Foued Theljani , Kaouther Laabidi , Salah Zidi , Moufida Ksouri

Abstract:

The paper presents a new Kernel-based monitoring algorithm compared with statistical process control methods, such as DISSIM and MS-PCA and some others methods widely used in process control applications. The proposed algorithm is a modified version of the well known support vector domain description (SVDD). The last one is commonly used for one-classification problems, named also novelty detection. In this paper, we have used a modified SVDD endowed with useful tools to manage multi-classification problems. The proposed classifier is also able to deal with stationary as well as non-stationary data. The principle is based on the dynamic update of the training set through a recursive deletion/insertion procedure according to adequate rules. In order to reduce the computational complexity and improve the rapidity of convergence, the algorithm considers in each run a limited frame of samples for the training process. To prove its effectiveness, the approach is assessed at first on artificially generated data. Then, we have performed a case study applied on chemical process.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
February 2015, Volume 40, Issue 2, pp 633-643

Predictive Functional Control with Observer (PFC-O) Design and Loading Effects Performance for a Pneumatic System

- Khairuddin Osman, Ahmad ’Athif Mohd Faudzi , M. F. Rahmat , Omer Faris Hikmat , Koichi Suzumori

Abstract:

Demand for higher accuracy and control systems is growing rapidly and becoming more important in high-tech industries. However, precise position control of a pneumatic cylinder is very difficult to achieve due to the compressibility of air, nonlinear behavior of the air flow rate through the valves and the friction force between the cylinder and the piston of the system. The purpose of this paper was to present a model and a novel linear process control strategy to design a position controller for a real-time pneumatic system. This paper mainly analyzes the horizontal and vertical precision positioning control under loading effect for pneumatic system in real-time experiment. System identification approach is selected to obtain the plant model. Predictive Functional Control with observer (PFC-O) design is proposed as control strategy to improve tracking performance of the pneumatic system. Performance assessment of the controller was performed in MATLAB. The effectiveness of the proposed control strategy is verified through real-time experiment with the plant. The simulation and the experimental results confirm that the proposed PFC-O controller shows good control performance with various load configurations.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
March 2015, Volume 40, Issue 3, pp 975-987

An Approach for Analyzing the Reliability of Industrial System Using Fuzzy Kolmogorov's Differential Equations

- Harish Garg

Abstract:

The main objective of this paper is to present a technique to permit the reliability analyst's or system manager for increasing the performance of the system. As traditionally, it was assumed that probabilities in Markov chain models are deterministic in nature, but as the system are growing complex and more complex these days, so the reliability data are either insufficient or mixed with uncertainty. Thus to handle these kind of issues, the *n*th-order fuzzy Kolmogorov's differential equations are developed by using a fuzzy Markov model of a repairable industrial system from its transition diagram and then evaluate the fuzzy reliability of the system both in transient as well as in steady state using Runge–Kutta method. Sensitivity analysis has been conducted for finding the most critical component of the system by varying the failure and repair rates of the system. Final results are compared with the existing results. To show the application of the proposed method, a case of the thermal power plant, a repairable industrial system, has been taken for evaluating the fuzzy reliability of the system.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
March 2015, Volume 40, Issue 3, pp 959-974

Maintenance Scheduling Problem with Fuzzy Random Time Windows on a Single Machine

- Ling Nie , Jiuping Xu , Yan Tu

Abstract:

This work developed an integrated scheduling model which incorporated both production scheduling and maintenance planning for a single machine problem and considered the multiple objectives of minimizing total weighted completion time and maximizing average timeliness level under a fuzzy environment. First, a fuzzy random variable for maintenance time windows was considered, and this model was then transformed using the expected value. Finally, a numerical example was used to demonstrate the value of this improved algorithm, the computational results from which proved its efficiency.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
April 2015, Volume 40, Issue 4, pp 1239-1253

Development of an Agent-Based Collaborative Production System Based on Real-Time Order-Driven Approach

- Yanting Ni , Yi Wang

Abstract:

With high variation of ordering in current marketing environment, the collaboration of dynamic production planning and scheduling strategies is becoming critical for manufacturers to make quick and correct decisions. On the basis of the complex and distributed semiconductor manufacturing system environment, it is imperative to consider the external disturbances on production scheduling and solve the related issues. However, current researches mostly focus on the collaboration issues within factory internal hierarchy, and lots of methods are discussed on the job sequence or order fulfillment problems on the work cells. Toward this end, a real-time order-driven (RTOD) approach is introduced to assist manufacturers in responding to real-time orders and reflecting them into collaborative production planning and scheduling. An agent-based heterarchical model is established to modularize the collaboration process of planning and scheduling accordingly. A distributed algorithm is provided to quantify the different scenarios during the collaboration, and three sub-algorithms are discussed in detail. Subsequently, the interaction process of each agent is discussed to identify the solutions paths in accordance with the proposed algorithms specifically. A case study is conducted in S semiconductor factory. A Java Agent Development Frameworks platform is developed to simulate the presented collaborative system, and two numerical experiments testified the effectiveness of RTOD approach accordingly.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
June 2015, Volume 40, Issue 6, pp 1793-1808

A Simple Remote Sensing Ground Receiving System for Interest Creation in Systems Engineering and Geophysics Research

- Abdelatif Hassini , Ahmed Hafid Belbachir

Abstract:

The METEOSAT Second Generation (MSG3) geostationary satellite main payload is the optical imaging radiometer, the so-called Spinning Enhanced Visible and InfraRed Imager (SEVIRI). With its 12 spectral channels and its high temporal resolution, SEVIRI can offer improved geophysics thematic products measurements. So, the development of a system that can exploit the temporal behavior of the terrestrial disk observations is crucial for these near-real-time applications. Advanced Very High Resolution Radiometer (AVHRR) data from polar-orbiting NOAA19 satellite are acquired and processed here. A ground station is required to collect and follow the temporal, spectral, and space evolution of the treated topic of interest. The main objective of this research is to give the most important directives for developing a simple remote sensing ground station. The system consists of hardware and software parts and gives meaningful results using received daily data from either SEVIRI-MSG3 or AVHRR-NOAA19. Satellite multi-sensor database is created and enriched everyday. A realized autotracker capable of automatic tracking satellites is mounted in our ground station. Based on received images, some acquisition and MSGViewer software processing results such as brightness temperature, Albedo conversions from the raw data, and different red–green–blue combinations between visible and infrared windows are illustrated and discussed. The system can be easily applied for operational research uses.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
June 2015, Volume 40, Issue 6, pp 1777-1791

A Probabilistic Fuzzy Inference System for Modeling and Control of Nonlinear Process

- N. Sozhamadevi , S. Sathiyamoorthy

Abstract:

A new class of fuzzy inference system is introduced, a probabilistic fuzzy inference system, for the modeling and control problems, one that model and minimize the effects of uncertainties, i.e., existing randomness in many real-world systems. The fusion of two different concepts, degree of truth and probability of truth in a distinctive framework leads to this new concept. This combination is carried out both in fuzzy sets and fuzzy rules, which gives rise to probabilistic fuzzy sets and probabilistic fuzzy rules. Consuming these probabilistic elements, a distinctive probabilistic fuzzy inference system is developed as a fuzzy probabilistic model, which improves the stochastic modeling capability. This probabilistic fuzzy inference system involves fuzzification, inference and output processing. The output processing includes order reduction and defuzzification. This integrated approach accounts for all of the uncertainty like rule uncertainties and measurement uncertainties present in the systems and has led to the design which performs optimally after training. A probabilistic fuzzy inference system is applied for modeling and control of a continuous stirred tank reactor process, which exhibits dynamic nonlinearity and demonstrated its improved performance over the conventional fuzzy inference system.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2015, Volume 40, Issue 9, pp 2813-2828

Wavelet Neural Network-Based NARMA-L2 Internal Model Control Utilizing Micro-artificial Immune Techniques to Control Nonlinear Systems

- Omar Farouq Lutfy , Hazlina Selamat

Abstract:

This paper presents an intelligent control strategy based on internal model control (IMC) to control nonlinear systems. In particular, a wavelet neural network (WNN)-based nonlinear autoregressive moving average (NARMA-L2) network is used to acquire the forward dynamics of the controlled system. Subsequently, the control law can be directly derived. In this approach, a single NARMA-L2 with only one training phase is required. Hence, unlike other related works, this design approach does not require an additional training phase to find the model inversion. In the literature, gradient descent methods are the most widely applied training techniques for the neural network-based IMC. However, these methods are characterized by the slow convergence speed and the tendency to get trapped at local minima. To avoid these limitations, the newly developed modified micro-artificial immune system (modified Micro-AIS) is employed in this work to train the NARMA-L2. The simulation results have demonstrated the effectiveness of the proposed approach in terms of accurate control and robustness against external disturbances. In addition, a comparative study has shown the superiority of the WNN over the multilayer perceptron and the radial basis function based IMC. Moreover, compared with the genetic algorithm, the modified Micro-AIS has achieved better results as the training method in the IMC structure.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2015, Volume 40, Issue 9, pp 2805-2812

Fuzzy Decoupling Control of Greenhouse Climate

- M. Azaza , K. Echaieb , F. Tadeo , E. Fabrizio , A. Iqbal , A. Mami

Abstract:

Greenhouses are complex and nonlinear systems in which the inside temperature and humidity are deterministic parameters for the optimal growth of the plants. Several control methods have been developed to get an optimized microclimate. Physically both parameters are strongly coupled; hence, this paper proposes a novel fuzzy controlling method considering the temperature and humidity's coupling effects; the controller is based on a validated greenhouse physical model and an evaluation of the correlation of both parameters. The results show the high performance of the decoupling method and the effectiveness of the fuzzy controller to manage the inside climate while saving energy.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2015, Volume 40, Issue 9, pp 2829-2840

Optimal Control for Advertised Production Planning in a Three-Level Stock System with Deteriorating Items: Case of a Continuous-Review Policy

- Abdelghani Bouras

Abstract:

We consider in this paper a reverse-logistics problem chain with three stock categories where the production system is boosted by advertisement campaigns. Newly manufactured items are stored in the first stock category. The second stock category is reserved for remanufactured items, while the third contains items that are returned from the market. We assume that remanufactured items are not necessarily as-good-as-new. We also assume that new and remanufactured items are subject to deterioration and to dynamic demands, that customer return rate is also dynamic, and that the firm adopts a continuous-review policy. We use an optimal control approach to obtain optimal manufacturing rate, remanufacturing, rate, disposal rate and inventory levels in all three stock categories. Numerical examples and sensitivity analyses illustrate the results obtained.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
November 2015, Volume 40, Issue 11, pp 3351-3361

A New Optimization Model for Project Portfolio Selection Under Interval-Valued Fuzzy Environment

- Vahid Mohagheghi , S. Meysam Mousavi , Behnam Vahdani

Abstract:

Selecting the right projects is the primary objective of project-oriented organizations. The main concern of this research is to propose a new optimizing model for project evaluation and project portfolio selection under interval-valued fuzzy (IVF) environment. Projects involvement in uncertainties and complexities is notable, and managers have to make decisions under uncertain environments. In order to assist top managers in project selection under these circumstances, investment capitals and net cash flows of the projects in this paper are presented as IVF numbers instead of crisp or classical fuzzy numbers. Using IVF sets enables the proposed model to consider uncertainty more practically which is achieved through addressing vagueness and lack of information intuitively. A new compound index that simultaneously takes risk and return into account is also presented. This approach illustrates both risk level and return level of project and then calculates the risk of unit return of project. Risk is measured by lower semi-variance of projects' returns which is a direct, clear and widely accepted downside risk measure. The presented model is first proposed for project evaluation and comparison; then, it is extended for project portfolio selection problem. Finally, the proposed optimization model is exemplified by evaluating the candidate projects and selecting a portfolio of project in real case study of a holding company in developing countries. Moreover, a numerical example is presented to illustrate the capability of model in large-size problems.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
December 2015, Volume 40, Issue 12, pp 3759-3773

Synchronization of Coupled Switched Neural Networks with Time-Varying Delays

- Guang He , Jian-An Fang , Zhen Li , Xin Wang

Abstract:

In this paper, the exponential synchronization problem of delayed coupled switched neural networks with individual node and network topology switching is investigated. By using the matrix decomposing approach and the switched system comparison principle, several synchronization criteria for such complex dynamical networks are obtained. Firstly, under the assumption that all subnetworks are self-synchronized, a sufficient condition is derived in terms of an algebraic inequality. Then, when some subnetworks are not self-synchronized, based on the maximal dwell time length, the exponential synchronization criteria are given in terms of algebraic inequalities. Finally, examples are provided to illustrate the effectiveness of the theoretical results.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Review Article - Systems Engineering
March 2016, Volume 41, Issue 3, pp 711–758

Networked Control Systems Analysis and Design: An Overview

- Magdi S. Mahmoud

Abstract

This paper provides an overview of the research investigations into the evolving area of networked control system. Initial discussions were focused on exploring the impact of a common digital communication network in the feedback architecture. Results on addressing communication network artifacts, such as time delays, packet dropouts, and limited communication capability due to signal quantization are thoroughly examined. Several one-channel feedback NCS configurations were presented and analyzed with focus on nonstationary packet dropouts. State, observer-based and Output feedback control design methods over a shared digital communication network are treated. Recent developments pertaining to quantized control and estimation methods are reported. A concise account of event-based control and filtering schemes is presented. Finally, the concept of cloud control systems is discussed in this paper, which is an extension of networked control systems (NCS). With the development of Internet of Things (IOT), the technology of NCSs has played a key role in IOT. Cloud computing is developed rapidly, which provides a perfect platform for big data processing, controller design, and performance assessment. The research on cloud control systems will give new contribution to the control theory and applications in the near future. Some of the laboratory-scale applications are demonstrated.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3663–3681

Controller System Design Using the Coefficient Diagram Method

- João P. Coelho, Tatiana M. Pinho

Abstract

Coefficient diagram method is a controller design technique for linear time-invariant systems. This design procedure occurs into two different domains: an algebraic and a graphical. The former is closely paired to a conventional pole placement method and the latter consists on a diagram whose reading from the plotted curves leads to insights regarding closed-loop control system time response, stability and robustness. The controller structure has two degrees of freedom and the design process leads to both low overshoot closed-loop time response and good robustness performance regarding mismatches between the real system and the design model. This article presents an overview on this design method. In order to make more transparent the presented theoretical concepts, examples in Matlab®code are provided. The included code illustrates both the algebraic and the graphical nature of the coefficient diagram design method.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3683–3694

Iterative Learning Control for Strict-Feedback Nonlinear Systems with Both Structured and Unstructured Uncertainties

- Hocine Benslimane, Abdesselem Boulkroune

Abstract

In this paper, the problem of designing a new iterative learning control has been investigated for a class of strict-feedback nonlinear systems subject to both structured and unstructured uncertainties and dynamic disturbances. The considered systems are assumed to perform the same operation repeatedly under alignment condition. Simple learning mechanisms are proposed to estimate the unknown state-dependent nonlinear functions satisfying local Lipschitz conditions. By using the concept of command filtered backstepping, the problem of the explosion of complexity existing in conventional backstepping is eliminated and the proposed controller is greatly simplified. Lyapunov-like functional method is used to prove the boundedness of all signals of the resulting closed-loop system and the convergence of the tracking errors to zero over iterations. Simulation results are provided to show the effectiveness of the proposed control scheme.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3695–3702

Integral Sliding Mode Approach to Robust Control Systems Against Friction Force

- Montadher Sami Shaker

Abstract

Owing to the interesting challenges in the design of control systems that involve friction force, this paper proposes a new approach to the design of robust control system against friction. The proposal is motivated by the criticism aroused against the model-based friction compensation approaches such as the need for detailed friction model, accurate observer-based friction estimation, and issues of design complexity. The proposal utilizes the inherent robustness and relative design simplicity of the integral sliding mode control to attain closed-loop system robustness against friction effects if the maximum bound of friction is known. The use of ISMC provides closed-loop system robustness without the need for detailed friction modelling or accurate observer-based friction estimation and therefore simplifies closed-loop system design complexity significantly. The friction force in a tutorial example is considered to demonstrate the robustness of the proposed algorithm.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3703–3715

An Entropy-Robust Optimization of Mobile Commerce System Based on Multi-agent System

- Zhengying Cai, Yu Zhang

Abstract

Today, mobile commerce is very popular, but all kinds of risks or uncertainties may result in very serious impacts in its development because of its open environment. Therefore, the robust operation and optimization of the mobile commerce system are discussed here. Firstly, a mobile commerce system with uncertainty is modelled as a multi-agent system, as well as its characteristics and related definitions. Secondly, the entropy evolution mechanism of the system is illustrated by entropy flow analysis, and the entropy robustness is also defined based on which the mobile commerce system is described as a system set with an exact part and an uncertain one. Thirdly, a two-dimensional entropy robustness index is presented including the space robustness and time robustness, by which the interaction mechanism of different uncertainties can be analysed and optimized. Lastly, self-organization behaviour and coupling operation of the proposed model are simulated and verified by a dynamics evolution experiment. The proposed model can realize data visualization of multi-agent system under uncertainty, providing a helpful tool for robust optimization of mobile commerce.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3717–3725

Reliability Prediction of Repairable Redundant System with Imperfect Switching and Repair

- Madhu Jain

Abstract

A redundant repairable system having provision of S dissimilar warm standby units and a repair facility is studied. The concepts of common cause failure, switching failure, reboot, repair delay and imperfect repair are taken into account to develop Markov model and facilitating the reliability indices of machining system operating under machining environment. Using appropriate transition rates, Chapman Kolmogorov equations governing the model are constructed to obtain the transient probabilities of the system states. Further, system reliability indices are explored by establishing the explicit expressions in terms of transient probabilities. Runge–Kutta fourth-order technique is applied to perform the numerical simulation and to explore the sensitivity of the various metrics including the availability and failure frequency, with respect to different system parameters.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3727–3737

Embedded Indirect Adaptive Fuzzy Controller Based on T–S Fuzzy Inverse Model

- Ahmad M. Zaki, Mohammad El-Bardini, F. A. S. Soliman, Mohammed Mabrouk Sharaf

Abstract

The present paper is a trial to shed further light on the Indirect Adaptive Fuzzy Logic Controller (IDAFLC). In this concern, the proposed technique is predestined from two levels, where the lower level is based on Mamdani fuzzy controller. On the other hand, the upper level is an inverse model based on a Takagi–Sugeno method, in which its output is used to adapt the parameters of the fuzzy controller in the lower level. Moreover, the upper level contains learning mechanism to adapt model identification parameters. The proposed IDAFLC is implemented using an Arduino DUE kit. From the practical results, it is proved that the proposed adaptive controller has the ability to adapt the model identification parameters and improves, successfully, both the performance response and the disturbance due to the load and also measurement error of sensor in the speed control of the DC motor.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3739–3748

Improving Performance for Nonlinear Aeroelastic Systems via Sliding Mode Controller

- Smain Dilmi, Brahim Bouzouia

Abstract

Nonlinear aeroelastic system for controlling the problem of flutter and limit cycle oscillatory (LCO) is proposed. The flight dynamic model describes the plunge and pitch motion of the aircraft section wing with leading and trailing edge control surfaces. Aerodynamic and structural nonlinearities interaction leads to instability phenomena such as flutter and LCO on the wing. Sliding mode control law is designed for the aeroelastic model, and its robustness toward suppressing the LCO and avoiding chatter phenomenon are shown. The results of the simulation show the improvement of the performance of the aeroelastic system. The proposed control law effectively removes the LCO problem and regulates the system states pitch and plunge to origin even under the gust disturbance and limited control surface deflection.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3749–3760

An Optimized and Improved STF-PID Speed Control of Throttle Controlled HEV

- Anil Kumar Yadav, Prerna Gaur

Abstract

An improved self-tuning fuzzy proportional–integral–derivative (ISTF-PID), fuzzy logic-based PID (FPID) and optimal PID controllers for speed control of nonlinear hybrid electric vehicle (HEV) are proposed in this paper. The performances of HEV with ISTF-PID, FPID and optimal PID controllers are compared with the performance of HEV with existing self-tuning fuzzy PID and conventional PID controllers. The gains of PID, FPID and ISTF-PID controllers are tuned using multiobjective genetic algorithm. The performance specifications such as integral of the absolute error, integral of the square of error, peak overshoot, rise time and settling time are considered as objective function of GA and for performance analysis of HEV with designed controllers. The proposed control techniques are designed to achieve the variable speed, fuel economy, reduced pollution and improved efficiency under uncertain environment.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3761–3770

A New Estimation at Completion of Project's Time and Cost Approach Based on Particle Filter

- M. T. Hajialinajar, M. R. Mosavi

Abstract

Estimation at completion is an important tool for supervising the performance and risk of each project, in order to estimate the project completion time and final cost. This calculation is one of the most important goals of project managing. In this paper, a new estimation at completion approach is presented for estimation of finishing time and final cost of the project. The innovation of this paper can be organized as using particle filter as one of the strong nonlinear filtering methods for next estimation state of the system by using smoothed data which is done by filter itself, based on autoregressive fitted model. After estimating next states, it will be possible to predict system's reaction in later seconds and the time and cost of finishing the project are estimated for comparing the performance and efficiency of invented method. The simulation results demonstrate the performance of proposed scheme in comparison with older approach.

Arabian Journal for Science and Engineering (Arab J Sci Eng)

Research Article - Systems Engineering
September 2016, Volume 41, Issue 9, pp 3771–3781

Optimal Selection of a Longwall Mining Method for a Thin Coal Seam Working Face

- Wang Chen, Tu Shihao

Abstract

The selection of a mining method is one of the most important decisions made by mining engineers. An appropriate fully mechanized mining method is of great importance to mining design and capacity planning for thin coal seams. Therefore, the comprehensive evaluation of alternative mining methods is an important part of mining design. Several parameters should be considered in that evaluation, and the evaluation is therefore complex and must be compliant with a set of criteria. In this paper, a comprehensive method that combines two multi-criteria decision-making methods, the analytic hierarchy process and the technique for order of preference by similarity to ideal solution, was adopted for the evaluation. The most appropriate mining method, which involved a shearer, was then selected for panel 43101 in the Liangshuijing coal mine in China.