ABSTRACT AND REFERENCES

INFORMATION AND CONTROLLING SYSTEM

SIMULATION OF COMBINED BODY TILT SYSTEM OF HIGH-SPEED RAILWAY ROLLING STOCK (p. 4-17)

Bagish Yeritsyan, Borys Liubarskyi, Dmytro Iakunin

The actual problem of creating a high-speed railway rolling stock with a combined electromechanical and pneumatic body tilt system is considered. Using the proposed simulation model created in the MATLAB environment, simulation of the rolling stock body tilt while passing a curved track section is carried out. To determine the parameters of the elements of electromechanical and pneumatic drive units, information is necessary about the electrophysical processes, occurring in the tilt system and determining the input parameters for the design of the considered tilt system. The dynamic performance of components of the proposed mechanism is identified, which allows giving practical advice on the choice of parameters of semiconductor converter elements, pneumatic and electromechanical devices of the combined tilt system, and also determining the forces acting in the tilt mechanism elements. Based on these dependencies, it is possible to choose the element base of the semiconductor converter (types of keys and diodes), parameters and types of cylinders of air springs, as well as to determine the load of the elements of the overbogie structure of the rolling stock. The results can be used in the development and design of high-speed railway rolling stock without substantial reconstruction of the existing transport infrastructure.

Keywords: combo drive, simulation model, body tilt, speed of movement, air springs, linear motor.

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CREATION OF THE ADAPTIVE CYBER THREAT DETECTION SYSTEM ON THE BASIS OF FUZZY FEATURE CLUSTERING (p. 18-25)

Valeriy Lakhno

The results of studies aimed at further development of methods and algorithms for detection of cyber threats and the most common classes of anomalies and cyber attacks in critical information systems (CIS) are presented. The problems of enhancing the CIS resistance in conditions of introduction of new and modernization of existing information and automated control systems, with the increased number of destabilizing effects on the information availability, confidentiality and integrity are considered.

It is shown that the cyber defense of CIS is monitored and analyzed by several parameters of the features of anomalies or cyber attacks. This, in turn, allows carrying out a preliminary information security evaluation via clustering of a feature set of anomalies or attempted cyber attacks.

A categorical model for building the adaptive intelligent cyber threat detection system (ICTDS) is proposed. Using the fuzzy clustering procedure, the training algorithm of ICTDS with the ability of hyper ellipsoidal correction of decision rules is developed. This allows creating adaptive ICTDS self-training mechanisms.

The efficiency of the algorithm of the ICTDS information-extreme training is checked. To evaluate the partitioning quality of the feature space of anomalies, vulnerabilities and cyber attacks, the choice of the rational number of clusters and the fuzziness index of clusters in the feature space is made.

It is proved that the proposed approach allows solving complex problems of the CIS cyber defense control and can be used in the development of software solutions for cyber defense systems.

Keywords: critical information systems, cyber security, information security, threat detection, anomalies, feature clustering, information-extreme algorithm.

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FORMATION OF PROGNOSTIC SOFTWARE SUPPORT FOR STRATEGIC DECISION-MAKING IN AN ORGANIZATION (p. 25-34)

Yuri Romanenkov, Vasily Vartanian

The study suggests a four-level model of a prognostic software system designed to solve the problems set forth for prognostic management of strategic decision-making support, including collection of statistical data, formation of a set of the main predictive methods, aggregation of prognostic estimates from different sources, and provision of an interactive mode of a parameter setting.

One of the models considered for the low level is the Brown prognostic model. A method of its parameter setting is suggested in the study on the basis of a retrospective analysis, which, unlike the existing ones, allows determining the tuning parameters of the model and ensures a maximum resistance of prognostic estimates to changes in the internal model parameters.

To create a means of prognostic data integration at the upper level, the study suggests a method of dynamic aggregation of prognostic estimates based on identifying prediction accuracy tendencies of alternative prediction sources, which, unlike the existing methods, ensures adaptability of the integration system and prognostic software support for strategic decision-making.

Keywords: prognostic software, managerial decision-making support, prediction/forecasting, integrated forecasting/aggregation of prognostic estimates.

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DEVELOPMENT OF ELECTRONIC DIAGNOSTIC SYSTEM FOR IMPROVING THE DIAGNOSIS RELIABILITY OF PASSENGER CAR BRAKES (p. 35-41)

Vasyl Ravlyuk, Iaroslav Derevianchuk, Igor Afanasenko, Nikolay Ravlyuk

The mathematical model that allows determining the pressure in the brake cylinder, distributor chambers and auxiliary reservoir of the car depending on the absolute pressure changes in the air flow through the throttle openings for a scheduled time is developed in the paper for diagnosing the parameters of the brake system of the individual car or train. It is embedded in the hardware-software system algorithm. This allows simulating the operation of the serviceable brake equipment and provides a high accuracy of identifying the diagnostic features of the technical condition of pneumatic systems of passenger cars.

The modern system of remote control of the passenger train brakes, which allows remote control of the brake equipment of the train and individual car during travel or at stops at the section and intermediate stations, is developed.

The experimental data, recorded during the monitoring of basic parameters of the brake equipment by the electronic diagnostic system of car brakes are checked for the adequacy with the analytical data by the mathematical model. Their correlation is proved.

Keywords: passenger car, diagnostic station, sensor, brake equipment, mathematical model, test bench, air pressure.

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DEVELOPMENT OF COMPUTATIONAL METHOD FOR DETECTION OF THE OBJECT'S NEAR-ZERO APPARENT MOTION ON THE SERIES OF CCD-FRAMES (p. 41-48)

Sergii Khlamov, Vadym Savanevych, Olexander Briukhovetskyi, Serhiy Oryshych

A computational method for detecting near-zero apparent motion of objects on the series of CCD-frames using the XY-wise and coordinate-wise decision rules is developed. The method is based on checking the statistical significance of the factor of speed of the object apparent motion on the studied series of measurements using the Student's t-test for coordinate-wise decision rules and F-test for XY-wise decision rules. This is the main feature of the developed computational method compared with the conventional decision rules based on the maximum likelihood criterion.

The developed computational method for detecting near-zero apparent motion of the objects was tried and tested, and embedded in the block of inter-frame processing of the CoLiTec software package for the operational automated detection of new and tracking of the known asteroids, comets and faint celestial bodies.

Using the CoLiTec software package and the proposed embedded computational method, the comet C/2012 S1 (ISON) — long-period sungrazing comet was discovered, which at the time of discovery was the object with near-zero apparent motion.

Keywords: CCD-measurements, near-zero apparent motion, OLS parameter estimation, Student's t-test, F-test, asteroids.

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