

THE DYNAMIC ERROR OF THERMOCOUPLES

František ADAMČÍK, Peter KRAJŇÁK

Abstract: The contribution is focused on solving the problem of the dynamic error at the thermocouples, used to measure temperature of gases aft of the turbine. The temperature of gases aft of the turbine is a parameter limited by the material used for manufacturing the turbine blades of aviation jet-engine. The time behaviour of the temperature the gases behind the turbine is also an important indicator in terms of the combustion chamber diagnostics. The dynamic error of thermocouples makes it impossible to use the temperature values of the gases aft of the turbine, recorded in flight onto an airborne engine diagnostic device, in various modes of engine operation, consequently, solving the problem of the dynamic errors of thermocouples is of primary importance.

Keywords: Jet-pipe temperature, parameter check, aircraft engine.

DISCRETE MODELS OF OPTIMIZATION AND SAFENESS IN TRANSPORT AND TRANSFER

Štefan BEREŽNÝ

Abstract: Nowadays in most of the industries evaluation and ensuring various forms of security comes only out of statistical data processing and evaluating, eventually from specifications that are often designed on the statistical basis. In this paper I want to present view on the way, how to use possibilities of discrete optimization in this industry. With these information are used, that are collected from statistical data processing. I attempted to illustrate some findings from discrete optimization in various industries of transport and transfer.

Keywords: Mathematical model, optimization, statistical data processing, graph, objective function.

SELECTED ASPECTS OF DRIVERS MICROCLIMATE EVALUATION

Štefan ČORŇÁK

Abstract: The traffic safety is a serious issue regarding both the society and general transport. This problem has increasing intensity in terms of increasing density of traffic and motorisation. The transport means number has been growing constantly which has negative impact onto traffic accidents numbers. Looking at the traffic accidents statistics which has been collated for long time period it is remarkable that the main contributors to the traffic accidents are drivers (more than 90%). An environment quality is one of the essential contributors to the driver's reactions apart from the good life style (feeding, corporal activities, sleeping, resting, etc.). The working place/an environment - microclimate in other words is a limited space of the environment. Such space is affected and its state is modulated by contributors represented by energy stream and mass stream between two environments. We can distinguish the internal microclimate according to the contributors - influencing factors such as: thermal, optical, acoustic, air quality of the interior, etc. No other situation in terms of the microclimate influence is at the vehicles' area. The air quality of the driver's environment is the main contents of the contribution.

Keywords: Traffic safety, driver's environment, driver's microclimate, carbon dioxide.

AIR TRAFFIC COMPLEXITY AS A SAFETY PERFORMANCE INDICATOR

Jelena DJOKIC, Hartmut FRICKE, Michael SCHULTZ, Christoph THIEL

Abstract: Numerous studies emphasize the significant influence of air traffic complexity on controller's workload and consequently on the overall safety level. This paper describes a detailed investigation into these air traffic complexity metrics. The evaluated data originate from traffic samples of a recently conducted real-time simulation in air traffic control at EUROCONTROL CRDS Budapest. In these traffic samples both flight characteristics of individual aircraft and the interactions between pairs of aircraft were taken into consideration. With an attempt to quantify potential changes of the safety level, relevant indicators as the position, collision- respectively conflict probabilities were used. A traffic simulation environment was developed in order to determine these quantitative criteria more accurately. Additional emphasis was put onto the consideration of actual navigation performance of each aircraft to allow correlating air safety with performance based navigation (PBN) concepts.

Keywords: Air Traffic complexity, safety, collision probability, Actual Navigation Performance (ANP).

NOTES ON VEHICLE-BASED VISUAL TRAFFIC SURVEILLANCE FOR CRASH-PREDICTION

Péter GÁSPÁR, Zoltán FAZEKAS, Alexandros SOUMELIDIS

Abstract: Though some sections of motorways and multi-lane roads have been built in the last few years in Hungary, a good portion of the domestic and transit road traffic is still served by two-lane roads. Some of these roads are burdened with intense and relatively slow truck and lorry traffic. The traffic safety situation is aggravated by the impatience and carelessness of a sadly high number of drivers. These factors render the mentioned roads extremely unsafe. It is questionable whether the conventional measurement approaches – including also the fixed-camera measurements – are adequate for traffic safety monitoring purposes and whether they can provide sufficient insight into the traffic safety situation. Building upon the experience with camera-based traffic lane tracking systems, relying on reports on the applicability of surrogate safety measures for crash-prediction, and on the application of omni-directional vision systems in road vehicles, a mobile omni-directional camera-based approach of assessing the safety of the mentioned roads is outlined and motivated herein.

Keywords: Traffic safety, traffic surveillance, dynamic surround map, surrogate safety measures, catadioptric cameras, omni-directional vision systems.

HISTORICAL DATA BASED WIND SEGMENTATION

Eva GELNAROVÁ, Petr KRUPANSKÝ, Jiří SVOBODA, Petr MEJZLÍK, Tomáš NEUŽIL

Abstract: The 4D trajectory concept requires the precise guidance of aircraft along a predefined flight path. In particular, for the concerned longitudinal trajectory predictions are necessary, among others, reliable weather data, even in case the weather forecast is not available. In some applications, it might be useful to know the typical weather trends along the trajectory. This contribution describes the methodology how historical upper wind trends along a trajectory may be constructed. The analysis of effects influencing the segmentation of winds along the selected trajectory has been done using cluster analysis. The probability of transitions between wind magnitude states along the selected trajectory has been investigated using transiogram. As a data source, the stored predictions of U.S wind magnitudes and bearings from Rapid Update Cycle (RUC-2) have been used.

Keywords: Wind magnitude and bearing, transiogram, data clustering, the Rapid Update Cycle (RUC).

ANALYSIS OF THE CHARACTERISTICS OF A PILOT IN THE AIRCRAFT FLIGHT

Rudolf JALOVECKÝ, Přemysl JANŮ

Abstract: The paper represents an attempt to analyze the properties of human flight in the aircraft. The approach is shown to create a replacement model of the behaviour of humans - pilot in the creation of a replacement model in terms of automatic control. There is not much information on how to access the analysis features of humans in terms of automatic control in history. Simulation of "response" on the human impulse input is an essential building block in the design of circuit auto flight aircraft control. Particular attention is paid to simulations of pilot - aircraft group in curbing the fast oscillations aircraft.

Keywords: Aircraft automatic control, Autopilot, Aircraft, Matlab, Simulink.

OBSTACLE DETECTION SYSTEMS USING EO CAMERAS

Ondřej KOTABA

Abstract: This paper describes the possible approaches to the two distinct tasks of the sense&avoid capabilities using the visual sensors. For the obstacle mapping, we discuss the feasibility of stereo reprojection, optical flow, and structure from motion approaches. For the traffic collision detection and avoidance, the classification approaches, stereo reconstruction, structure from motion, and heterogeneous systems are being evaluated.

Keywords: Visual sense and avoid, vision-based navigation, sense and avoid, S&A, object avoidance, traffic collision avoidance, obstacle detection.

UTILIZATION OF SIMULATION AT THE EVALUATION OF FATIGUE PROPERTIES OF MATERIALS

Mariana KUFFOVÁ, Václav KRÁLÍK

Abstract: The fatigue process is very sensitive to a great amount of both external and internal factors that, each of them on its own, but especially when acting simultaneously, can affect the fatigue resistance of materials, parts and constructions. The fatigue tests can be performed in various experimental conditions at different loading frequencies. We have all come across examples of materials fatigue failure, whether it is the broken rail which caused trains to be delayed or the broken shaft which caused car crash, etc. The importance of fatigue is tied foremost to safety of persons, which life is dependent on the reliability of given device operation. Lowering costs and in substantial extent also increasing efficiency allows us progress in computer technology usability and in application of numerical techniques onto large amount of problems in mechanical engineering.

Keywords: Simulation, finite element software ADINA, safety, construction materials.

COMMUNICATION ANTENNA EMITTING IN TRANSVERSE VERTICAL PLANE OF AIRCRAFT

Ján LABUN, Pavol KURDEL, Pavol LIPOVSKÝ

Abstract: In professional and laymen circles there is a prevailing idea that in order to enlarge the boundary of the radio communication range, it is appropriate to bank an aircraft so that to improve the line of sight of the antenna with reference to the ground communication point. This theory is true on condition that the angle of banking does not exceed a certain stated angle, which is specific for each type of aircraft and is dependent on various factors. It is about the factors such as dimensions and the shape of the aircraft, location of the antenna on the aircraft surface, operating frequency etc. From this point of view, the article is a treatise on the causes and rules underlying of the frequency drops in the radiation pattern of the communication antenna located on the body of the aircraft from the point of the angle of bank with the minimum level of the signal received. As it is generally known, the change in the level of signal reception is of substantial effect on the range of communication link.

Keywords: Asymmetric dipole, aircraft antenna, range of radio communication.

DETECTION AREA ANALYSIS IN THE ELINT SYSTEM

Zdeněk MATOUŠEK, Pavel BUČKA

Abstract: In this article we describe a possible analysis technique of detection area in the Electronic Intelligence - ELINT system depending upon the values of detection probability P_D , false alarm probability P_F and the change of output within ELINT source P_Z . By this analysis it is assumed that there is a monitoring of mobile ELINT sources, which are located on the margin of ELINT system radio horizon, whereby it is necessary to carry out the radio-locating of these sources in the main lappet of directivity pattern source axis and ELINT device.

Keywords: Electronic Intelligence, reconnaissance system, the Doppler effect, transmitter, power agility, the probability detection.

MPM 20 MAGNETIC AURA RESEARCH AND ITS UTILIZATION FOR MPM 20 SITUATIONAL CONTROL

Jana MODROVIČOVÁ, Ladislav MADARÁSZ, Ján KABÁT

Abstract: This article is aimed at in-depth research and experimental confirmation of aircraft turbojet engines magnetic aura existence, more exactly magnetic aura of small turbojet engine MPM 20. MPM 20 magnetic aura is one of its important properties and its utilization possibilities for control purpose until now aren't closely explored. Worked article contains motives and references of its utilization for MPM 20 situational control methodical application.

Keywords: MPM 20, magnetic aura, measurement, cross-section.

MULTIPLE SENSOR INTEGRATION FOR AUTONOMOUS VEHICLE NAVIGATION

Martin Ernesto OREJAS, Ľuboš VÁCI, Milan SOPATA

Abstract: This paper presents a software solution for multiple sensor integration for autonomous vehicle navigation. The system unique features and shortcomings are taken into account to implement the fusion of an inertial navigation system (INS) with measurements from global navigation satellite system (GNSS), altimeter, odometer and magnetometer employing a complementary extended Kalman filter to produce an accurate, reliable and robust navigation solution. The aim of this work is to present specific problems and solutions of sensor integration.

Keywords: INS, GNSS, Kalman filter, navigation system integration, sensor fusion.

PASSIVE SAFETY OF CAR FLEET IN THE CZECH REPUBLIC

Jan POKORNÝ, Michal ŠELMÁT

Abstract: Safety of car fleet is usually estimated according to its age. But this estimation is quite inaccurate and gives only information about the average age of common cars in a territory. It does not consider passive and active safety structure of that car fleet. This article shows possibility involving some of these parameters to this estimation. A method introduced in this paper is based on fuzzy sets application to this problem and appears from data obtained from Central Register of Vehicles and EuroNCAP.

Keywords: Passive safety, car fleet, fuzzy set.

EVALUATION OF A NEW TIMETABLE CONCEPT ON THE TRACK PRAHA-KLADNO USING A SIMULATION TOOL

Ondřej POLÁK, Vít JANOŠ, Karel BAUDYŠ

Abstract: On behalf of České dráhy (the Czech Railways) a railway operation model for the railway track Praha – Kladno was compiled using the Swiss simulation tool „Opentrack“. The aim of the study was to prove the feasibility and robustness of a new timetable concept, which slightly raised the traffic intensity. The study proved the feasibility and pointed out the critical moments of the planned concept. It especially simulated the possible effects of operation irregularities at the critical points. To prove the robustness of the timetable a 5-15 minutes entry delay was simulated for every train in the planned work-day timetable. The conclusions of the simulation were later projected into specific dispatching issues for every station dispatcher as well as the overall operations control. Apparently thanks to the results of the study the influence of delays on this track was minimized. This was an important contribution to improve the marketing image of the new timetable.

Keywords: Operations simulation, Opentrack, robustness of a timetable, railway operations control.

TEST ANALYSES OF DAM DEFORMATIONS FOR SECURITY OF PEOPLE AND ENVIRONMENTAL PROTECTION

Vladimír SEDLÁK, Miloš JEČNÝ, Marián MESÁROŠ, Miroslav KELEMEN, Pavel NEČAS

Abstract: Deformations on buildings and structures due to own weight, water pressure, inner temperature, contraction, atmospheric temperature and earth consolidation occur. Especially, it is necessary to embark on monitoring and analysing of deformation effects and movements of any sizeable dams and water basins and so to prevent of their prospective catastrophic effects into the environment and also human lives. The paper is centred on stability of the bulk (rock-fill) dam of the water basin Pod Bukovcom near Košice in the East Slovak Region. Results and analyses of the geodetic terrestrial and GPS measurements on the rock-fill dam are undergone by to test-statistics, the model of stability or prospective movement of the rock-fill dam with time prediction. The paper outputs are incorporated into GIS and information system of U.S. Steel Košice.

Keywords: Deformation, dam, security, GPS.

ALLIANCE'S STRATEGIC CONCEPT

Peter SPILÝ, Pavel NEČAS

Abstract: Alliance's Strategic Concept (hereinafter „SC“) represents the most important strategic frame, which determines the main direction and areas of its activity. SC has always responded to an actual global security environment situation and to changes, which have had direct influence over Alliance's security. Due to this document importance, validity of each SC was longer, thus only six SC were adopted throughout Alliance history. Nowadays we are witnesses to intensive discussions of the new SC creation necessity as reflected in the conclusions from the recent NATO Summit in Strasbourg/Kehl when the heads of the member states tasked the Secretary General to establish and lead a group of qualified experts, whose task is to develop a new SC by the next NATO summit.

Keywords: Alliance's strategic concept, global security environment, challenges and risks, massive retaliation, flexible response, deterrence, partnership.

TRAFFIC LIGHTS CONTROL USING RECURRENT NEURAL NETWORKS

Michal TURČANÍK

Abstract: The paper presents theoretical and experimental investigation of traffic lights control using recurrent neural networks. The structure of the recurrent neural network for traffic lights control and a learning algorithm for recurrent neural networks is presented. Verification of the functionality of the designed recurrent neural network was done through dynamic simulation model of selected traffic lights.

Keywords: Feed forward and recurrent neural networks, control system.

AIRBORNE SIDE AND AUTOMATED EN-ROUTE CONFLICT DETECTION AND RESOLUTION

Jiří VAŠEK, Pavel KOLČÁREK, Petr KRUPANSKÝ, Christopher MISIAK

Abstract: This paper presents a summary of results gathered during the simulator based airborne impact assessment of the ERASMUS research project. The ERASMUS project is a European Commission FP6 project, which tries to significantly improve efficiency, effectiveness and safety of the European Air Traffic management system. Its goal is to provide automatic conflict detection and resolution up to 20 minutes ahead of the conflict during the en-route phase of the flight, while maintaining the advantage of actively involved Air Traffic Controllers. In spite of the major focus on the ground side of the Air traffic management, the implementation of ERASMUS in the future European airspace heavily depends on a number of airborne related issues such as acceptability, timely response or situation awareness. Results related to these areas are presented in the paper and based on them, modifications of the current onboard equipment related to the processing of the conflict resolution clearance onboard are proposed.

Keywords: Automated aircraft separation management, transaction time, acceptability, data-link communication.

APPRAISAL OF CRITICAL TRANSPORTATION INFRASTRUCTURE – RISKS AND SAFETY

Jaroslav ZAJÍČEK, Jiří HAVLÍČEK, Pavel FUCHS
Radovan SOUŠEK, Miroslav KELEMEN, Lucia KOVÁČOVÁ

Abstract: Risk management is a proper platform for solving of critical infrastructure protection tasks. Risk Assessment as a substantial part of risk management contains processes and tools for risk evaluation. Transportation infrastructure disturbances are evaluated by risk measures and calculation of risk value is presented.

Keywords: Critical infrastructure, risk assessment, risk evaluation, probability, consequence, FMECA.