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XVI International Conference

MEASUREMENT AND CONTROL IN COMPLEX SYSTEMS (MCCS - 2022)

Vinnytsia
November 15-17, 2022

The goal of the conference is to discuss the measurement and control problems of technical, ecological, industrial, medical and biological and other complex systems in order to find common approaches, exchange ideas, discuss trends of development in this particular scientific sphere, to establish fruitful relations and motivate talented youth to participate in scientific research. Special attention will be paid to the use of mathematical modeling, optimization, artificial intelligence and other approaches of technical sciences to solve the problems of environment protection, sustainable use of natural resources, management, medicine etc.

Conference work directions:

- **Theoretical foundations of measurement and control** (general problems of mathematical modeling and control, mathematical methods in modeling and control, modeling and control under uncertainty);
- **Promising methods, software and hardware of measurement and control systems** (Internet of Things, methods and equipment for measurement and control optical information processing in measurement and control systems, telecommunications and computer networks, electronics and computing in control systems, software of control systems);
- **Measurement and control in different areas** (measurement and control in transport, ecology and mining engineering, biotechnical systems, medicine, construction, management of organizational and economic systems etc.);
- **Control and measurement in energetics** (control in power supply and generation systems, in systems with renewable sources, management in power systems, etc.);
- **Intelligent technologies in control systems** (intelligent data analyzes, machine learning, optimization and decision making, pattern recognition in measurement and control systems, fuzzy methods and models in control, neural networks, genetic and other heuristic algorithms, expert systems, methodology for specialists learning in the field of control and management).

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IMPORTANT DATES:

Application and abstract submission	October 16
Notification of paper acceptance to conference program	October 25
Report (article) submission	November 11
Opening of the conference	November 15, 10.00 a.m.

Due to the state of war in Ukraine, the conference will be held via teleconference.

If it is impossible to participate in the conference in person, you should send an electronic presentation in PowerPoint, as well as an audio recording of the report or a video recording of the report with the presentation, for demonstration of the conference participants.

Participation in the conference is free.

Official languages: Ukrainian, English.

Applications for participation in the conference are submitted using the Open Conference Systems on the conference page

https://conferences.vntu.edu.ua/index.php/mccs/mccs2022/schedConf/cfp

To submit an application, it is necessary to download an *abstract* of the report of 180-200 words.

Papers presented and approved at the conference will be published as electronic publications (Proceedings of MCCS-2022) with a DOI assigned for each publication.

Materials of the report, if it is included in the conference program, should be sent to kuss2022@vntu.edu.ua.

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Web-site https://conferences.vntu.edu.ua/index.php/mccs/mccs2022

Proceedings

Conference Materials Requirements:

The report should be prepared in the Word for Windows editor.

The recommended structure of abstract:

- The formulation of the general problem (3 lines);
- State of its solution in the world (10-12 lines)
- Problem survey (5 lines);
- Characteristics of the research and the obtained results;
- Summary (5 lines);
- References (1-3 sources).

The length of the report is 2-7 pages.

Abstracts Formatting

Margins should be 22mm, paper size - A4. ***Font***: Times New Roman Cyr, 11 pt, single-spaced. Symbol sizes ***in formulas***: 12pt (Σ - 12pt, table - 9 pt), subscript/superscript 8pt (Σ - 11pt, table - 7pt), sub-subscript/superscript 6pt (Σ - 8pt, table - 5pt), symbol 10pt. Formulas should be centered. Formulas should be created in Equation Editor 3.0/3.1 (internal formula editor of Microsoft Word). Insert ***figures*** in the following way: copy a figure to clipboard, than choose "Edit", "Special Paste", "Picture"; figure caption should be formatted 9 pt: Fig. 1a; Fig. 2 a, b. Figures should be centered.

Material layout: 1) *Authors*: skip one line, then print first names and surnames, degree and affiliation of all co-authors (12pt, bold); 2**)** print the *report title* in capital letters (12pt, bold) in the center of the next line; spacing before and after – 6 pt; 3**)** print *main text* from the new line and indent11pt; 4**)** list of *references*.

ABSTRACT SAMPLE

V.M. Dubovoi, Dr. of Sc., Prof., E.D. Nikitenko, Phd, Ass. Prof.

THE PRINCIPLES OF CONTROL WITH MINIMAL ENERGY IN CONDITION OF UNCERTAINTY

The branching processes are the most difficult types of technological processes. The problem of effective management of such processes is actual because of their prevalence in various fields of industry, business process management, agriculture and etc. The peculiarity of such processes management is that at the end of any transaction of this process the decisions are made regarding transition to the next stage and selection process branch in the point of branching. Decision-making is carried out in a combined stochastic, fuzzy and interval uncertainty conditions of the process implementation [1,2]. New problems in the management of branching processes emerged by the need to save energy on all phases of management: from receiving information about process state to making and implementing decisions. Reducing uncertainty is associated with the energy spending to receive information and make decision. Problem of constructing of optimal algorithms and multi-step decision-making for reducing energy spending in condition of combined uncertainty is not enough studied which reduces efficiency of such processes.

Problems of energy saving technologies of information processing development are becoming more and more important part of a comprehensive scientific and practical direction in the world under the title «Green IT». The theme of energy saving is one of the most cited in scientific and business conferences in recent years, such as: «IT Future», «Fujitsu Siemens Computers», «Cebit». Intel, Google, Hewlett-Packard, Microsoft, Lenovo, Dell and others joined under the slogan "Slow down global warming". However, the problem of effective and energy-saving management of branching technological processes in conditions of uncertainty is new. Energy savings, and in particular energy-saving decision-making control systems would become a prerequisite for promoting technical solutions to the market in the coming years.

Objective: To improve efficiency and energy-saving characteristics of branching technological processes (BTP) management in conditions of uncertainty through the development of theories, models, methods and means of multi-step decision making and coordination in distributed systems.

The approach to problem solving involves the use of the Bellman principle and uncertain graphs as models of BTP and search for the optimal path in the graph as BTP implementation plan after each operation. The news in this approach is the decomposition of each graph node representing a state of BTP to sub-processes of control, decision-making and implementation, to evaluate the energy consumption at each stage as components of risk criteria (average losses).

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The methods of multi-parametric optimization are applied when solving the problem of finding the optimal control, and one of the criteria is the energy consumption to make and implement decisions. To account different types and sources of uncertainty generalization of presentation of reliable, stochastic and fuzzy data about process characteristics was made using generalized uncertainty function β and use of this presentation for generalized risk definition as the criteria for optimal decision making:

$$R = \iiint\limits_{\Omega_{E_m, E_d, E_c}} (E_m + E_d + E_c)\beta(E_m, E_d, E_c)dE_m dE_d dE_c ,$$

where E_m, E_d, E_c - energy consumption to measure parameters of BTP state, decision making and implementation of management respectively. There is a relationship between the variables E_m, E_d, E_c :

$$E_d \uparrow \Rightarrow E_m \uparrow, E_c \downarrow .$$

Conclusions. The proposed approach to the optimization of information and computing systems based on an algorithmic model is convenient for formalization using operations on weighted graphs.

References

1. Прийняття рішень в управлінні розгалуженими технологічними процесами : [монографія] / В. М. Дубовой, Г. Ю. Дерман, І. В. Пилипенко, М. М. Байас. — Вінниця : ВНТУ, 2013. — 223 с.

2. Efficient Resources Allocation in Technological Processes Using an Approximate Algorithm Based on Random Walk / M.M. Bayas, V.M.Dubovoy // International Journal of Engineering and Technology (IJET) Vol 5 No 5 Oct-Nov 2013 p 4214-4218