



EWG-ORSDCE

NEWSLETTER OF EWG ORSDCE DECEMBER 2012

ORSDCE - The OR in Sustainable Development and Civil Engineering Working Group of EURO
<http://www.orsdce.vgtu.lt/>

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Words of chairman

Dear Members of EWG-ORS DCE, dear Friends,

It is a great pleasure to address you some introductory words and present the achievements of scientific cooperation. Last year was rich in scientific events were members of EWG-ORS DCE have participated.

This year was signified by appearance of new optimization method – Weighted Aggregates Sum Product Assessment method (WASPAS) that gives high accuracy of estimation and could be successfully applied in computer-aided systems to support multiple criteria decisions. Method has a promising future in the construction engineering field, because offers a highly methodological basis for decision support. The article “Optimization of weighted aggregated sum product assessment” presenting WASPAS method was published this year in scientific journal *Elektronics and electrical engineering* (No. 6 (122)).

In year in fields of construction and sustainable development 2012 four dissertations have been defended. The Newsletter presents the short summaries of defended dissertations. Books published this year by several members of EWG-ORS DCE are briefly presented. This issue of Newsletter presents also the forthcoming events, were the EWG-ORS DCE members are participating as organizers or scientific committees’ members.

We would like to express the gratitude to colleagues contributed to the organization of the stream of invited sessions in the field “*OR for Development and Developing Countries*” in the 25th European Conference on Operational Research (EURO XXV), which was held in Vilnius, Lithuania, on July 8-11, 2012. Special thanks to Jana Šelih from Ljubljana University (Slovenia), Folke Björk from Royal Institute of Technology (Sweden) and Tatjana Vilutiene from Vilnius Gediminas Technical University (Lithuania) for chairing the sessions of stream.

We wish you fruitful scientific collaboration, plenty of health, happiness and prosperity in the new year!

With my best wishes, Yours sincerely,
Edmundas Kazimieras Zavadskas, Chairman of EWG-ORS DCE

Forthcoming Events

**11th International Conference
"Modern Building Materials, Structures and Techniques"
Vilnius, Lithuania
May 16 - 17, 2013**

The Conference is organized by: Faculty of Civil Engineering, Vilnius Gediminas technical university and partners: International Association for Bridge and Structural Engineering (Lithuanian group), European Council of Civil Engineers, The Association of European Civil Engineering Faculties, The Working Group of EURO "OR in Sustainable Development and Civil Engineering", The Lithuanian Academy of Sciences

Starting from year 1991, faculty of Civil Engineering at Vilnius Gediminas Technical University (VGTU) together with national and international partners already has organized ten highly successful international scientific conferences to discuss up-to-date problems in civil engineering. This conference is aimed at discussing of both industrial and academic research which has been recently carried out on analysis and design of modern structures, development of innovative building materials, maintenance of structures, building technology and management, etc. The peer-reviewed selected papers of the previous conferences were indexed by Thomson Reuters Conference Proceeding Citation Index (ISI Conference Proceedings database).

The conference will cover these broadly defined areas: Operational research; Building information system; Decision making, decision support systems and management in construction; Optimization in structural engineering; Innovative analysis and design methods for bridges and building structures; Architectural engineering; Construction technology and organization; Repair, renovation and strengthening of bridges and building structures; Building materials and production technology; Behavior and design of concrete, masonry, glass, steel, timber and composite structures; Stability of steel and composite structures; Geotechnics; Facility and real estate management; Fire safety, human safety and ergonomics.

By the Conference date all the peer-reviewed Conference papers will have been published by Elsevier in open-access Procedia Engineering (no subscription needed). This will result in the maximum exposure and high worldwide visibility of the authors and their papers. Published papers will also be sent to Thomson Reuters Conference Proceeding Citation Index (ISI) and SCOPUS for possible indexing.

Authors of the selected Conference papers will have the possibility of publishing their articles in the following scientific journals:

Journal of Civil Engineering and Management (Taylor and Francis), ISI WOS, IF=2.171 (2011)

The Baltic Journal of Road and Bridge Engineering (Taylor and Francis), ISI WOS, IF=1.610 (2011)

Technological and Economic Development of Economy (Taylor and Francis), ISI WOS, IF=3.235 (2011)

International Journal of Strategic Property Management (Taylor and Francis), ISI WOS, IF=1.620 (2011)

Journal of Environmental Engineering and Landscape Management (Taylor and Francis), ISI WOS, IF=1.958 (2011)

Automation in Construction (Elsevier), ISI WOS, IF=1.5 (2011)

Transport (Taylor and Francis), ISI WOS
Engineering Structures and Technologies (Taylor and Francis)
Geodesy and Cartography (Taylor and Francis)

Important dates:

- Full registration and submission of papers, before 25th of January 2013
- Submission of papers corrected according to reviewers comments, before 22nd of February 2013
- Payment of early (reduced) conference fee, before 15th of March 2013
- Payment of full conference fee, before 5th of May 2013
- Conference 16–17th of May 2013

Website: <http://mbmst.vgtu.lt/>



14th German-Lithuanian-Polish Colloquium
“Innovative solutions in construction technology and
management”
Vilnius, Lithuania
May 15, 2013

The 14th German-Lithuanian-Polish colloquium will cover these broadly defined areas: construction technology and organization; operational research, decision making, decision support system; innovative solutions; sustainable development in civil engineering; construction management. Papers in this area should cover concepts of „Innovative solutions in construction technology and management“. Papers in this area should cover also researches in field of application and development of MADM methods.

The Conference will be hosted by Vilnius Gediminas Technical University.

Authors of the selected conference papers will be offered to supplement or modify their papers for possible publishing in the following scientific journals:

Automation in Construction (Elsevier), WOS, IF=1.500, (2011);

Journal of Civil Engineering and Management (VGTU and Taylor & Francis), WOS, IF=2.171, (2011);

Technological and Economic Development of Economy (VGTU and Taylor & Francis), WOS, IF=3.235, (2011);

International Journal of Strategic Property Management (VGTU and Taylor & Francis), WOS, IF=1.620, (2011);

The Baltic Journal of Road and Bridge Engineering (VGTU and Taylor & Francis), WOS, IF=1.610 (2011);

Journal of Environmental Engineering and Landscape Management (VGTU and Taylor & Francis), WOS, IF=1.958, (2011);

Transport (VGTU and Taylor & Francis), WOS;

Engineering Structures and Technologies (VGTU and Taylor & Francis);

Geodesy and cartography (VGTU and Taylor & Francis).

Important dates:

- Full registration and submission of papers, before 25th of January 2013
- Submission of papers corrected according to reviewers comments, before 22nd of February 2013
- Payment of early (reduced) fee, before 15th of March 2013
- Payment of full fee, before 5th of May 2013
- Colloquium 15th of May 2013

Registration for colloquium 2013 is opened from September 5th, 2012. Information about authors, article titles and contacts please send to organizers by email: colloquium13@vgtu.lt

26TH EUROPEAN CONFERENCE ON OPERATIONAL RESEARCH

“All roads lead to OR”

Rome , Italy

July 1-4, 2013

Following the success of previous EURO Conferences, we announce the 26th EURO – INFORMS Joint International Conference, which will be held in Rome on 1-4 July 2013. The Programme Committee chaired by Marc Sevaux (EURO) and David Simchi Levi (INFORMS) and the Organizing Committee chaired by Paolo Dell’Olmo (AIRO), are preparing a high quality Scientific programme and an exciting social programme for the Conference.

Oral presentations will be organized in parallel sessions. Authors can present only one paper at the Conference. Submission invited on, but not limited to, the following areas:

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|--|--|
| – Artificial Intelligence, Fuzzy systems | – OR Education, History, Ethics |
| – Computing | – OR for Developing Countries, Humanitarian applications |
| – Continuous Optimization | – OR in Health & Life Sciences |
| – Control Theory & System Dynamics | – OR in industry and software for OR |
| – Data science, Business analytics, Data mining | – OR in Natural Resources |
| – Decision Analysis, Decision Support Systems, DEA and Performance Measurement | – Production Management & Supply Chain Management |
| – Discrete Optimization, Geometry & Graphs | – Revenue Management |
| – Emerging applications of OR | – Scheduling, Time Tabling & Project Management |
| – Energy, Environment and Climate | – Service systems |
| – Financial Modeling, Risk Management, Managerial Accounting | – Simulation, Stochastic Programming and Modeling |
| – Game theory, Mathematical Economics | – Soft OR and Problem Structuring Methods |
| – Location, Logistics, Transportation | – Telecommunication, Networks and Social Networks |
| – Metaheuristics | |
| – Multiple Criteria Decision Making and Optimization | |

Important dates:

- Abstract submission deadline: 1 March 2013
- Notification to authors: 15 March 2013
- Deadline for early registration (and inclusion in the programme): 15 April 2013
- Registration and Welcome Cocktail: 30 June 2013
- Conference date: 1 - 4 July 2013

Registration fees:

Regular: 350.00 Euro (early) 470.00 Euro (late)

Student: 190.00 Euro (early) 290.00 Euro (late)

Accompanying persons: 80.00 Euro

Submit your abstract (max 600 characters) and register on line: www.euro2013.org

Scientific events 2012

Membership in EURO conference organizing committee

This year, on July 8-11, Vilnius was gathered scientific elite – here was held the XXV European Conference on Operational Research organized by Association of European Operational Research Societies (EURO) and Lithuanian Operational Research Society (LitOrs). The chair of conference organizing committee was prof. Leonidas Sakalauskas, and the members of organizing committee were assoc. prof. Tatjana Vilotienė and assoc. prof. Jonas Žaptorius the members of EWG-ORS DCE.

It was perhaps the largest conference ever held in Lithuania. Conference gathered 2 119 scientists from about 70 countries from all over the world. The majority arrived from Germany, the U.S., Great Britain, Spain, France, Turkey, Italy, Portugal, Japan, Brazil and Belgium.

Nobel Prize-winning professor Finn Erling Kydland from the University of San Francisco (USA) and other well-known scientists in the field of operations research presented their scientific researches at EURO 2012 conference. "Nobel Prize in economics and many other prestigious awards are often awarded for achievements related to operations research. It is stated that half of the world's richest people included in FORBES list were able to take advantage of information and communication technology in innovation development related to operations research"- highlighted EURO 2012 conference report.

The main topic of EURO XXV was the "OR Connecting sciences" and main areas were Continuous Optimization; Control Theory & System Dynamics; Data Mining Knowledge Discovery and Artificial Intelligence; DEA and Performance Measurement; Decision Analysis, Decision Support Systems; Emerging applications of OR; Energy/Environment and Climate; Financial Modeling & Risk Management; Fuzzy Systems and Softcomputing; Game, Theory, Mathematical Economics; Location; Logistics, Transportation, Traffic; Metaheuristics; Multiple Criteria Decision Making and Optimization; OR in Health & Life Sciences; OR in industry and software for OR; OR for Development and Developing Countries; Production Management & Supply Chain Management; Revenue Management & Managerial Accounting; Scheduling, Time Tabling & Project Management; Simulation & Stochastic Programming and Modelling; Soft OR and Problem Structuring Methods; Telecommunication & Networks and others.

EWG-ORS DCE had organized the stream of invited sessions in area "OR for Development and Developing Countries". The 12 articles presented in this stream covered the issues of sustainable development in construction, civil engineering and urban development.

Next XXVI EURO - INFORMS Joint International Conference "All roads lead to OR" will be held in Rome on July 1-4, 2013. The Programme Committee and the Organizing Committee are preparing a high quality scientific programme and an exciting social programme for the conference. The XXVI EURO - INFORMS Joint International Conference will be an extraordinary opportunity for the OR community to get together again in a unique location, and we are looking forward to meeting you in Rome in 2013. Registration is open. More information on the website <http://euro2013.org/>.



26TH EUROPEAN CONFERENCE
ON OPERATIONAL RESEARCH
ROME 1-4 JULY, 2013

Membership in International Academy of Information Technology and Quantitative Management (IAITQM)

This new organization called International Academy of Information Technology and Quantitative Management (IAITQM) was established at a right time to consider how to physically bring educators, scholars, policy makers, and professionals around the world in the fields of information technology and quantitative management together to exchange their fresh thoughts, creative ideas, research findings and business experience to further benefit humanity.

Academy covers any information technology driven research and practices as well as Management issues in terms of data analyses. Currently, IAITQM has given a birth to Business Analytics (BA) and/or Business Intelligence (BI). In the future, IAITQM can produce more new fields to fundamentally change human lives.

The inauguration meeting of IAITQM took place in Omaha of United States on June 3, 2012. More than 50 participants, coming from China, United States, Australia, South Korea, Japan, The Netherlands, Poland, Romania, Singapore, Spain, Lithuania, Turkey and other countries, attended the meeting. The members of EWG-ORS DCE prof. Edmundas Kazimieras Zavadskas and prof. Zenonas Turskis were invited as founders.

IAITQM attendees discussed and passed the IAITQM bylaws, and held the first election. Attendees elected Prof. Yong Shi as the President, Prof. Peter Wolcott as the Vice President for Conferences, Prof. Wikil Kwak as the Vice President for Finance, and Prof. Jianping Li as the Secretary. According to the bylaws, the attendees also elected five committees and their chairpersons, namely, the advisory committee, the awards committee, the executive committee, the conferences committee, and the publications committee. More information on the Website of Academy: www.iaitqm.org.



IAITQM attendees (Embassy Suite Hotel, Omaha)

Scientists from Taiwan joined EWG-ORSDC



Sitting in first line: prof. Z.Turskis, assoc. prof. J.Tamošaitienė, prof. E.K.Zavadskas, prof. Dr. Gwo-Hsiung Tzeng and dr. James J.H. Liou

Standing: prof. A.Kaklauskas, assoc. prof. A.Banaitis, lector I.Vinogradova, assoc. prof. J.Šaparauskas, assoc. prof. T.Vilutienė, prof. L.Ustinovičius, assoc. prof. J.Antuchevičienė

Scientists from Taiwan arrived this year July 8-11 in Vilnius were the international scientific conference "The 25th European Conference on Operational Research took place. Conference gathered 2,119 participants from nearly 70 countries around the world. Most participants came from Germany, Great Britain, Spain, France, Turkey, Italy, Portugal, the USA, Brazil, Japan and Belgium. The delegation from Taiwan joined 53 scientists, together arrived VGTU guests prof. Dr. Gwo-Hsiung Tzeng (National Chiao Tung University and the Kainan University) and dr. James J.H. Liou (National Taipei University of Technology).

Professor G.-H.Tzeng having interested in scientific achievements of Vilnius Gediminas Technical University, contacted professor E.K.Zavadskas and offered to cooperate. After communication via e-mail, Professor G.-H.Tzeng was invited to visit Vilnius Gediminas Technical University. During the visit, Taiwan professors not only acquainted with the university but also gave a public lecture. During meeting and official reception presentations were made also by VGTU scientists and EWG-ORSDC members: prof. E.K.Zavadskas, prof. A.Kaklauskas, prof. Z.Turskis, assoc. prof. J.Tamošaitienė and assoc. prof. T.Vilutienė.



Prof. Dr. Gwo-Hsiung Tzeng

Professor Gwo-Hsiung Tzeng presented his research paper „A New Hybrid MCDM Model Combining DANP with VIKOR for Problems Improvement”.

Professors E. K. Zavadskas and A. Kaklauskas presented their research on development and application of intelligent and biometrics systems at Vilnius Gediminas Technical University.

Presentation on scientific achievements and relevant scientific research fields of Vilnius Gediminas Technical University was made by professor Z.Turskis.

Assoc. prof. T.Vilutienė presented the history and insights of future activities of Working Group of EURO "The OR in Sustainable Development and Civil Engineering".

The reports were followed by scientific discussion, bilateral cooperation between higher education institutions in field of research and education was discussed.

Dabar VGTU mokslininkų koordinuojama EURO darbo grupė „OR in Sustainable Development and Civil Engineering (EWG-ORSDCE)“ („Operacijų tyrimai darnioje plėtroje ir statyboje“) pasipildė naujais nariais iš Taivano ir ateityje tikimasi produktyvaus bendradarbiavimo operacijų tyrimo srityje.

Now EURO Working Group "OR in Sustainable Development and Civil Engineering (EWG-ORSDCE) coordinated by Vilnius Gediminas Technical University scientists was enhanced by new members from Taiwan and is expected future fruitful cooperation in the field of operations research.

Scientific recognition



For achievements in construction engineering and management field professor. Habil. Dr. E. K. Zavadskas was granted as Honorary International Chair Professor at National Taipei University of Technology (Taiwan).

工業工程與管理系



國立台北科技大學
National Taipei University of Technology
工業工程與管理系
Industrial Engineering and Management

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Edmundas Kazimieras Zavadskas



◇ 相關資料 ◇

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Lithuanian Academy of Sciences appointed the fellowship 2012-2013 for young scientists in the field of physical, biomedical sciences and technology for EWG-ORSDC member, Vice-Dean of Civil Engineering Faculty in Vilnius Gediminas Technical University dr. Jolanta Tamošaitienė.

Lithuanian Academy of Sciences announces an annual competition for these scholarships and select the 12 best and most promising researchers.

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New Optimization Method

Weighted Aggregates Sum Product Assessment method (WASPAS)

E.K.Zavadskas, Z.Turskis, J.Antucheviciene, A.Zakarevicius, 2012



Prof. dr. habil.
Edmundas Kazimieras
Zavadskas



Prof. dr. habil.
Zenonas
Turskis



Assoc. prof.
Jurgita
Antuchevičienė



Prof. dr. habil.
Algimantas
Zakarevičius

The authors of current research propose to select an appropriate multiple criteria method based on its accuracy of estimation. Combination of tow methods, i.e WSM (weighted Sum Model) and WPM (Weighted Product Model), was proposed to increase the ranking accuracy. It was proved that accuracy of aggregated methods is larger comparing to accuracy to single ones.

The Weighted Sum Model (WSM) is one of the best known and often applied multiple criteria decision making method for evaluating a number of alternatives in terms of a number of decision criteria. In general, suppose that a given MCDM problem is defined on m alternatives and n decision criteria. Next suppose that w_j denotes the relative significance of the criterion and is the performance value of alternative i when it is evaluated in terms of criterion j . Then, the total relative importance of alternative i , denoted as $Q_i^{(1)}$, is defined as follows [12]:

$$Q_i^{(1)} = \sum_{j=1}^n \bar{x}_{ij} w_j, \quad (1)$$

where linear normalization of initial criteria values is applied, i.e.

$$\bar{x}_{ij} = \frac{x_{ij}}{\max_i x_{ij}}, \quad (2)$$

if $\max_i x_{ij}$ value is preferable or

$$\bar{x}_{ij} = \frac{\min_i x_{ij}}{x_{ij}}, \quad (3)$$

if $\min_i x_{ij}$ value is preferable.

According to the Weighted Product Model (WPM) the total relative importance of alternative i , denoted as $Q_i^{(2)}$, is defined as follows [12]:

$$Q_i^{(2)} = \prod_{j=1}^n (\bar{x}_{ij})^{w_j}. \quad (4)$$

There was an attempt to apply a joint criterion for determining a total importance of alternative, giving equal contribution of WSM and WPM for a total evaluation [9]:

$$Q_i = 0.5Q_i^{(1)} + 0.5Q_i^{(2)} \tag{5}$$

Based on previous research [9] and supposing the increase of ranking accuracy and, respectively, the effectiveness of decision making, the Weighted Aggregated Sum Product Assessment (WASPAS) method for ranking of alternatives is proposed in the current research:

$$Q_i = \lambda \sum_{j=1}^n \bar{x}_{ij} w_j + (1 - \lambda) \prod_{j=1}^n (\bar{x}_{ij})^{w_j}, \lambda = 0, \dots, 1. \tag{6}$$

It is proposed to measure the accuracy of WASPAS based on initial criteria accuracy and when $\lambda = 0, \dots, 1$. When $\lambda = 0$, WASPAS is transformed to WPM; and when $\lambda = 1$, WASPAS is transformed to WSM.

Assuming that errors of determining the initial criteria values are stochastic, the variance σ^2 or standard deviation σ is a measure of dispersion in the distribution [14].

Suppose, there is the function:

$$y = \varphi(x_1, x_2, \dots, x_n). \tag{7}$$

The standard deviations of the function's arguments (Eq. 2) are $\sigma(x_1), \sigma(x_2), \dots, \sigma(x_i), \dots, \sigma(x_n)$

The variance of function y is determined as follows:

$$\sigma^2(y) = \sum_{i=1}^n \left(\frac{\partial \varphi}{\partial x_i} \right)^2 \sigma^2(x_i), \tag{8}$$

where $\frac{\partial \varphi}{\partial x_i}$ is a partial derivative of a function in respect of every argument.

Following the Eq. 1, 4 and 6, the expression can be written:

$$Q_i = \lambda Q_i^{(1)} + (1 - \lambda) Q_i^{(2)}, \lambda = 0, \dots, 1. \tag{9}$$

Accordingly, based on Eq. 8 and 9, estimate of variance of relative importance of alternative Q_i is determined as follows:

$$\sigma^2(Q_i) = \left(\frac{\partial Q_i^{(1)}}{\partial \lambda} \right)^2 \sigma^2(Q_i^{(1)}) + \left(\frac{\partial Q_i^{(2)}}{\partial \lambda} \right)^2 \sigma^2(Q_i^{(2)}) \tag{10}$$

The following equation is obtained after calculating respective derivatives:

$$\sigma^2(Q_i) = \lambda^2 \sigma^2(Q_i^{(1)}) + (1 - \lambda)^2 \sigma^2(Q_i^{(2)}) \tag{11}$$

The variances $\sigma^2(Q_i^{(1)})$ and $\sigma^2(Q_i^{(2)})$ should be calculated. It can be written from Eq. 1 and Eq. 4:

$$\sigma^2(Q_i^{(1)}) = \sum_{j=1}^n \left(\frac{\partial Q_i^{(1)}}{\partial \bar{x}_{ij}} \right)^2 \sigma^2(\bar{x}_{ij}), \tag{12}$$

$$\sigma^2(Q_i^{(2)}) = \sum_{j=1}^n \left(\frac{\partial Q_i^{(2)}}{\partial \bar{x}_{ij}} \right)^2 \sigma^2(\bar{x}_{ij}). \tag{13}$$

Partial derivatives are calculated from Eq. 1 and Eq. 4 and inserted in Eq. 12 and Eq. 13:

$$\sigma^2(Q_i^{(1)}) = \sum_{j=1}^n w_j^2 \sigma^2(\bar{x}_{ij}), \tag{14}$$

$$\sigma^2(Q_i^{(2)}) = \sum_{j=1}^n \left(\frac{\prod_{j=1}^n (\bar{x}_{ij})^{w_j w_j}}{(\bar{x}_{ij})^{w_j} (\bar{x}_{ij})^{(1-w_j)}} \right)^2 \sigma^2(\bar{x}_{ij}). \tag{15}$$

Estimates of variances of normalized initial criteria values are calculated as follows:

$$\sigma^2(\bar{x}_{ij}) = \left(\frac{\bar{x}_{ij}^k}{t} \right)^2, \tag{16}$$

where k – coefficient that summarizes uncertainty of measured criterion, t is a multiplier depending on the distribution law of errors and on the credibility level q. k=0.10 when the uncertainty of estimation of the initial data to be approximately equal to 10 percent of an average criteria value. t=2.0 in the case of normal distribution with the credibility q=0.05. Accordingly

$$\sigma^2(\bar{x}_{ij}) = (0.05 \bar{x}_{ij})^2. \tag{17}$$

Variances of estimates of alternatives (Eq. 11) in WASPAS depend on variances of WSM and WPA (Eq. 12 and Eq. 13) as well as coefficient λ. Accordingly, the aim of the current part of the research is to calculate optimal values of λ, i.e. to find minimum dispersion σ² (Qi) and to assure maximal accuracy of estimation. Optimal values of λ can be find when searching extreme of function. Extreme of function can be found when derivative of Eq. (9) in regard to λ is equated to zero:

$$2\lambda\sigma^2(Q_i^{(1)}) - 2\sigma^2(Q_i^{(2)}) + 2\lambda\sigma^2(Q_i^{(2)}) = 0, \tag{18}$$

$$\lambda = \frac{\sigma^2(Q_i^{(2)})}{\sigma^2(Q_i^{(1)}) + \sigma^2(Q_i^{(2)})}. \tag{19}$$

Optimal λ (Eq. 19) should be calculated for every alternative before applying WASPAS (Eq. 6). Optimal λ may vary depending on ratio of $\frac{\sigma^2(Q_i^{(1)})}{\sigma^2(Q_i^{(2)})}$ in every particular case.

The modelling of engineering problems is based on a different kind of logic taking into consideration the existence of multiple criteria, the conflicting aims of decision maker, the complex, subjective and different nature of the evaluation process, and the participation of several decision makers. MCDM contributes in engineering context through the identification of the best alternatives according to the problematic chosen, the satisfactory solution of the conflicts between the criteria, the determination of the relative importance of the criteria in the decision making process, and the revealing of the preferences and system of values.

Effectiveness of computer-aided multiple criteria decision support system as well as accuracy of decisions is based on an application of a proper MCDM method. It was observed that WSM and WPM methods can produce different ranking results. Accordingly, methodology for evaluation of accuracy of methods, based on initial criteria values, was developed. It was proposed to apply a joint method of the latters, i.e. WASPAS (Weighted Aggregates Sum Product Assessment), to increase the ranking accuracy. Accuracy of estimation applying WSM, WPM and WASPAS was evaluated. It was estimated that accuracy applying WASPAS increases up to 1.3 times as compared to WPM and up to 1.6 times as compared to WSM. Consequently, it was ascertained that the proposed joint method enables to increase the ranking accuracy.

It can be stated that new proposed method enables to reach the highest accuracy of estimation.

In conclusion, WASPAS method has a promising future in the construction engineering field, because offers a highly methodological basis for decision support.

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New scientific papers

Zolfani, Sarfaraz Hashemkhani; Rezaeiniya, Nahid; Aghdaie, Mohammad Hasan; Zavadskas, Edmundas Kazimieras. Quality control manager selection based on AHP- COPRAS-G methods: a case in Iran. Iš: *Ekonomška istraživanja = Economic research Pula : Juraj Dobrila University of Pula, 2012, Vol. 25, no. 1* p. 88-104. ISSN 1331-677X. [Data bases: Science Citation Index Expanded (Web of Science); CAB Abstracts; Elsevier]

Brauers, Willem Karel M.; Zavadskas, Edmundas Kazimieras. Robustness of MULTIMOORA: a method for multi-objective optimization. Iš: *Informatica. Vilnius : Matematikos ir informatikos institutas., Vol. 23, iss. 1 (2012)* p. 1-25. ISSN 0868-4952. [Duomenų bazės: Science Citation Index Expanded (Web of Science); INSPEC; Scopus]

Lashgari, Ali; Yazdani-Chamzini, Abdolreza; Fouladgar, Mohammad Majid; Zavadskas, Edmundas Kazimieras; Shafiee, Shahriar; Abbate, Nick. Equipment selection using fuzzy multi criteria decision making model: key study of Gole Gohar iron mine. Iš: *Inžinerinė ekonomika = Engineering economics. Kaunas : Technologija., 2012, Nr. 2 (23)* p. 125-136. ISSN 1392-2785. [Data bases: Science Citation Index Expanded (Web of Science); Business Source Complete; IBSS; VINITI; CEEOL; DOAJ]

Zavadskas, E.K.; Turskis, Z.; Antucheviciene, J.; Zakarevicius, A. Optimization of weighted aggregated sum product assessment. Iš: *Elektronics and electrical engineering = Elektronika ir elektrotechnika Kaunas : Technologija, 2012, No. 6 (122)* p. 3-6. ISSN 1392-1215. [Data bases: ISI Web of Science; CSA; EBSCO; INSPEC; VINITI]

Fouladgar, Mohammad Majid; Yazdani-Chamzini, Abdolreza; Lashgari, Ali; Zavadskas, Edmundas Kazimieras; Turskis, Zenonas. Maintenance strategy selection using AHP and COPRAS under fuzzy environment. Iš: *International journal of strategic property management Vilnius: Technika, Vol. 16, no. 1 (2012)* p. 85-104. ISSN 1648-715X. [Data bases: Thomson Reuters; Scopus; ICONDA; CSA; INSPEC]

Turskis, Zenonas; Lazauskas, Marius; Zavadskas, Edmundas Kazimieras. Fuzzy multiple criteria assessment of construction site alternatives for non-hazardous waste incineration plant in Vilnius city, applying ARAS-F and AHP methods. Iš: *Journal of environmental engineering and landscape management. Vilnius : Technika, Vol. 20, no. 2 (2012)* p. 110-120. ISSN 1648-6897. [Data bases: Science Citation Index Expanded (Web of Science); Scopus; ICONDA]

Kaklauskas, Artūras; Rutė, Jevgenija; Zavadskas, Edmundas Kazimieras; Daniūnas, Alfonsas; Pruskus, Valdas; Bivainis, Juozas; Gudauskas, Renaldas; Plakys, Vytautas. Passive house model for quantitative and qualitative analyses and its intelligent system. Iš: *Energy and buildings. Lausanne : Elsevier Science., 2012, Vol. 50* p. 7-18. ISSN 0378-7788. [Data bases: ISI Web of Science; Science Direct]

Brauers, Willem Karel M.; Yazdani-Chamzini, Abdolreza; Zavadskas, Edmundas Kazimieras. A multi-objective decision support system for project selection with an application for the Tunisian textile industry. Iš: *E & M: Economie a management Liberec : Technická Univerzita v Liberci, Vol. 15, no. 1 (2012)* p. 28-43. ISSN 1212-3609. [Data bases: Science Citation Index Expanded (Web of Science)]

Fouladgar, Mohammad Majid; Yazdani-Chamzini, Abdolreza; Zavadskas, Edmundas Kazimieras. Risk evaluation of tunneling projects. Iš: *Archives of civil and mechanical engineering Oxford : Elsevier Ltd, Vol. 12, no. 1 (2012)* p. 1-12. ISSN 1644-9665. [Data bases: Science Citation Index Expanded (Web of Science)]

Bitarafan, M.; Hashemkhani Zolfani, S.; Arefi, S. L.; Zavadskas, Edmundas Kazimieras. Evaluating the construction methods of cold-formed steel structures in reconstructing the areas damaged in natural crises, using the methods AHP and COPRAS-G. Iš: Archives of civil and mechanical engineering. Oxford : Elsevier Ltd, Vol. 12, iss.3 (2012) p. 360-367. ISSN 1644-9665. [Data bases: Science Citation Index Expanded (Web of Science)]

Antuchevičienė, Jurgita; Zavadskas, Edmundas Kazimieras; Zakarevičius, Algimantas. Ranking redevelopment decisions of derelict buildings and analysis of ranking results. Iš: Journal of Economic computation and economic cybernetics studies and research (ECECSR). Bucharest : Academy of Economic Studies, Vol. 46, no.2 (2012) p. 37-62. ISSN 0424-267X. [Data bases: Science Citation Index Expanded (Web of Science); Social Sciences Citation Index®; Social Scisearch®; Journal Citation Reports/Social Sciences Edition];

Zavadskas, Edmundas Kazimieras; Vainiūnas, Povilas; Turskis, Zenonas; Tamošaitienė, Jolanta. Multiple criteria decision support system for assessment of projects managers in construction. Iš: International journal of information technology & decision making Singapore : World Scientific Publishing Company, Vol. 11, no. 2 (2012) p. 501-502. ISSN 0219-6220. [Data bases: Science Citation Index Expanded (Web of Science); Academic Search Complete]

Turskis, Zenonas; Gajzler, Marcin; , Dziadosz. Reliability, risk management, and contingency of construction processes and projects. Iš: Journal of civil engineering and management. Vilnius : Technika, Vol. 18, no.2 (2012) p. 290-298. ISSN 1392-3730. [Data bases: Science Citation Index Expanded (Web of Science); Scopus; ICONDA]

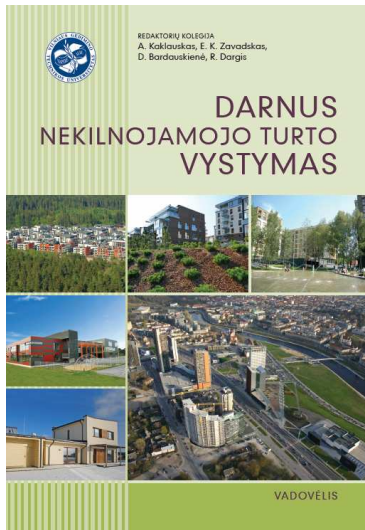
Simanavičienė, Rūta [Simanaviciene, R.]; Ustinovičius, Leonas. A New approach to assessing the biases of decisions based on multiple attribute decision making methods. Iš: Electronics and electrical engineering = Elektronika ir elektrotechnika. Kaunas : Technologija, 2012, No. 1(117) p. 29-32. ISSN 1392-1215. [Data bases: Science Citation Index Expanded (Web of Science); CSA; EBSCO; INSPEC; VINITI]

Simanavičienė, Rūta [Simanaviciene, Ruta]; Liaudanskienė, Rita [Liaudanskiene, Rita]; Ustinovičius, Leonas [Ustinovichius, Leonas]. A new synthesis method of structural, technological and safety decisions (SyMAD-3). Iš: Journal of civil engineering and management. Vilnius : Technika, Vol. 18, no. 2 (2012) p. 265-276. ISSN 1392-3730. [Data bases: Science Citation Index Expanded (Web of Science); Scopus; ICONDA; CSA; INSPEC]

Liaudanskienė, Rita; Simanavičienė, Rūta; Ustinovičius, Leonas. A model for solving structural, technological and safety problems. Iš: Journal of civil engineering and management. Vilnius : Technika, Vol. 18, no. 1 (2012) p. 30-42. ISSN 1392-3730. [Data bases: Science Citation Index Expanded (Web of Science); Scopus; ICONDA; CSA; INSPEC]

Staniūnas, Mindaugas [Staniunas, Mindaugas]; Burinskienė, Marija; Malienė, Vida [Maliene, Vida]. Ecology in urban planning: mitigating the environmental damage of municipal solid waste. Iš: Sustainability. Basel : MDPI AG, Vol. 4, iss.9 (2012) p. 1966-1983. ISSN 2071-1050. [Data bases: EBSCOhost; CABI; CSA; TOC Premier]

Burinskienė, Marija; Rudzkienė, Vitalija. Sustainable solutions in development countries - Lithuania case. Iš: Sustainable development - education, business and building construction-agriculture and food security Rijeka : InTech, 2012, p. 221-246. ISBN 9789535101161.

Books published in 2012

**Darnus nekilnojamojo turto vystymas
(Sustainable Real Estate Development)**
Study book

Authors: Artūras Kaklauskas, Edmundas Kazimieras Zavadskas, Dalia Bardauskienė, Dargis Robertas

Published: 2012

Publisher: VGTU publishing house „Technika“

Pages 880

ISBN: 9786094571978

URI: <http://dspace.vgtu.lt/handle/1/1365>

Textbook provides the overview of the theoretical and practical aspects of sustainable real estate development process, challenges, provides concrete examples. The book presents theoretical and practical studies. The publication contains the knowledge about the real estate development in terms of socio-cultural aspects of the generally recognized principles of sustainable development, urban development and aesthetic values, planning and public participation in heritage preservation. It is recognized that the economic crisis is inevitable, and present methods to reduce potential losses. The textbook provides links to the best global practices, the scientific literature sources. Textbook is useful for building economic and real estate development students (undergraduate and graduate). The book may be useful to other high schools in economics, management, and other areas of students, the real estate business practitioners.

Biometric and intelligent decision support
Monograph

Authors: A.Kaklauskas and E.K.Zavadskas

Published: 2012

Publisher: VGTU publishing house „Technika“

Pages 344

ISBN 978-609-457-073-5



The book introduces the relevant scientific research of intellectual support and biometric solutions. The biometric technology and support solutions have been analyzed. Book provides an introduction to the language of the body, biometric technology (systems of pattern recognition, voice analysis technology, eyes systems analysis, etc.), examples of application of intelligent systems in various areas of human activity.

Book describes several systems created by the authors: systems to identify students' knowledge based on the analysis of voice stress and iris, interactive intelligent biometric mouse to analyze the emotional state and performance.

Interactive decision support systems presented by authors: a decision support internet system in the field of exports, in management of buildings and structures, in ethical decision making; interactive decision support system in the property sector, the system of e-business in the construction , intellectual library, the system support decision analysis of competitiveness of construction. The book is intended for scientists of different fields, practitioners, doctoral students and undergraduates interested in the issues, theory and practice of biometrics and intelligent decision support.



Risk Management - Current Issues and Challenges

Book edited by Nerija Banaitiene

Published: 2012

Publisher: InTech

Pages 584

ISBN 978-953-51-0747-7

DOI: 10.5772/2568

Book available at:

<http://www.intechopen.com/books/risk-management-current-issues-and-challenges#book>



Miestotvarka (Urban Planning)

Authors: M. Burinskienė, K. Jakovlevas-Mateckis, V. Adomavičius, P. Juškevičius, A. Klibavičius, B. Narbutis, G. M. Paliulis, A. Rimkus, J. Šliogeris, Z. Paulauskienė, V. Kvedaras

Published: 2012

Publisher: VGTU publishing house „Technika“

Pages 474

ISBN 9786094570797

DOI 10.3846/1252-S

Textbook describes the principles of system planning of urban environment. Introducing the all urban complex engineering problems and their solution methods, evaluation of weather conditions, terrain, design methods, atmospheric, groundwater lowering systems, and other key urban management.



Paveldosaugos pastatų tvarkybos technologija (Rehabilitation technology for heritage buildings)

Author: V. Kutut

Published: 2012

Publisher: VGTU publishing house „Technika“

Pages 268

ISBN 9786094570117

DOI 10.3846/1243-S

Book examines the most important objectives for heritage works to preserve cultural values and their environment. Given heritage work technologies that help improve and enhance the physical condition of cultural values, highlighting the cultural heritage value of the object, creating conditions and opportunities for conservation and practical use of cultural property. Book analyses the reasonableness based on the necessary historical, archaeological, architectural and other objects investigations, through the processing and analysis of historical works and the latest technology.



Land Management: Potential, Problems and Stumbling Blocks

Authors: Hepperle, E., Dixon-Gough, R., Maliene, V., Mansberger, R., Paulsson, J. and Pödör A. (eds.)

Published: 2012

Publisher: vdf Hochschulverlag AG an der ETH Zurich

ISBN 978-3-7281-3479-0 (Print version)

ISBN 978-3-7281-3480-6 (Open access)

Download: www.vdf.ethz.ch

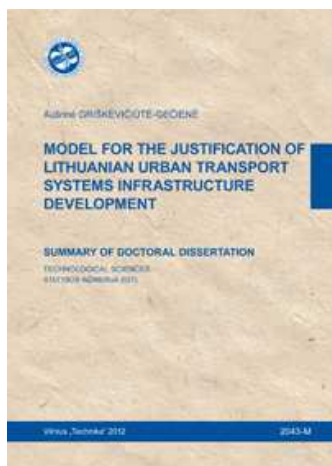
International projects in process

No.	Programme	Project	Short code	Date from - to	Responsible person (project manager)
1	Framework 7	Sustainable Zero Carbon ECO-Town Developments Improving Quality of Life across EU - ECO-Life http://www.ecolife-project.eu/	ECO-Life	2010-2015	Assoc Prof Dr Tatjana Vilitienė
2	Intelligent Energy Europe (IEE)	Initiative to boost continuing or further education and training of craftsmen and other on-site construction workers and systems installers in the building sector http://www.buildupskills.eu/	Build Up Skills - Lithuania	2012-2013	Assoc Prof Dr Tatjana Vilitienė
3	Non-state actors and local authorities programme for the Baltic sea region	Project on Introduction of Advanced European Practices on Energy Efficiency in Houses and Public Buildings in Baltic Sea Regions of the Russian Federation.	Project # 2011/263-5	2012-2014	Milena Medineckienė
4	2007 - 2013 Baltic Sea Region Theme: Environment and climate change	COOL Bricks - Climate Change, Cultural Heritage & Energy Efficient Monuments www.co2olbricks.eu	COOL Bricks	2010-2013	prof. dr. Marija Burinskienė
5	ESPO 2013 Programme	International ESPON training programme creation promoting the interest in ESPON 2013 knowledge http://www.espon.eu/	ESPO Train	2010-2013	prof. dr. Marija Burinskienė
6	Intelligent Energy Europe (IEE)	NorthPass - Promotion of the Very Low Energy House Concept to the North European Building Market http://northpass.ivl.se/	NorthPass	2009-2012	Prof. Artūras Kaklauskas
7	Erasmus Mundus	Linking European, African and Asian Academic Networks on Climate Change http://www.climatechangeedu.eu/leancc/	LEAN CC	2011-2013	Prof. Artūras Kaklauskas
8	Erasmus	Learning Augmented Reality Global Environment	LARGE	2011-2013	Prof. Artūras Kaklauskas

PhD Dissertations defended during 2012

Name of doctoral student	Title of dissertation	Year	Scientific supervisor
Aušrinė Griškevičiūtė-Gečienė	Model for the Justification of Lithuanian Urban Transport Systems Infrastructure Development	2012	Prof. Marija Burinskienė
Jurgita Alchimovienė	Assessing Sustainable Refurbishment of Apartment Buildings in Urban Neighbourhoods	2012	Prof. Saulius Raslanas
Rūta Simanavičienė	The sensitivity analysis of the quantitative multiple attribute decision making methods	2012	Prof. Leonas Ustinovičius
Rita Liaudanskienė	Development of a complex model of construction process safety decision making	2012	Prof. Leonas Ustinovičius
Jurgita Šakėnaitė	Combined Application of Multi-Attribute Selection and Risk Analysis to the Assessment of Building Fire Safety	2012	Prof. Egidijus Rytas Vaidogas
Andrej Vlasenko	Research of emotional state students during test using biometric technology Doctoral Dissertation	2012	Prof. Edmundas Kazimieras Zavadskas (2008-2011) Prof. Leonas Ustinovičius (2007-2008)

Short review of defended dissertations



Model for the Justification of Lithuanian Urban Transport Systems Infrastructure Development

Aušrinė Griškevičiūtė-Gečienė
2012

Scientific supervisor: Prof. Marija Burinskienė

Research object. The object of the Research is defined as a framework for justification and assessment of urban transport systems infrastructure development, including: establishment of justification principles and assessment system; analysis of preparation and adaptation of the theoretical justification methodology (following the example of Lithuanian cities). In Object of Research is detailed with these issues: identification of urban and rural transport systems infrastructure objects; analysis of urban transport infrastructure development project cycle; analysis of justification process of urban and rural transport systems infrastructure development by defining the assessment framework and operating principles.

Aim and Tasks of the Work. The main aim is to develop a theoretical model for the justification of urban transport systems infrastructure development by adapting the model for identification of priorities and practical execution of construction and reconstruction projects.

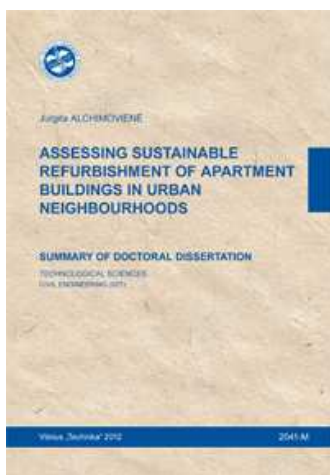
Research methodology. A theoretical model for justification of Lithuanian urban transport systems infrastructure development projects was prepared according to the analysis of the latest scientific literature from scientific databases. In this way analysis of justification principles of the

development projects and the assessment methodologies applied was carried out. Proposed justification model was developed applying the method of the expert assessment, statistical data processing/analysis and the method of multi-criteria analysis.

Defended Statements. Three defended statements were developed by the author: 1. Methodology comprising traffic safety, economic, social, strategic, technical, environmental and land use aspects is created, referring to which urban transport systems infrastructure development is justified and assessed. 2. Due to differences in technical infrastructure the justification of transport systems infrastructure development of urbanised territories has to be separated from assessment methods of development projects of non-urbanised territories. 3. Implementation of multi-criteria analysis methods enables to develop a theoretical model of the justification of urban transport systems infrastructure development which allows performing appropriate selection of alternative projects.

The scope of the scientific work. The Research consists of the general characteristics of the dissertation, 4 chapters, conclusions, references, the list of the publications and the addenda. The total scope of the dissertation is 154 pages, including 21 figures, 34 tables and 6 appendixes.

Approval of the thesis. 3 articles in reviewed scientific periodical publications. 12 in other editions



Assessing Sustainable Refurbishment of Apartment Buildings in Urban Neighbourhoods

Jurgita Alchimoviene
2012

Scientific supervisor: Prof. Saulius Raslanas

Research object. The Research Object is a large-panel apartment building in an urban neighbourhood, its condition and environment as well as the refurbishment means, strategies, scenarios and the assessment of the effectiveness of its refurbishment.

The Aim of the Thesis is to offer a method for rating the sustainable refurbishment of apartment buildings in urban neighbourhoods of Lithuania, aimed at increasing the effectiveness of modernizing residential apartment buildings.

Research methodology.

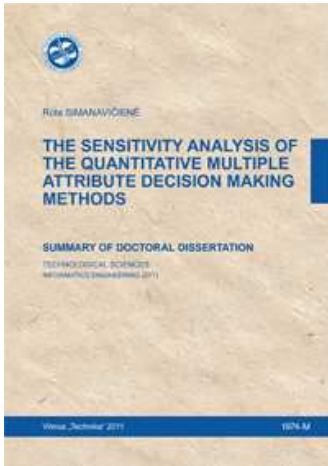
Methodology is based on the scientific and other publications of Lithuanian and foreign authors, the experience of EU states in performing the refurbishment projects, statistical data on the Internet, encyclopaedic knowledge and other scientific and informational publications of Lithuanian and foreign institutions. The method offered for the sustainable refurbishment of apartment buildings in Lithuania is the result of the analysis of sustainable building rating systems and methods, with its basis being the BREEAM method. Moreover, the method offered for refurbishing apartment buildings in urban neighbourhoods is based on the criteria, adapted to and characteristic of Lithuania.

Defended Statements. 1. It is necessary to improve Lithuanian legislation, related to urban territory planning, to create a sustainable refurbishment system for urban neighbourhoods. 2. The strategies and the scenarios based on them have been offered for refurbishing the apartment buildings in urban neighbourhoods of Lithuania. These strategies and scenarios must be employed to achieve effective comprehensive refurbishment of apartment buildings and their environment. 3. A method for rating the sustainability of refurbishing buildings in urban neighbourhoods has been adapted to Lithuania. A decision support system (DNDAVSPS) for assessing the sustainable refurbishment of apartment buildings has been created using the proposed method. The system allows to determine the effectiveness of refurbishing apartment buildings from the perspective of sustainability. 4. Using the decision support system for assessing the sustainable refurbishment of apartment buildings

(DNDAVSPS), the sustainability of refurbishing an apartment building can be assessed. Based on the results, a sustainability standard can be determined and awarded.

The scope of the scientific work. The dissertation consists of the Introduction, four main chapters, the Conclusion, References and a list of the relevant works by the author, as well as 6 appendices. The length of the dissertation is 160 pages (without appendices). There are 14 numbered formulas, 14 figures and 38 tables. The number of referents used is 168.

Approval of the thesis. 7 scientific papers, 6 of them in reviewed scientific journals



The sensitivity analysis of the quantitative multiple attribute decision making methods

Rūta Simanavičienė
2012

Scientific supervisor: Prof. Leonas Ustinovičius

The work is aimed at extending the possibilities of multiple attribute decision-making methods by developing the techniques that allow to evaluate the stochastic nature of these methods.

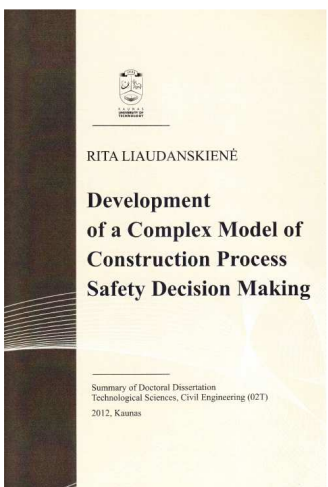
Research object. The research object is the sensitivity of the quantitative multiple attribute decision-making methods to the initial data biases.

Research methodology. Statistical modeling and data analysis are used for determining sensitivity of the considered methods and reliability of the solution obtained by using them. To realize the methods suggested in the dissertation, the methods of experimental analysis are used.

Defended propositions 1. A new method of sensitivity analysis is developed, which may be used for determining sensitivity of multiple attribute decision-making methods based on quantitative measurements. 2. A new method for evaluating decision reliability is developed which may be used for evaluating the reliability of decisions made with the help of multiple attribute

The scope of the scientific work. The scientific work consists of the general characteristic of the dissertation, four chapters, conclusions, the list of literature (114 items), the list of publications and the addenda. The total scope of the dissertation – 122 pages, 34 pictures, 33 tables and 3 addenda.

Approval of the thesis. 12 scientific papers. 5 in reviewed scientific journals, 6 in conference proceedings.



Development of a complex model of construction process safety decision making

Rita Liaudanskienė
2012

Scientific supervisor: Prof. Leonas Ustinovičius

The thesis has the aim to discuss the research made in the construction sector employee health and safety area and propose ways to solve the problem of safety solution development in construction.

Research object. Correlations among the constructional, technological and safety solutions in the

construction process and effective multi-level, multi-purpose safety decision making.

Purpose of the research. To develop a new complex constructional, technological and safety decision making system for the selection of an effective construction process safety solution.

Research methodology. OHS problems, causes and factors of accidents at work have been identified through researching papers published and statistical methods described by Lithuanian and foreign scientists. Constructional, technological and safety solution correlations have been analysed by means of the decision tree method. The method of constructional, technological and safety complex decision making has been developed by integrating the available multi-purpose decision making methods.

Statements defended. 1. Effective construction process safety decisions are made based on the results of the complex building analysis of constructional, technological and safety variations. 2. The reliability of a complex solution to construction process safety is enhanced when several multi-criteria decision making methods based on different assumptions are incorporated to make a decision. 3. The SyMAD-3 method is intended to generate various alternative solutions and assess the constructional, technological and work safety solutions as a whole as well as justify and make effective decisions.

The scope of the scientific work. The thesis consists of an introduction, five parts, conclusions, list of references and publications, and appendixes. The thesis is 149 pages long, 60 numbered formulas, 41 figures and 21 tables have been used. 332 references have been used while writing the thesis.

Approval of the thesis. Ten articles have been published on the topic of this thesis: four articles in the ISI main publication and the rest have appeared in other reviewed publications and conferences in Lithuania and abroad.



Combined Application of Multi-Attribute Selection and Risk Analysis to the Assessment of Building Fire Safety Doctoral Dissertation

Jurgita Šakėnaite
2012

Scientific supervisor: prof. Egidijus Rytas Vaidogas

Research object. The object of research is fire safety of buildings considered from the standpoint of fire risk management. In mathematical terms, the research object is an integration of risk assessment models and mathematical models used for multi-attribute selection.

The combination of fire safety assessment and MCDM by supplementing the decision matrix of MCDM with attributes expressing the level of fire safety and fire risk.

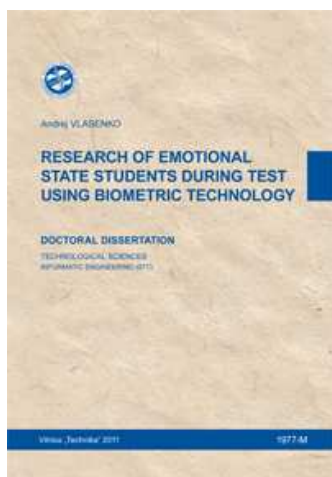
Research methodology. The methodology of research was an analysis of presently available methods used in the fields of fire safety, QRA and MCDM. The methodological core of research was analysis of the aforementioned methods with an aim to combine them in one decision making model. Stochastic simulation was applied to a solution of MCDM problems with random decision matrices. A computeraided fire simulation model, known as the two-zone model was applied for specifying attribute values of a building-related MCDM problem.

Statements defended. Fire safety of existing and future buildings must be taken into account in building-related MCDM. This requires expressing fire safety quantitatively. 2. Methods of MCDM can be combined with the assessment of fire safety, because fire safety can be expressed by numerical measures and these can be applied as attributes in MCDM problems. 3. Results of fire safety assessment can be expressed either by fixed (deterministic) indices or by components of risk profile which are uncertain in the epistemic sense and are computed by means of QRA. Indices can be included MCDM problems solved by means of conventional MCDM methods. An inclusion of uncertain

components of the fire risk profile will yield a random decision making matrix. A special MCDM method must be developed to solve an MCDM problem expressed by such a matrix. 4. An MCDM problem with a random decision making matrix can be solved by applying a simulation-based uncertainty propagation. For this purpose, algorithm of a conventional (deterministic) MCDM method must be integrated into a Monte Carlo loop and the problem of MCDM solved repeatedly in the simulation run, each time for a different decision making matrix generated by means of simulation. The MCDM alternative with the highest frequency of selection as the best one can be chosen as a final result of MCDM.

The scope of the scientific work. The dissertation consists of an introduction, three numbered chapters, conclusions, list of references and author's publications and eight annexes. The volume of the dissertation is 136 pages, excluding annexes. The dissertation includes 46 numbered formulas, 39 pictures and 32 tables. The list of referentes consists of 171 items.

Approval of the thesis. The main statements of the dissertation were published in six scientific articles: three articles – in the Thomson ISI Web of Science register (Vaidotas and Šakėnaitė 2010b; Vaidogas and Šakėnaitė 2011a, 2011b), three – in other editions (Šakėnaitė 2009, 2010; Šakėnaitė and Vaidogas 2010a).



Research of emotional state students during test using biometric technology
Doctoral Dissertation

Andrej Vlasenko
2012

Scientific supervisors: Prof. Edmundas Kazimieras Zavadskas (2008-2011)
Prof. Leonas Ustinovičius (2007-2008)

Research object. The object of the Research – computer systems, enabling the determination of psychoemotional human state, based on the analysis of such biometric and physiological parameters as speech and diameter of an eye pupil, and formation of the result-oriented respondent's reaction. The main purpose of this dissertation is employing suitable methodologies and algorithms to automatically process and analyse human voice parameters and analysis of dynamics of eye pupil size change. Created algorithms can be used in Stress Management System software.

Research methodology. We used the following algorithms and methods: K-mean clustering, Perceptron, Gaussian Mixture Models, The Method of Intonational Dependency (MID), hidden Markov model (HMM), fast Fourier transform (FFT), Digital Phase Demodulation.

Statements defended. 1. Founded interdependencies between speech parameters, eye pupil diameter and psychoemotional state of students during testing has provided us with the possibility to create algorithms for psychoemotional state estimation realized on the basis of evaluation of such biometrical and physical parameters as speech and eye pupil diameter. 2. Provided algorithms can form the stress management system, which can determine stress state and give particular recommendations, in order to minimize stress level.

The scope of the scientific work. The dissertation consists of four parts including Introduction, 4 chapters, Conclusions and References. The introduction reveals the investigated problem, importance of the thesis and the object of research and describes the purpose and tasks of the paper, research methodology, scientific novelty, the practical significance of results examined in the paper and defended statements. The introduction ends in presenting the author's publications on the subject of the defended dissertation, offering the material of made presentations in conferences and defining the structure of the dissertation. Chapter 1- the Recommended Biometric Stress Management System founded on the speech analysis. The System can assist in determining the level of negative stress and resolve the problem for lessening it and can help to manage current stressful situation and to minimize future stress by making the level of future need satisfaction more rational. Chapter 2

investigates the possibilities of detecting trends of microtremor frequency (Pitch phase modulation). Suggested methodology and the algorithm microtremor detect and show that when a person experiences stress, the value microtremor can reach 12 Hz. Besides suggested methodology and the algorithm determine the preparation grade students for the examination and evaluation of knowledge based on his speech analysis. Chapter 3 investigates the possibilities of detecting trends of voice signal parameters. Suggested methodology and the algorithm voice signal parameters detect and show, that when a person is in anger state Pitch in-creases by 30-50 percent compared to a neutral state. Chapter 4 investigates the possibilities of detecting trends of pupil size change depending on person's psychoemotional state. Suggested methodology and the algorithm detecting psychoemotional state based on measurements pupil size change. Presented hardware system to measure the pupil size change. Shows relationship between pupil size and person's emotional state.

Approval of the thesis. On the dissertation topic 11 scientific articles have been already published: 4 with Science Citation Index Expanded (accessed via Web of Science) (Kazlauskas et al 2007a, 2010, 2011; Vlasenko et al 2011); 4- was published in the conference proceedings, indexed by Thomson ISI Proceedings (Kaklauskas et al 2008, 2009; Zavadskas et al 2007, 2008); 3 in other reviewable international publications (Kaklauskas et al 2007b, 2007c, 2008).

Editor's comments

Dear EWG-ORSDCE members, dear fiends,

This issue includes a section entitled "New Optimization Methods" with a presentation of the new developed multiple criteria decision making method WASPAS. We are thankful to assoc. prof. Jurgita Antuchevičienė who has kindly provided us with the information. For the next issues, other proposals with descriptions of new optimization methods are welcome.

Next year all members of EWG-ORSDCE are invited to participate in next meeting of EWG-ORSDCE (colloquium), which will held on May 15, 2013 in Vilnius, Lithuania, as well as in 11th International Conference "Modern Building Materials, Structures and Techniques", which will held next two days on May 16-17, 2013 in Vilnius, Lithuania and also in 26th European Conference on Operational Research "All roads lead to OR", which will held on July 1-4, 2013 in Rome, Italy.

On behalf of the Editorial Board of EWG-ORSDCE Newsletter
Tatjana Vilitienė

EWG-ORSDCE Newsletter
Editorial Board: Tatjana Vilitienė, Edmundas Kazimieras Zavadskas