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ADVANCED EXPERT PANEL

on

‘Future Trends in Knowledge Management and Decision Making in Autonomous Systems’

Supported by the foresight project ‘Scenarios and Development Trends of the Selected Information Society Technologies until 2025’ co-financed by the ERDF within the Innovative Economy Operational Programme (POIG), Action 1.1.1



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**Held at the 11th International Conference on Artificial
Intelligence and Soft Computing (ICAISC) in Zakopane,
Poland**



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PANELISTS:

Prof. Włodzisław Duch, Copernicus University, Toruń

Prof. Janusz Kacprzyk, Systems Research Institute, PAS,
Warsaw

Prof. Ignacy Kaliszewski, Systems Research Institute, PAS,
Warsaw

Mr. Tomasz Kopacz, Microsoft Polska Ltd., Warsaw

Prof. Antoni Ligeża, AGH University of Science and
Technology, Kraków

Prof. Kaisa Miettinen, University of Jyväskylä, Finland

Dr. Rafał Scherer, Czestochowa Technical University

Prof. Andrzej M. Skulimowski (moderator), ICDSF & AGH
University of Science and Technology, Kraków



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Highlights:

- The discussion will be preceded by a short presentation of the foresight project methodology and its results achieved so far (5-10 minutes)
- About ten hot topics from within the AI areas covered by the Panel will be discussed by the panelists, with contributions from the audience (5-8 minutes each)
- The discussion of specific topics will be followed by a short general discussion (10-15 minutes) on the future of AI
- All participants are invited to an expert Delphi related to the Panel topics



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1. Decision Support Prospects until 2025

- Progress in structuring human decisions until 2025:
 - new kinds of theoretical models?
 - better understanding of neural decision mechanisms (mirror neurons and...?)
 - non-stationarity of human preferences
 - coping with inconsistency and irrationality
- Cognitive MCDM?
- DSS in the cloud, mobile DSS, recommenders
 - Electronic Personal Preference Record (EPR)?
 - Privacy protection issues
 - Fusion of all one's preference information gathered by different web agents
- MCDM-based intelligent recommenders
- New DSS architectures?



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Panelist: Professor Kaisa Miettinen, V-ce Rector of the University of Jyväskylä, Finland; President of the International Society on MCDM



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2. Future Applications of Direct Brain Interfaces (D-BCI) in Decision Support Systems (DSS)

- D-BCI and ‘the Internet of Brains’
- The role of enhanced reality in decision making
- Virtual realities created with D-BCI and a simulation of consequences of decisions made
- What kind of decisions may be supported using BCI?
 - a) D-BCI for operational decisions (eg. control of complex industrial and transportation systems)
 - b) Military DSS with D-BCI
 - c) Supporting everyday decision making (with direct brain interfaces?)
- Time perspective: 2020?, 2025?, 2030?



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**Panelists: Professor Włodzisław Duch, V-ce Rector of the
Copernicus University of Toruń,
Professor Ignacy Kaliszewski, Member of the IPBF Council**



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3. Application Prospects of External (no implants) BCI and Physiological Human Computer Interfaces (PHCI)

- Applications of BCI in man-machine communication
- Applications of BCI in virtual reality and games (trends? market estimations?)
- Thought recognition by external BCI (technological trends?, privacy challenges?, other threats?)
- Reading, recording, and recognition of short-term human memory – applications in elderly amnesia treatment
- Reading, recording, and recognition of long-term human memory – applications in therapy of post traumatic stress disorder symptoms, such as amnesia
- Novel PHCI technologies and mechanisms (recognition of mimics, eye and eyelid movements, skin thermal potentials etc.)
- Applications in mobile DSS



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4. Common Application of Autonomous Mobile Robots (AMR)

- Main functionalities of autonomous mobile robots
- Research robots (all environments except space)
- Personal robotic companions vs. intelligent buildings
- Industrial applications of autonomous mobile robots
- Main technical problems
(hardware and lower-level software such as hardware drivers and communication software)
- Main issues related to intelligent decision software development
- Cellular mobile robots (standard simple robots capable of creating ad hoc specialized complex organisms)



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5. Autonomous Flying Robots (UAV)

- UAV prospects until 2025:
 - no more manned combat aircraft?
 - first unmanned passenger aircraft
- Space robots and planetary flying robots
- UAV propulsion and energy supply
- Airships, quadcopters, artificial insects, and ... ?
- UAV swarms
- Progress in robot vision and other sensory perception mechanisms for UAV (cognitive radar etc.)
- Technology transfer from the military sector
- Autonomous flying robots, but to what extent?



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6. Worldwide Monitoring Systems

- Automatic recognition of dangerous situations
- A new direction of development: Citizen monitoring? (decentralized monitoring systems serving the community that also manages them)
- Global CBIR (from the web, from different ground- and air-based monitoring systems etc.)
- Global satellite-based monitoring systems
- Integration of monitoring systems
- Building Very Large Audiovisual Data Archives (VLADA)
- Privacy issues



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7. Merging Knowledge Acquisition, Vision and Rule Based Systems

- Trends in rule-based image understanding
- The emergence of tailored knowledge bases to facilitate image analysis and understanding
- Automatic medical image understanding systems (CT, USG, NMR, PET etc.)
- Remote patient monitoring and multidimensional data fusion
- Merging all kinds of medical information: data management and privacy protection issues
- New developments in uncertainty management
- Trends in rule-based diagnostic systems: technologies, tera-rule databases, applications
- Heterogenous information processing in neural networks



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Panelists: Professor Antoni Ligęza, Member of the IPBF Council, Professor Andrzej M.J. Skulimowski, President of the IPBF



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8. Hot Topics in Machine Intelligence and Neurocognitive Systems

- Towards Artificial Autonomous Decision-Making Systems (AADS)
- Machine consciousness and machine anticipatory capabilities
- How to manage decision freedom in autonomous systems?
- Machine creativity and imagination
- Preference transfer problem (how to transfer and update one's preferences to an AADS efficiently and reliably?)
- Hierarchy of goals and conflicts of interests between AADS. How to solve them?
- Robotic societies and co-evolution



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9. Towards a Human- or a Machine-Intelligence-Centered Civilization?

- HCT (= human centered technologies) development prospects
- How humans will be changed by technology - confluence of humans, sensors, and computers (in a broader sense than BCI)
- Will virtual realities evolve into a Matrix scenario – will the computer addicts facilitate this process?
- Will there be a revolt against robots and the web?
- Or shall we expect a revolt of robots or a web rebellion?
- Or will mankind just surrender to the emergence of a higher intelligence?



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10. Disruptive Technologies, Wild Cards, Uncertainties

- Examples of unexpected technological trend changes from the past
- Low-probability high-impact scientific discoveries relevant to the ICT trends and scenarios (easy-to-build quantum computer, ESP confirmed and made available to everyone,.....)
- Low- to medium-probability biological, economic and social phenomena (emergence of a new common philosophy or belief that refuses the use of ICT, long-term exposition to weak electromagnetic fields can cause mental disorders,....)
- Medium- to high-probability disruptive political and natural events (military conflicts, natural and anthropogenic disasters,....)



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Thank you for your participation!

Everybody is invited

- To participate in the Delphi research on the panel topics.
Questionnaires and more info can be found at:
<http://www.ict.foresight.pl/user/index.php?module=delphi>
- To participate in the SCETIST Final Conference
(no registration fee, the Delphi participants will be registered first)
to be held in Kraków on March 14, 2013,
Registration forms will be available soon at:
<http://www.ict.foresight.pl/user/index.php?module=conference>
- To participate in the 8th International Conference on Knowledge, Information,
and Creativity Support Systems, Kraków, November 7-9, 2013,
www.kicss2013.ipbf.eu