

**Special session**  
**"Ubiquitous Complex Event Processing in Exocortex Applications"**

International Conference on Brain Inspired Cognitive Systems (<http://sentic.net/bics>)  
Beijing (Peking China), June 9-11, 2013

**Organizers:**

Rainer von Ammon (CITT Regensburg)  
Atta Badii (University of Reading)  
Andrea Kübler (University of Würzburg)

**Abstract**

The aim of this special session is to bring together experts from academia and industry as well as potential adopters in order to investigate an exocortex based on Ubiquitous Complex Event Processing as an Artificial Cognitive System. The transdisciplinary workshop will discuss the state of the art and future research to investigate how to enhance human cognitive abilities, manage assistive robots, and their cooperation with humans via an exocortex system. Adopters will participate as proof-of-concept in the domain of emergency management of smart spaces like an arena as location for mass events.

Specific contributions are addressed: (i) A smart space monitor based on the prediction of upcoming critical situations by processing basic events to meaningful complex event patterns. Pre-modeled processes induce appropriate reactions and non-deterministic suspicious event patterns are identified by artificial intelligent algorithms. (ii) A reference model and architecture to connect humans and robots to the knowledge from a global event cloud by means of an exocortex as a preprocessor for relevant or subscribed complex event patterns. (iii) A procedure to notify a human and to transform event patterns into understandable and processable signals via smart fashion (belt-technology) which introduces additional senses and enhanced sensitivity ranges. (iv) Analysis of evoked brain patterns with EEG and imaging technology resulting in defined reaction patterns that can be recognized by brain-neural computer interfaces (BNCI) and transferred into action either of humans or robot companions. (v) Realizing hypercommunication via non-verbal communication between exocortices of humans and those of robots. Depending on a detected brain pattern the specific exocortex of a person as a bidirectional BNCI fires an event pattern back into the cloud which can be received by another human or a robot. It triggers an event-driven process of the robot according to its world knowledge or "matrix". Likewise the robot companions build their own matrix autonomously which becomes increasingly complex and allows for rapid and adapted reaction. The aim of this special session is to discuss with a group of transdisciplinary experts whether this approach is principally possible.

The special session could be organized similar to what we have done for ServiceWave conference series since 2008 <http://www.citt-online.com/CfP-edBPM-UCEP-2011.htm> (co-located conference with EC's Future Internet Week)

## List of papers:

The special session announcement will include "position papers", which may not present concrete results but ideas and concepts, precise enough as a basis for a fruitful discussion.

- 1) Reference Model and Reference Architecture for U-CEP based Exocortex Applications  
Rainer von Ammon (CITT Regensburg), Albert Fleischmann (Metasonic AG Pfaffenhofen), Artur Krukowski (Intracom Telecom Athens)
- 2) Analysis and Modelling of Complex Event Patterns, Cognitive Processes and Process Management in Exocortex Scenarios  
Rainer von Ammon (CITT Regensburg), Dimitris Iakovidis (TEILAM Lamia), Gernot Müller-Putz (TU Graz), Andrea Kübler (U Würzburg), Javier Minguez (Bit&Brain Zaragoza), Peter König (U Osnabrück)
- 3) Mathematical Modelling of Complex Multi-Scale Systems based on U-CEP  
Andree Ehresmann (U Picardie), Egon Börger (U Pisa), Albert Fleischmann (Metasonic AG Pfaffenhofen)
- 4) Low Level and High Level Cognitive Processing Methods in U-CEP based Exocortex Applications  
Elpiniki I. Papageorgiou (TEILAM Lamia), Atta Badii (U Reading), Reinhold Scherer (TU Graz)
- 5) Aspects and Experiences of the Development of Generic Components and System Integration for U-CEP based Exocortex Applications  
Muhammad Shafique (KIT Karlsruhe), Nikolaos Ioannidis (Intracom Telekom Athens), A.A. Khan (U Reading), Javier Minguez (Bit&Brain Zaragoza)
- 6) The Next Generation of Brain Machine Interfaces as a hyper-communication based on Ubiquitous Complex Event Processing  
Tobias Kaufmann (U Würzburg), Selina Wriessnegger (TU Graz), Kai Kaspar (U Osnabrück)
- 7) Emergency Management and System Surveillance based on Smart Space Monitors as an U-CEP based Exocortex Application  
Manfred Bogen, Stefan Rilling (Fraunhofer IAIS Bonn), Steffen Guder (ProTec Hannover)

## CVs of the organizers

**Rainer von Ammon** is founder and managing director of the SME CITT <http://www.citt-online.com/> as gateway between U-CEP related research and industry since 2005 and is now associated with the University of Würzburg. As founding member of Event Processing-Technical Society (EP-TS), he has coined "Ubiquitous Complex Event Processing" together with Prof. em. David Luckham of Stanford University. Rainer v. Ammon is evangelizing this U-CEP concept as a member of EUCogIII and NESSI where he has organized four workshops at the ServiceWave conference series as well as CEP symposia and CEP Dagstuhl seminars with the CEP and BPM key players from industry, research and with adopters. Until October 2005 he was professor for Software Engineering, Distributed Systems and Internet Infrastructures at the Upper Austria University of Applied Sciences. He was also professor at HTW Dresden and adjunct professor in Regensburg since 1990. Today he is a leading expert for Complex Event Processing and has a strong industrial experience as manager of the field

Basic Systems at Mummert&Partner consultancy or as principal consultant and R&D manager at BEA Systems in the CEE region. He organized three “Hochschul-Industrie-Kooperationskonferenzen” since 2000. In the last years he has led many projects in the field of Event-Driven Business Process Management, e.g. at Dresdner Bank, FMSBank, CACEIS, Norisbank, Teambank, Hamburger Sparkasse, TietoEnator business development, Audi, Deutsche Telekom. In the last years he started the international initiative to combine U-CEP, process management, BNCI, belt-technology and other Human Enhancement Technologies for Exocortex applications.

**Atta Badii**, Founding Director of ISR, is assisted by a number of senior research scientists, RTD and project managers. He holds the Chair of Secure Pervasive Technologies and has a multi-disciplinary academic and industrial research experience in the fields of Distributed Intelligent and Multi-modal Interactive Systems, Pattern Recognition, Security & Trust Architectures, Semantic Workflow and Knowledge Integration. He has contributed to 25 collaborative projects to-date and has served as the Scientific and Technical Leader of several projects at both national and international level; has successfully coordinated several UK/EU-funded projects (e.g. FastMatch, CompanionAble, Dream, MOSAIC, VideoSense); is the pioneer of several paradigms in user-centred assistive-ambient technologies and in research steering boards as coordinator/technical leader/invited expert e.g. as the Chair of the Security Architectures and Virtualisation Taskforce of the European RoadMap Project SECURIST and as Chair of the VideoSense: European Video-Analytics Network of Excellence. Atta Badii has made fundamental contributions to pushing forward the frontiers of research in Security Context Representation (e.g. as in Hydra LinkSmart Technology) and Mitigation (e.g. FastMatch Next Generation IDS-IPS Architectures), Access Security and Privacy Enhancing Technologies (e.g. Mobi-PETS-GRID, Hydra), Ontology-based Semantic Integration, User-centred Co-design and Integrated Requirements Prioritisation and Usability Evaluation (e.g. UI-REF), Human-Computer-Robot Interaction (e.g. CompanionAble, CORBYS), Multi-modal Communications Control (MOveOn, C3PAL), Advanced Affective-Interactive Interfaces (CALLAS), Dynamic Media Adaptation (Axmedis, MoveOn), Semantic Workflow Integration (Axmedis, 2020-3D Media), Advanced Multi-modal Media Indexing and Retrieval (DREAM, Content Safari), Automated Affective Music Composition (CALLAS), Semantic Music Representation & Search (I-Maestro, CC-MOLE, SoundScape), and framework architecture for Man-in-the-Loop Assistive-Interactive Systems (CORBYS).

**Andrea Kübler** is a biologist and psychologist and holds the professorship of Intervention Psychology at University of Würzburg. Her Department holds outstanding experience in BNCI research and specifically in applying BNCI technology to users in the field, healthy and patients alike. The department has fully equipped psychophysiology laboratories with EEG, fNIRS and peripheral measures. Since 2010 the University holds an Institute for Humans-Computers-Systems ([http://www.mcm.uni-wuerzburg.de/no\\_cache/startseite/](http://www.mcm.uni-wuerzburg.de/no_cache/startseite/)) and the Department of human-computer interaction develops task oriented interactive systems. The Computer Science department VII – robotics and telematics (<http://www7.informatik.uni-wuerzburg.de/>) has also strong expertise in telematics-integrating telecommunications, computer science and control and also in engineering Robotics and Mechatronics - integrating electronics, mechanics, sensors, control engineering, information processing and a collaboration is established. She published extensively on the use of BCI in severely impaired patients. Andrea has been working with BCI since the beginning of her PhD in 1996 and has a huge experience with BCI based neurofeedback training and EEG recording including the development of experimental designs to test attention and executive function. Andrea Kübler is part of EU funded projects TOBI (IP) and BACKHOME and coordinates DECODER and CONTRAST.