SOCIONICAL

NEWSLETTER

September Edition 2011

Recent news about contingencies in Europe and around the world

Winner of prestigious award!

VENI GRANT FOR SOCIONICAL PARTNER
Dr. Alexei Sharpanskykh
from Vrije Universiteit, Amsterdam, Netherlands

FEW-researcher Dr. Alexei Sharpanskykh received a Veni grant for his project:

Safety First: Managing Emergencies in Safety-Critical Organisations

In this project Alexei will develop novel mathematical and computational techniques for safety analysis of modern organisations such as power plants, air traffic organisations, incident management organisations, etc. He will investigate how incidents and safety hazards emerge from local behaviour and interaction of a large number of variables, representing people and technical systems in the organisational context. We wish him well in this important work.

Civil Protection Department - Malta

This year's Notte Bianca in Malta will see some SOCIONICAL activity. People with iPhones will be invited to download the SOCIONICAL iPhone app.

Notte Bianca is an annual event which takes place in Malta's lovely capital city Valletta and attracts thousands of visitors both local and foreign. During Notte Bianca, Valletta's museums, historical buildings, private and public art galleries, and other cultural institutions are open free of charge and the capital is transformed into a city-wide festive gathering, including music, dance, film and theatre performances. Space is also provided for both local and international artists to be appreciated by the general public throughout the night. From a majestic Caravaggio to exhibitions by young aspiring artists, from the romantic tunes of Chopin to the potent riffs of heavy metal Maltese bands, from an engaging folk dance to magnificent contemporary jazz, Notte Bianca offers a diversity that makes it a truly unique experience.

The SOCIONICAL iPhone app is designed to enhance the experience for those who choose to download it, as it offers them information about sites in relation to the geographical location of the iPhone.

Although still in beta, with some of the proposed functionalities still to be tested, the application will not only be useful to the users, it will also provide important information for emergency first responders and the event organisers.

This mass event calls for proper emergency response planning and coordination by the Civil Protection Department and other emergency response providers to ensure that the safety of the public is maintained at all times.

For this purpose, the Civil Protection Department sets up a forward command cell close to where the main activities take place and acts as a common point of reference for all stakeholders taking part in the safety operations.

The role of the Civil Protection Department is to act as a liaison between the Notte Bianca organisers, the council of the city of Valletta and, on this occasion, also with the app development team in Passau.

The Civil Protection Department has also funded the travels of a graduate student from the Faculty of ICT, University of Malta, for a two-month internship at the University of Passau, working jointly with the rest of the SOCIONICAL app development team.

The data collected in Malta will be used primarily for research and development purposes. It will enhance the test bed for further major research and development studies at subsequent events in London and Munich.

The City of London Lord Mayor's Show -Three miles of splendid pageantry

Where does SOCIONICAL fit in?

The modern procession is over three miles long – almost twice as long as the route it follows. It travels from Mansion House to the Royal Courts of Justice, where the Lord Mayor takes an oath of allegiance to the sovereign before the Lord Chief Justice and the judges of the Queen's Bench Division. The procession

then returns on a different route to Mansion House. The day finishes with one of London's grandest firework displays at 5 o'clock from a barge moored in the river Thames. Large numbers of the public attend.

It's a full day out for the family, with lots to do and see. On the Show website there are useful maps and timetables, tips on how to get here and where to stand, details of the procession and lots of information about the history of the Show.

This year for the first time there will be a new app for the Lord Mayors Show. The Pageant Master is working closely with partners from the EU project, SOCIONICAL, and including staff from the London School of Economics and the University of Passau, Germany

SOCIONICAL is a European project looking at evacuation dynamics after a major emergency. As the research team cannot set up an emergency, it is testing an app during crowded events, such as the Lord Mayor's Show (and Notte Bianca in Malta, as reported above). The researchers have developed an app for the iPhone that will provide information about the show, useful local facilities, transport details, etc., The researchers will collect data on the density of a crowd and its movement. In the case of an incident, advice will be sent via the app to users on appropriate courses of action. If these experiments are successful, the app should be further developed and used in future to help save lives.

Potential contribution of traffic micro-simulation experiments to real traffic management

C. Beltrán Ruiz, J.J. Mínguez Rubio

SICE, in its zeal of constant enhancement of the services offered to the transport sector, is nowadays carrying out functional improvements in its ITS systems leading to offer advanced services for traffic monitoring and control.

Under the umbrella of the European funded project SOCIONICAL, and with the aim to improve the management of traffic in urban highways, SICE is working on adding new technological and functional value to it's ITS systems for traffic control through the integration of an advanced and complete traffic micro-simulation tool.

This tool will allow motorway operators to have a more graphical and in depth vision of traffic conditions improving the capabilities offered by conventional ITS systems. This simulation will run in an automated and synchronized fashion with the real time traffic information gathered by the ITS system from the road-side data collection Units. As a result, the improved simulation model will show the updated –minute by minute refreshed- traffic network situation picture.

In addition, SICE is developing a traffic prognoses algorithm aimed at performing near-future-minute-estimations of traffic evolution in a dynamic approach. Such estimations will be based on the information –output- provided by the micro-simulation experiments. At present, values of prognosis of 15 minutes have been evaluated with a reliability level of 85 %.

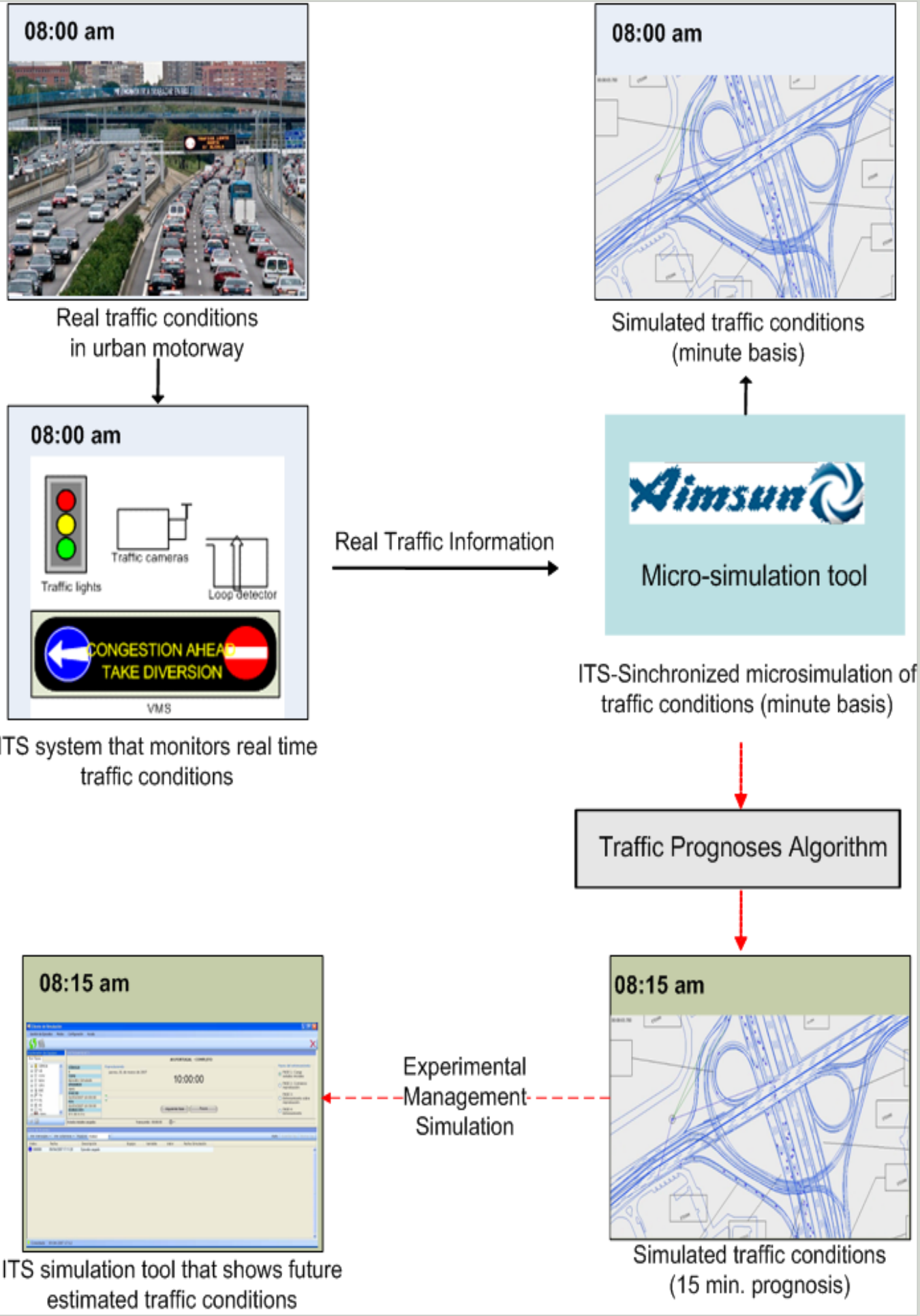
This innovative advantage, to know the evolution of the traffic in an immediate enough future (15 minutes), will allow road traffic managers to be readily prepared to deal with the future traffic situation. Furthermore, it will provide traffic decision makers with the capability to adapt the different control measures to the new situation, thus enabling them to offer a quicker, more reliable and valuable information to the driver.

These new developments will mean a substantial improvement of current traffic management systems which are unable to provide control actions until the incidents have taken place. The first step for an optimized management consists on premature detection.

Potential capacity of Aimsun Micro-simulator on the improvement of traffic management

The Aimsun Micro-simulator tool has been designed and implemented as a tool for traffic analysis to help traffic engineers in the design and assessment of traffic systems. It has proven to be very useful for testing new traffic control systems and management policies, either based on traditional technologies or as implementation of Intelligent Transport Systems.

The Aimsun Micro-simulator follows a microscopic simulation approach. This means that the behaviour of each vehicle in the network is continuously modelled throughout the simulation time period while it travels through the traffic network, according to several vehicle behaviour models (e.g., car following, lane changing). The Microscopic simulator in Aimsun is a combined discrete/ continuous simulator. This means that there are some elements the system (vehicles, detectors) whose states change continuously over simulated time, which is split into short fixed time intervals called simulation cycles or steps. There are other elements (traffic signals, entrance points) whose states change discretely at specific points in simulation time. The system provides highly detailed modelling of the traffic network, distinguishes between different types of vehicles and drivers, it enables wide range of network geometries to be dealt with, and it can also model incidents, conflicting manoeuvres, etc. Most traffic equipment present real traffic network is also modelled in the Micro-simulator: traffic lights, traffic detectors, Variable Message Signs, ramp metering devices, etc.


08:00 am
Real traffic conditions
in urban motorway
08:00 am
Traffic lights
Traffic cameras
Loop detector
CONGESTION AHEAD
TAKE DIVERSION
VMS
ITS system that monitors real time
traffic conditions
Real Traffic Information
08:00 am
Simulated traffic conditions
(minute basis)
Aimsun
Micro-simulation tool
ITS-Sinchronized microsimulation of
traffic conditions (minute basis)
Traffic Prognoses Algorithm
08:15 am
10:00:00
ITS simulation tool that shows future
estimated traffic conditions
Experimental
Management
Simulation
08:15 am
Simulated traffic conditions
(15 min. prognosis)

Hate: no choice. Agent simulations.

Krzysztof Kulakowski, Malgorzata J. Krawczyk, Przemyslaw Gawroński
Faculty of Physics and Applied Computer Science, AGH University of Science and Technology, Cracow, Poland (kulakowski@novell.ftj.agh.edu.pl)

We treat hate as a socially mediated state of mind. From this point of view, hate as a topic overlaps with themes that are well established in socially oriented simulations: social norms, cooperation and public opinion. Their common content is a picture of a heterogeneous community, where seemingly unimportant differences can lead to a split into groups. As a consequence, cooperation and contact between the groups is deteriorated, mutual understanding is substituted by ignorance, finally the social labelling and hostility emerge between members of different groups. These processes lie at the bottom of hate.

We are going to report our recent simulations on these social processes. The first simulation deals with the so-called Heider balance [1] where initial purely random preferences split the community into two mutually hostile groups. The second simulation [2] shows that once these groups are formed, the cooperation between them is going to fail. The third simulation [3] provides a numerical illustration of the process of biased learning; the model indicates that lack of objective information is a barrier to new informations. The fourth simulation [4] is devoted to the possibility of cooperation with enemies in the presence of a strong conflict.

[1] K. Kulakowski, Some recent attempts to simulate the Heider balance problem, Computing in Science and Engineering 9, July/August 2007, 86.
[2] P. Gawronski, M. J. Krawczyk and K. Kulakowski, Altruism and reputation: cooperation in groups, presented at the Conference of Complex Systems, Warwick, September 2009 (arXiv: 0903.3902)
[3] K. Kułakowski, Opinion polarization in the Receipt-Accept-Sample model, Physica A 388 (2009) 469.
[4] K. Kułakowski, Cooperation and defection in ghetto, Int. J. Mod. Phys. C 17 (2006) 287.

Emergency management is the generic name of an interdisciplinary skill set dealing with the strategic organisational management processes used to protect the critical assets of an organisation from hazard risks and thus to ensure the continuance of the organisation within its planned lifetime. Assets are categorised as: living things, non-living things, cultural, economic. Hazards are categorised by their cause: natural or man-made. The entire strategic management process is divided into four fields to aid in identification: risk reduction, preparing resources to respond to the hazard, responding to the actual damage caused by the hazard (including limiting further damage, e.g. emergency evacuation, quarantine, mass decontamination, etc.), and returning as close as possible to the state before the emergency. The skill set is used in both the public and private sector, sharing the same processes, but with different focuses.

Emergency Management is a strategic process - not a tactical one - thus it usually resides at the executive level in an organisation. It normally has no direct power, but serves as an advisory or coordinating function to ensure that all parts of an organisation are focused on the common goal. Effective Emergency Management relies on a thorough integration of emergency plans at all levels of the organisation and an understanding that the lowest levels of the organisation are responsible for managing the emergency and getting additional resources and assistance from the upper levels. The most senior person in the organisation administering the program is normally called an Emergency Manager, or a derived form based upon the term used in the field, e.g. Business Continuity Manager. SOCIONICAL partners are working with such officials.

Human Aspects in Ambient Intelligence (HAI 2011)

Tibor Bosse of VU University Amsterdam

On August 22, 2011, the Fifth International Workshop on Human Aspects in Ambient Intelligence (HAI 2011), was held as part of the WI/IAT 2011 conference in Lyon, France (see http://www.few.vu.nl/~tbosse/HAI11/). The workshop was organised by a group of international experts in the field (Juan Carlos Augusto, Tibor Bosse, Cristiano Castelfranchi, Diane Cook, Mark Neerincx, Fariba Sadri), and was chaired by Tibor Bosse of VU University Amsterdam. The main aim of the workshop series is to bring together researchers from different areas related to Human Aspects in Ambient Intelligence. More specifically, the workshop aims to get modellers in the psychological, neurological, social or biomedical disciplines interested in Ambient Intelligence as a high-potential application area for their models, and make researchers in Ambient Intelligence, Agent Systems, and Artificial Intelligence more aware of the possibilities to incorporate more substantial knowledge from the psychological, neurological, social and biomedical disciplines in Ambient Intelligence applications.

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The 2011 edition of the workshop received 14 submissions, of which 8 high quality papers (including a paper by two SOCIONICAL partners) were accepted (i.e., an acceptance rate of 57%). Overall, approximately 20 people participated in the workshop. All presenters showed up and the workshop could be held as planned and announced in the program. Prof. Catholijn Jonker from Delft University of Technology gave a very interesting invited talk about 'Challenges of Creating a Negotiation Support System for Bilateral Multi-Issue Bargaining'. Inspired by her talk and the other presentations, a number of relevant questions have been discussed during the workshop and the final discussion session, which resulted in a list of challenging issues within Ambient Intelligence of which the participants agreed that they are worth addressing in the coming years.

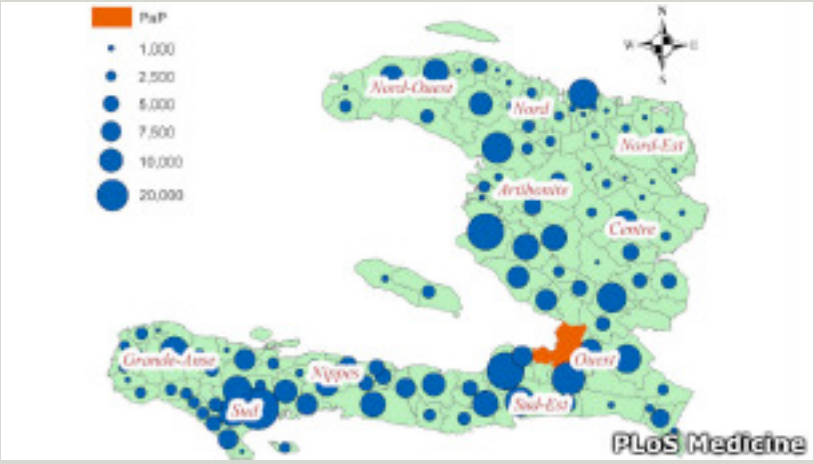
Mobile phones helped to target disaster aid in Haiti

Data from the Digicel network in Haiti was used to estimate population movement

Population movements following the Haiti earthquake were mapped based on location data from two million handsets.That information allowed aid organisations to channel relief supplies to those areas most in need. A non-profit organisation to provide location analysis for future disasters.

In the immediate aftermath of the 2010 Haitian earthquake, many people fled the capital, Port au Prince. Researchers from Sweden's Karolinska Institute and Columbia University in the US asked the country's biggest cellular network, Digicel, to provide anonymised information about the phone

towers that people were using. From that data they estimated that 600,000 Haitians had left the capital in the first 19 days and were also able to locate concentrations of displaced people on a map.



Estimated distribution of Haiti population 19 days after the earthquake

This analysis was sent out to aid coordinators working in the field, so that numbers of evacuees could be verified and supplies targeted to specific locations. When a cholera outbreak struck Haiti later that year, the researchers were quick to respond.

"We rapidly received mobile phone data and within 12 hours we were able to send out analyses describing which areas had received people from the cholera outbreak zone to provide information on areas at increased risk of new outbreaks," said Dr Linus Bengtsson of the Karolinska Institute.

Dr Bengtsson said that his model could be used almost anywhere in the world as 86% of the global population now has cellular network coverage.

However, in military confrontations - such as the uprising in Libya - it may be more difficult to implement.

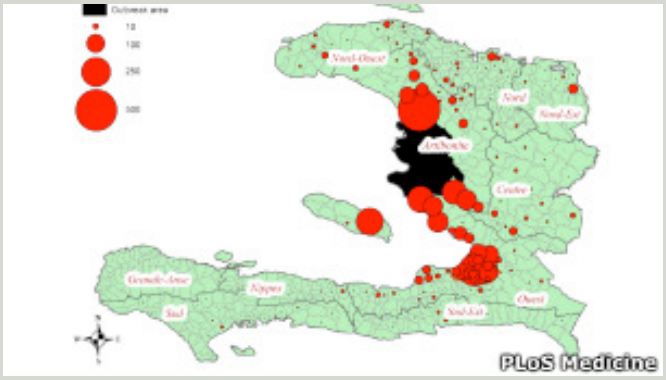
"In a conflict you must take into account the objectives of the factions involved. The phone operators might be reluctant to share information if there is a risk for them," explained Dr Bengtsson.

"In natural disasters, the goal of all players is to help those affected."

This study is one of many technological solutions to be tested during the disasters that struck Haiti.

After the earthquake, Haitians used the web and social networks to communicate with each other, telling their families where they were.

The Ushahidi project - an open, crowd sourcing initiative - used this information to construct an online map which showed the infrastructure damage, areas lacking of food and water, and reports of missing people.



Estimated population location during Haiti cholera outbreak

"We passed this map on to organisations on the ground. They could then work with the specific needs reported by the people," Erik Hersman, co-founder of Ushahidi.

Dr Bengtsson welcomes cooperation between the various crowd sourcing projects in the hope that this will lead to better disaster response in future.

Some recent publications by SOCIONICAL Partners:

Daniel Roggen, Martin Wirz, Gerhard Tröster, Dirk Helbing
Recognition of crowd behaviour from mobile sensors with pattern analysis and graph clustering methods
AIMS - Networks and Heterogeneous Media (NHM) Pages: 521 - 544, Volume 6, Issue 3, September 2011
ISSN 1556-1801(Print) ISSN 1556-181X(Online)

Christopher Auer, Patrick Wuechner and Hermann De Meer
Target-Oriented Self-Structuring in Classifying Cellular Automata
Journal of Cellular Automata (JCA), 6(1):3--23 2011
ISSN: 1557-5969 (Print); 1557-5977 (Online)

Nasir Ali, Daniel Baselt and Hermann De Meer
Analysis of Car-to-Car Beaconing with Network Coding
Electronic Communications of the EASST, 37:1--13 2011
ISSN: 1863-2122

Richard Holzer and Hermann De Meer
Methods for Approximations of Quantitative Measures in Self-Organising Systems
In Christian Bettstetter and Carlos Gershenson, editor, Proc. of the 5th Int'l Workshop on Self-Organising Systems (IWSOS 2011) Volume 6557 of Lecture Notes in Computer Science (LNCS) , page 1--15.
Publisher: Springer-Verlag, 2011
DOI: 10.1007/978-3-642-19167-1_1
ISBN: 978-3-642-19166-4 (Print); 978-3-642-19167-1 (Online)

Richard Holzer and Hermann De Meer
Modelling and Application of Self-Organising Systems - Tutorial Paper
Proc. of the 5th Int'l IEEE Conference on Self-Adaptive and Self-Organising Systems (SASO 2011) of IEEE Computer Society Press 2011

Richard Holzer, Patrick Wuechner and Hermann De Meer
Modeling of Self-Organising Systems: An Overview
Electronic Communications of the EASST, 27:1--12 2010
ISSN: 1863-2122

More recent publications by SOCIONICAL Partners:

Sharpanskykh, A., Treur, J., **Abstraction Relations Between Internal and Behavioural Agent Models for Collective Decision Making**. *Web Intelligence and Agent Systems Journal*. (in press)

Sharpanskykh, A., Treur, J**., An Ambient Agent Architecture Exploiting Automated Cognitive Analysis.** *Journal of Ambient Intelligence and Humanized Computing*. (in press)

Sharpanskykh, A, **Agent-based Modeling and Analysis of Socio-Technical Systems. Cybernetics and Systems.** Special Issue on Agent and Multi-Agent Systems, Jedrzejowicz, P., Nguyen N.T., and Szczerbicki, E. (eds.) (in press)

Bosse, T., Hoogendoorn, M., Klein, M.C.A., Treur, J., and Wal, C.N., van der, **Agent-Based Analysis of Patterns in Crowd Behaviour Involving Contagion of Mental States**. In: Mehrotra, K.G., Mohan, C., Oh, J.C., Varshney, P.K., and Ali, M. (eds.), Proceedings of the 24th International Conference on Industrial, Engineering & Other Applications of Applied Intelligent Systems, IEA/AIE'11, Part II. Lecture Notes in Artificial Intelligence, vol. 6704. Springer Verlag, 2011, pp. 566-577.

Hoogendoorn, M., Treur, J., Wal, C.N. van der, Wissen, A. van, **Agent-Based Modelling of the Emergence of Collective States Based on Contagion of Individual States in Groups.** Transactions on Computational Collective Intelligence, vol. 3, 2011, pp. 152-179.

Jaffry, S.W., and Treur, J., **Modelling Trust for Communicating Agents: Agent-Based and Population-Based Perspectives**. In: Jedrzejowicz, P., Nguyen, N.T., Hoang, K. (eds.), Proceedings of the Third International Conference on Computational Collective Intelligence, ICCCI'11, Part I. Lecture Notes in Artifical Intelligence, vol. 6922. Springer Verlag, 2011, pp. 366-377.

Sharpanskykh, A., and Treur, J., **Group Abstraction for Large-Scale Agent-Based Social Diffusion Models**. In: Zhan, J., et al. (eds.), Proceedings of the Third International Conference on Social Computing, SocialCom'11. IEEE Computer Society Press, 2011, to appear.

Sharpanskykh, A., and Treur, J., **Group Abstraction for Large-Scale Agent-Based Social Diffusion Models with Unaffected Agents**. In: Kinny, D., Hsu, D. (eds.), Proceedings of the 14th International Conference on Principles and Practice of Multi-Agent Systems, PRIMA'11. Lecture Notes in Artificial Intelligence, Springer Verlag, 2011.

Treur, J., **From Mirroring to the Emergence of Shared Understanding and Collective Power** (invited talk). In: Jedrzejowicz, P., Nguyen, N.T., Hoang, K. (eds.), Proceedings of the Third International Conference on Computational Collective Intelligence, ICCCI'11, Part I. Lecture Notes in Artifical Intelligence, vol. 6922. Springer Verlag, 2011, pp. 1-16.

Treur, J., **Modelling Joint Decision Making Processes Involving Emotion-Related Valuing and Mutual Empathic Understanding**. In: Kinny, D., Hsu, D. (eds.), Proceedings of the 14th International Conference on Principles and Practice of Multi-Agent Systems, PRIMA'11. Lecture Notes in Artificial Intelligence, Springer Verlag, 2011, to appear.

Sharpanskykh, A., Zia, K., **Grouping behaviour in Aml-enabled crowd evacuation.** In Proceedings of the 2nd International Symposium on Ambient Intelligence, ISAmI'11, Springer Verlag, to appear.

Sharpanskykh, A., Spisak, B., **An Agent-based Evolutionary Model of Leadership.** In: Zhan, J., et al. (eds.), Proceedings of the Third International Conference on Social Computing, SocialCom'11. IEEE Computer Society Press, 2011, to appear.

If you have any comments or wish to contribute to the next SOCIONICAL Newsletter
please contact:: ELLISM1@LSE.ac.uk

SOCIONICAL is an Information and Communication Technologies Project

funded under European Seventh Framework Programme (FP7), aiming to develop Complexity Science based modelling, prediction and simulation methods for large scale socio-technical systems.

SOCIONICAL Partners:

University of Passau, Germany,
Beacon Tech Ltd., Israel,
University of Linz, Austria,
London School of Economics and Political Science, UK,
Eidgenössische Technische Hochschule Zürich, Switzerland,
VU University Amsterdam, The Netherlands,
AGH University of Science and Technology, Poland,
University of Würzburg,
The Fraunhofer Institute for Applied Information Technology,
SOCIEDAD IBERICA DE CONSTRUCCIONES ELECTRICAS SA, Spain,
SmartCare Srl,
Technische Universität München, Germany,
Martin-Luther-University Halle-Wittenberg, Germany,
Civil Protection Department – Ministry of Home Affairs, Malta.

SOCIONICAL focuses on the specific example of Ambient Intelligence (AmI) based smart environments. A key component of such environments is the ability to monitor user actions and to adjust its configuration and functionality accordingly. Thus, the system reacts to human behaviour while at the same influencing it. This creates a feedback loop and leads to a tight entanglement between the human and the technical system. At the same time there is dynamic, heterogeneous human-human, human-technology, and technology-technology communication leading to ad-hoc coupling between components and different feedback loops. The project will study global properties and emergent phenomena that arise in AmI based socio-technical systems from such local feedback loops and their coupling on two concrete scenarios: transportation and emergency/disaster.

SOCIONICAL takes a parallel, multi facetted research approach. Thus, it will address analytical methods, complex networks based representations, and agent based models. The advances in modelling and prediction will be verified by large scale, distributed simulation driven by real life data.

Partners and background

The project has assembled an interdisciplinary consortium encompassing Computer Science, Electrical Engineering, Mathematics, Physics, Sociology, Psychology, and Transportation Technology. Such an interdisciplinary consortium allows us to investigate global properties and emergent phenomena in socio-technical systems from different angles and to include in our investigation all relevant technological, social and psychological factors. It also allows SOCIONICAL to address and integrate a broad range of modelling, simulation and prediction approaches. The consortium also contains companies and public bodies (e.g. strategic planning department of the Italian fire fighters, SmartCare, SICE dealing with monitoring, management and control of large transport facilities, London School of Economics) that can provide realistic scenarios and ensure that the results of the project will influence policy and strategy in relevant areas.

Each partner in the consortium has a well defined role, with some key competences being held my multiple partners. The partners in the consortium can be divided into 4 groups. The largest group of partners come from different areas of Complexity Science and closely related fields. As socio-technical systems per definition involve social/psychological issues and the understanding of the technology each of those topics has a group of partners devoted to it. Finally we have partners who are directly involved with applications related to the SOCIONICAL case studies who will be in charge of providing scenarios, real life data sets, and ensuring that the results of the project lead to relevant guidelines and recommendations for policy makers and industrial decision makers.

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for more information please email SOCIONICAL@lse.ac.uk