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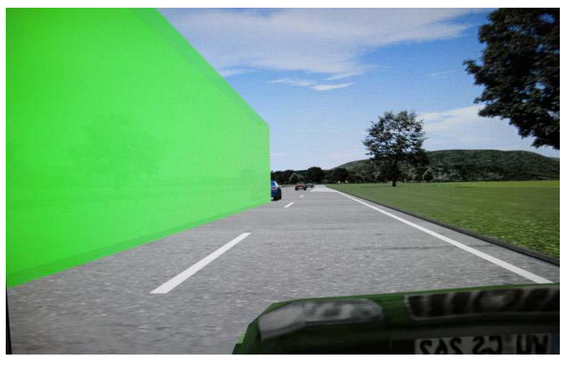
Five years ago SOCIONICAL set out through a new FP7 EU funded project to develop understanding of an emerging new class of socio-technical systems based on Ambient Intelligence devices. Much has been achieved.

New modelling and simulation methodologies were developed, a wide range of concrete systems investigated, and fundamental insights into system properties gained. Beyond mere scientific advances the SOCIONICAL Crowd Management App has spectacularly demonstrated the social and economic relevance of our research. Having been used during the Malta Notte Bianca Festival, London Olympics, London "Lord Mayor's Show", the Vienna Marathon and the Zurich New Year's Eve celebration it has lead to continued interest from civil protection authorities all over Europe and the founding of a spinoff company.

University of Passau and University of Kaiserlautern developed and implemented quantitative measures for the evaluation of self-organizing properties in systems. A measure for emergence indicates whether some global structures are induced by the local interactions between the entities, for target orientation specifies whether the overall goals of the system are satisfied, for adaptivity specifies how good the system can react to changes in the environment, such that the overall goal is still satisfied, for resilience describes how good the system can react to abnormal events in the system like malfunctioned nodes, attacks against some entities of the system or a breakdown of some entities, for global state awareness specifies the amount of information of each single entity about the relevant global properties, such that the entities are able to make the right decisions to fulfill the overall goal of the system, for autonomy specifies the amount of external data needed to control the system.

University of Würzburg developed a potential new ADAS called merging assistant ("Assisting drivers' merging onto the motorway: Evaluation of a new advanced driver assistance system (ADAS) using multi-driver simulation"). The results show that a measure based on time-to-collision (called TTC-difference) is a suitable parameter that guides drivers' evaluation of merging situations. It was shown that subjects who are already on the motorway are less likely to evaluate the gap in front of them as appropriate compared to subjects who want to merge from the slip road onto the motorway. Conflicts in merging areas could arise if drivers on the slip road assess gaps as appropriate that are not appropriate from the perspective of drivers already on the motorway.

Scenario below with merging assistant activated



Civil Defence Department, Government of Malta, Simulating a National Emergency. Having a community that is prepared for a disaster is no mean feat. It is very difficult to prepare the members of the general public for a disaster because very few people would willingly change their course of life, or their routine-based tasks, to get prepared in the event of a disaster, catastrophe or emergency. When the earthquakes shook Italy, the members of the community were mobilised into action. Even the Civil Protection Department were at some point involved by passing on aids to the people who had lost their homes and belongings. During the Arab Spring revolution, most of the information was being obtained through the Internet. The CPD was one of agencies involved as part of the local emergency management team during this crisis.

Maltese emergency teams aide injured people during simulation exercise

University of Linz model an agent based framework on a real physical space, simulating the evacuation of the space given a crowd of agents. Agents make routing decisions towards points of attraction, where we assume once these points have been reached the agents are safe. The routing decisions are based on a novel cognitive decision model, which integrates belief, trust, and confidence and is based on agent communications. Communications occur based on the physical proximity of other agents and distant communications, simulating phone conversations. The entire process is encapsulated by the agent perception map, which is the main contribution of this work. This work has been used with emergency flood situations in Linz.

London School of Economics collaborated with VU, Amsterdam on conceptualising trust in emergency situations; for example trust in the information provided through an AmI device and in decisions made using that information. LSE team organised several meetings and presentations with the London Fire Brigade, the London Ambulance Service, and The Royal London Hospital for Fraunhofer FIT and ETH, to discuss broad based exercises and virtual reality simulations. LSE & DFKI were also present at both the Lord Mayor's Show Control Centres in 2011 and 2012. LSE also organised trials of the SOCIONICAL app with DFKI & ETH at Wembley Stadium 2010, Lord Mayor's Show 2011 & 2012, London Olympics 2012 and worked with the Government of Malta.
LSE also conducted a series of meetings, seminars and interviews with policy makers and the emergency services to produce 'Guidelines & Recommendations for Policy Makers'. A data review summarized regulation and policy advice from worldwide sources, including the EU, Member State, Central, regional and local governments, National civil contingencies and Emergency services. These were promulgated at Seminars at the European Parliament and at City Hall London. Governments and emergency services can now apply recommendations to benefit populations in emergencies such as flooding and infrastructure disasters.

The Lord Mayor's 800 year old carriage broke down but our APP advised users of the event

AGH University of Science and Technology, Poland addressed new theoretical input developed within SOCIONICAL is a method of compression of networks of states. The method relies on local symmetry of states. In a nutshell, it can be explained as follows. In an initial network of states, the states of the considered system are represented by nodes. The network is formed by links between the nodes, which mark transitions between the states in some elementary processes. To provide examples, these could be flips of spins, moves of a random walker in a lattice, time steps of a cellular automaton or shifts of a vehicle by a road section. This kind of construction is known as a Kripke structure. This means that the stationary probabilities of all states can be reproduced exactly from the calculations of the probabilities of the classes. One of applications is the symmetry-driven reduction of a traffic system. The method is general and it can be applied to weighted and/or directed networks as well.

The Fraunhofer Institute for Applied Information Technology developed FireSim – Serious Games for the assessment and development of tools and work practices from earlier work in the EU project wearIT@work, Fraunhofer FIT has significantly extended and refined its FireSim toolset and approach to simulation-based assessment and design. In particular, FireSim has been extended with a real- time capable agent simulation using the BDI framework from SOCIONICAL project partner VU University Amsterdam. Fraunhofer FIT has applied FireSim to the study of emergency situations, in particular advanced navigation support for structural firefighting as well as smartphone based evacuation support.

The key interest in these studies was to investigate the huge socio-technical design spaces of the considered systems in order to identify trade-offs and potential positive and negative impacts in an attempt to inform and support the systemic innovation processes involving the technology on the one hand and the work practices on the other.

Physical firefighter system developed in PROFITEX with the support of FIRESIM.

SICE has maintained direct and constant contacts with its key clients in the transportation domain, including national policymakers and transport responsible institutions like the Traffic Engineering Department of Madrid City Council, the National Traffic Directorate in Spain, and the main representatives of transport concessions in Spain and worldwide. SICE has posed real traffic scenarios with different levels of complexity for analysis and modeling by SOCIONICAL partners, using real traffic datasets mainly from the operating centralized systems, with the ultimate goal of building tools able to support traffic operators and public authorities to better manage the daily traffic situations they face.

SCIE Staff in the Spanish General directorate of Transportation Control Centre, Madrid.

Other topical and important outcomes include:
Highest 'risk' of flooding identified in Europe
Where governments and emergency services apply SOCIONICAL practice and advice then emergencies can be handled and disasters and deaths avoided.
Simple planning for systems of Communicating with Vulnerable People in Emergencies exist and should be more widely applied. Work with Austrian Governments demonstrate this – we can only encourage other Governments to do the same!

SOCIONICAL Partners

University of Kaiserlautern
University of Passau
Beacon Tech Ltd.
AGH UST
DFKI GmbH
University of Linz
London School of Economics and Political Science
ETH Zürich
VU University Amsterdam
University of Würzburg
Fraunhofer FIT
SICE
SmartCare Srl
TU München
University of Halle-Wittenberg
CPD

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