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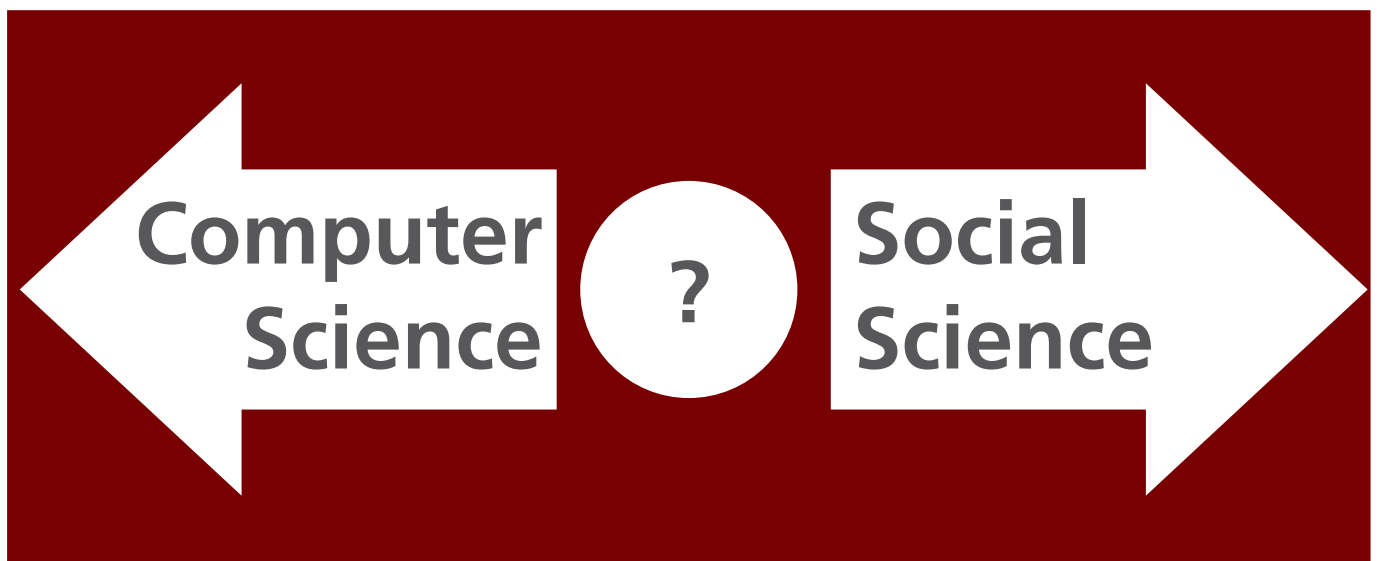
European Network for **Social Intelligence**

A multidisciplinary international workshop

Computational Social Science and Social Computer Science:
Two Sides of the Same Coin?

University of Surrey

23-24 June 2014

Computer Science **?** Social Science

Our Sponsors

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The European Network for Social Intelligence

The European Network for Social Intelligence (SINTELNET) is an FET Open Coordination Action. Traditional distinctions between the natural, the social and the artificial are becoming more and more blurred as radically new forms of Information Technology-enabled social environments are formed. These changes create the need to re-explore basic concepts of Philosophy, Humanities and Social Sciences. The aim of the European Network for Social Intelligence is twofold:

- To look into those IT-enabled domains as a means for the critical examination of those basic concepts
- To propose new approaches to understand and develop future IT-enabled social situations, by adapting and applying traditional concepts.

www.sintelnet.eu

Computational Social Science and Social Computer Science:
Two Sides of the Same Coin?

Introduction

This volume assembles research at the cutting edge of social simulation, where social sciences and computer science meet. Major challenges arise at this meeting point. Our capacity to model human sociality is still limited. Which of the myriad theories from social sciences can help us advance? So far, social science concepts such as norms, markets and rationality have found their way into computer science in general and agent-based research in particular where they model coordination between largely independent autonomous computational entities. Vice versa, in the social sciences - sociology, philosophy, economics, legal science, etc. - computational models and their implementations have been used to investigate the rigour of theories and hypothesis.

Social science concepts in computer science have often been combined and simplified for implementation in models. The "real" concept and the theories surrounding it often are not directly amenable to modelling. Equally, the computer models used are not always convincing as to social scientific validity, nor are all social scientists interested in computational models.

The European Network for Social Intelligence (Sintelnet) detected the burgeoning of an interest in fundamentally re-thinking the modelling of social reality. This was supported by a new research initiative to re-question existing models, which indicated that although intelligence is well covered, sociality has been under-modelled as yet. In order to overcome this problem and to facilitate future interaction of the two worlds, in March 2013 a first workshop – called Social.Path – was held. The present booklet summarizes the contributions of the second Social.Path workshop, held June 2014 at the University of Surrey in Guildford and sponsored by the Institute of Advanced Studies and Sintelnet.

At Social.Path key researchers from the social simulation and multi-agent modelling world were invited to discuss their ideas for integration. Roughly the contributions fall into two categories. Over half of them discuss generic social modelling issues such as contextuality, collectives, social ordering principles, making sociological theory usable for agent-based models. A minority places a case context in the foreground, attempting a credible social simulation of it.

The volume does not describe the plentiful discussions held at the workshop that hopefully will lead to new breakthroughs in the years ahead. We need these, if social simulation is to catch up with technological opportunities and social challenges.

Organisers:
Tina Balke, CRESS, Department of Sociology, University of Surrey
Gert Jan Hofstede, Wageningen University
Harko Verhagen, Stockholm University
Marina De Vos, University of Bath

Programme

DAY 1: Monday 23 June 2014

09.00	**Registration and Coffee**
09:50	**Welcome**
10:00	**Keynote** *The Challenge of Agent-based Modeling* Prof. Doyne Farmer (The Institute for New Economic Thinking at the Oxford Martin School)
11.15	**Coffee**
11:30	**Paper Session I** *Situational Deliberation; Getting to Social Intelligence* Frank Dignum, Virginia Dignum, Rui Prada and Catholijn Jonker *Collectives - How to Change Your World* Corinna Elsenbroich and Harko Verhagen
12:30	**Lunch**
11:30	**Paper Session II** *Who's friends, who's boss? Affiliation and hierarchy in multi-agent systems* Gertjan Hofstede, Floor Ambrosius, Eddie Bokkers and Iris Boumans CKSW: *A Folk-Sociological Meta-Model for Agent-Based Modelling* Martin Purvis, Maryam Purvis and Christopher Frantz

14:30 Coffee Break

14:45	**Paper Session III** *Computational Modelling for Law Enforcement Intelligence Analysis* Patrick Seidler, Atta Badii and Richard Adderley *Towards a Representational Model of Social Affordances from an Institutional Perspective* Giovanni Sileno, Alexander Boer and Tom Van Engers

15:45 – 17:00 Plenary: Brainstorm Session

19:00	**Conference dinner**

VENUE: Wates House, Treetops Room

DAY 2: Tuesday 24 June 2014

9:00	**Coffee**
9:30	**Keynote** *Computational models of the complexity of social integration* Prof. Andreas Flache (Department of Sociology at the University of Groningen)
10:30	**Coffee**
11:00	**Short Paper Session** *KIWI – a Knowledge-based Inquiry system With Intervention modelling. A simulation application to the early life-course* Peter Davis *The SWAP Model: Exploring a framework of farmer behaviour using an agent-based model* Peter Johnson
11:30	**Paper session IV** *The Sociality of Context* Bruce Edmonds
12:00	**Lunch**
13:00	**Plenary: Selection of Discussion Themes**
13:30	**Group discussions according the selected themes**
15:30	**Plenary: report back**
16:00	**Close**

Keynote

Prof. J. Doyne Farmer, Oxford University, UK

The Challenge of Agent-based Modeling

The ability to simulate complex systems with many interacting parts has revolutionized the physical and natural sciences, but the full impact of the computer revolution still remains to be felt in social science, and economics in particular. The common reason given for this is that unlike atoms, people can think. I will argue that this hurdle is surmountable, and that agent-based modeling, combined with behavioral experiments and other methods, provides the natural vehicle for doing so. In order to achieve this a variety of intermediate steps must be accomplished, such as the gathering of much richer micro data, and the solution of several fundamental problems in calibrating and validating agent based models.

J. Doyne Farmer is a Professor with the Institute for New Economic Thinking at the Oxford Martin School and with the Mathematical Institute, and he is External Professor at the Santa Fe Institute. He has broad interests in complex systems, and has done research in dynamical systems theory, time series analysis and theoretical biology. At present his main interest is economics. Particular projects include making realistic agent-based model of the economy (he is the scientific coordinator of the CRISIS project and PI for an INET-funded project to model housing markets); understanding technological evolution and economic growth, and understanding market ecologies, in particular with relation to financial instability. He was a founder of Prediction Company, a quantitative automated trading firm that was sold to the United Bank of Switzerland in 2006. During the eighties he worked at Los Alamos National Laboratory, where he was an Oppenheimer Fellow, founding the Complex Systems Group in the theoretical division. He began his career as part of the U.C. Santa Cruz Dynamical Systems Collective, a group of physics graduate students who did early research in what later came to be called "chaos theory". In his spare time during graduate school he led a group that designed and built the first wearable digital computers (which were used to beat the game of roulette).

www.oxfordmartin.ox.ac.uk/people/407

Prof. Andreas Flache, University of Groningen, The Netherlands

Computational models of the complexity of social integration

Prof. Andreas Flache took his master in computer science from the University of Koblenz-Landau and his Ph.D. in social sciences from the University of Groningen (1996). He is professor of sociology with particular emphasis on modelling norms and networks at the Department of Sociology / ICS of the University of Groningen. He also is chair of the department, director of studies and board member of the Interuniversity Research School ICS. Flache's main research interests concern social integration and cooperation, in particular in relation to social networks. He uses agent-based and game-theoretical modelling, social network research, laboratory experiments, survey- and interview research. His work has been published in social science journals, like American Journal of Sociology, Journal of Conflict Resolution and Journal of Mathematical Sociology, as well as in interdisciplinary journals like PNAS or PLoS Computational Biology.

www.gmw.rug.nl/~flache

Abstracts

Frank Dignum (Utrecht University), Virginia Dignum (TU Delft), Rui Prada (Instituto Superior Tecnico), Catholijn Jonker (TU Delft)

Situational Deliberation; Getting to Social Intelligence

Socially intelligent systems exhibit, understand, and reason about social behaviour, in order to support people in their daily lives. We claim that a fundamental new approach based on social concepts is needed to build these socially intelligent systems. In this paper, we explore how the concepts of social practices and social identities can be used to structure deliberations about actions. We then show the consequences for the architecture and reasoning capabilities of these systems.

Corinna Elsenbroich (University of Surrey), Harko Verhagen (Stockholm University)

Collectives - How to Change Your World

This paper explores the possibility of modelling collective reasoning as a new, genuine form of reasoning, different from atomistic and social influence modes. We distinguish different modes of human decision making, discuss which modes are currently captured in agent-based modelling and present a model that captures a further, as yet not modelled, mode of decision making.

Our conceptualisation of human decision modes is two dimensional with instrumental, normative and automatic along one axis and individual and social along the other. We argue for the addition of a third, collective dimension, which goes beyond the traditional conceptualisation of social as based on some kind of inter-agent influence dynamics. The collective dynamics is the result of an agent's capacity to understand oneself as a member of a collective, group or team and change its behaviour accordingly. For this we will use the demise of the Sicilian Mafia resulting at least partly) from the rise of the Addio Pizzo movement, as a social movement against the Mafia, as a case study.

Gert Jan Hofstede, Floor Ambrosius, Eddie Bokkers, Iris Boumans (Wageningen University)

Who's friends, who's boss? Affiliation and hierarchy in multi-agent systems

The everyday life of people working in organizations requires continuous coordination. In fact, coordination is what organizations are for. Yet people do not stick to what the organization prescribes for them to do. Human coordination is rife with issues of group affiliation, power, and leadership, and associated emotions. The fields of organizational behaviour and management reflect this. Modellers of organizational behaviour need to take these areas on board. This goes beyond formal organization. While sophisticated logics are used as well as intricate models of organizations, the social, volitional nature of the humans in them is hardly modelled, thus limiting the practical usability of these models. The article reviews the literature on group affiliation and hierarchy in agent-based models. It gives pointers as to which developments seem promising for advancing MAS and social simulation. It discusses the potential of complementary roles in agent-based models for formal organisation and human social nature.

Martin Purvis, Maryam Purvis and Christopher Frantz (Otago University)

CKSW: A Folk-Sociological Meta-Model for Agent-Based Modelling

The paper describes the CKSW (Commander-Knowledge-Skills-Worker) meta-model, developed for the purpose of representing arbitrary social systems across various levels of social organisation. It affords opportunities for modellers who want to move beyond folk-psychological models to the level of folk

sociology. A key feature of this model is the distinction between knowledge and skills, to offer more refined capabilities of explaining economic and social development in primitive and modern societies as well as in organisations.

We present the motivation for this model, followed by a description of its structure. The model's suitability to retrace social and institutional phenomena on an abstract level is explored using historical and contemporary scenarios.

Patrick Seidler (A E Solutions (BI) Ltd.), Atta Badii (University of Reading), Richard Adderley (A E Solutions (BI) Ltd.)

Computational Modelling for Law Enforcement Intelligence Analysis

The complexity of criminal behaviour generates growing demand for methods that enable intelligence analyst trainees and professionals to make sense of the criminal system under study. Computational modelling appears to offer methods for investigation of criminal behaviour and assessment of intervention strategies that would otherwise require long, expensive, and often ineffective analysis. In this paper, we explore the potential of computational models in the field of intelligence analysis. On the one hand, the discussion involves possibilities, challenges, and risks of applying computational modelling in the law enforcement domain, on the other hand the possible impact on law enforcement agencies' strategic positioning, internal processes and the specific work environment. We propose a methodological approach that is based on modelling the interaction of criminal network dynamics, the civil society in the law enforcement area, and intervention strategic analysis embodied in a virtual analyst agent.

Giovanni Sileno, Alexander Boer, Tom Van Engers (University of Amsterdam/Leibniz Center for Law)

Towards a Representational Model of Social Affordances from an Institutional Perspective

The paper investigates the connection of the concept of affordance with the concept of institution, fundamental in social sciences and in legal theory, with the purpose of delineating a working definition of social affordance. This hybrid concept enriches the representation tools to be used with agent-roles, knowledge components we use as basis in explaining and interpreting socio-legal scenarios. The paper shows how social affordances are of critical importance to model the agent-role embodiment mechanism.

Peter Davis (University of Auckland)

KIWI – a Knowledge-based Inquiry system With Intervention modelling. A simulation application to the early life-course

Our research group has developed a simulation model that uses real-world data from existing longitudinal studies in New Zealand to mimic a representative sample of biographical trajectories in the early life-course.

To do this we have developed a system of equations that, with a common starting file, is able to estimate synthetic data points for key transitions and outcomes through the early life-course across a socially representative sample. Because these data populate a simulation model that is calibrated to the real world, we have in effect created an inquiry system that can be interrogated by posing realistic counterfactual arguments of either a policy or theoretical nature.

We call this KIWI – a Knowledge-based Inquiry system With Intervention modelling.

In this presentation we will ask the question as to which causal mechanisms make the most difference to various social outcomes of both policy and theoretical interest, and we do this in particular in contrasting the impact of aggregated/structural factors versus personal attributes.

Abstracts

We find that our results are broadly similar across three domains – in health, education, and social behavior – and show that structural factors can make more of a difference than personal behaviour, and can do so in such a way that the benefits of "intervention" flow disproportionately to the most disadvantaged.

Peter Johnson (University of Surrey)

The SWAP Model: Exploring a framework of farmer behaviour using an agent-based model

This contribution will present the SWAP model, an agent-based model (ABM) of soil and water conservation (SWC) adoption amongst small-scale farmers in developing countries. This, at the time ongoing, research was presented last year at SOCIAL.PATH2013/AISB at the University of Exeter; this year the findings, from the use of the model to explore a social science theory-inspired framework of farmer behaviour, will be presented.

Bruce Edmonds (Manchester Metropolitan University Business School)

The Sociality of Context

It is well established that many human abilities are context-dependent, including: language, preference judgement, memory, reasoning, learning and perception. This is usually taken as a negative – that there will be limits on our understanding and modelling of these abilities. However, what is not always appreciated is that context-dependency can be a powerful tool in social coordination and communication. This paper pulls together several theories about the cognition of context, and presents a computational model of context-dependency. It then sketches its role in social communication, coordination and embedding. It looks at some of the approaches to dealing with context in the computer science and social science literature and concludes that none of these squarely faces the problem of context dependency. This points towards a substantial gap in the research and hence a future programme.

Participants

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Hofstede	Gert Jan	Wageningen University
Johnson	Peter	University of Surrey
Purvis	Maryam	Otago University
Seidler	Patrick	University of Reading
Sharpanskykh	Alexei	Delft University of Technology
Sileno	Giovanni	University of Amsterdam / Leibniz Center for Law
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