Worshop: The challenge of social cognition

Flash-talks

1) Human-robot interaction

Joint human-robot action: Virtual intentionality and hybrid human-robot cultures
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How must we understand joint action between humans and robots? Responding to Knoblich & Sebanz (2008) I ask the question if robots would meet he conditions for joint action prescribed by standard theories. On such accounts, it seems, (present) robots do not have intentions, so it seems only 'assymetrical' joint action is possible (at best), which leaves robots with the status of tools rather than co-actors. I propose to remedy this problem by offering the concept of 'virtual intentionality' (or simulated intentionality), which takes seriously robots as quasi-actors. In addition, I suggest that 'hybrid' human-robot cultures are likely to develop based on habits of joing human-robot action.

Ethics and Cognitive Systems an en-inter-active approach
Steve Torrance – University of Sussex

The challenge of understanding and modeling the time course of human social interactions
Matthias Scheutz – Indiana University - mscheutz@indiana.edu

I would like to report on our work on attempting to model joint attention mechanisms in a human-robot word learning task. I would spend about half the time talking about the requirements for embodied situation (robotic) models of social cognitive processes and half the time on giving a brief demonstration on our HRI work.

2) The dynamic approach

Sociality as the way to bridge the "cognitive gap" between minimal and human cognition
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Evolutionary robotics has become a popular engineering method for the synthesis of complex robotic systems. But how can we make it more relevant to the natural sciences? Here we propose to address this challenge by means of an integrative methodology which links evolutionary robotics with empirical research in terms of hypothesis generation and verification. To illustrate this proposal we report on a number of recent modelling experiments which have specifically targeted studies in social psychology. In particular, it is demonstrated how it is possible for the dynamics of a social interaction process to extend the behavioural domain of the individual agents. We argue on the basis of these results that sociality is a promising contender to bridge the 'cognitive gap' between minimal and human cognition, a fundamental problem which continues to be faced by bottom-up approaches such as embodied cognitive science.

Sense-making: an approach to social cognition
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Starting from the question *What is a social interaction?* we propose a fresh look at the problem of social cognition, aimed at integrating individual cognition and the interaction process in order to arrive at more parsimonious explanations of social understanding. We show how an enactive framework can provide a way to do this, starting from the notions of *autonomy*, *sense-making* and *coordination*. We propose that not only each individual in a social encounter but also the interaction process itself has autonomy. Examples illustrate that these autonomies evolve and change throughout an encounter, and that collective as well as individual mechanisms are at play in all social interactions. We also introduce the notion of *participatory sense-making* in order to connect meaning-generation with coordination. This notion describes a spectrum of degrees of participation, from the modulation of individual sense-making by coordination patterns, over orientation, to joint sensemaking. This research has implications for empirical research on social interaction, which I can also illustrate if there is time.

3) Modelling social interaction

Museum scenarios and attention-based approaches: a way to address the social interaction challenge

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Museum scenarios offer real-life ecological conditions and enable the analysis of individual as well as collective behaviors. Moreover, a typology of 4 museum visiting styles was already set up by Veron and Levasseur.

Non-invasive video-based systems are ideal tools for social interaction analysis. Nevertheless, classical approaches based on individual video tracking fail to provide robust results in such scenarios. The use of computational attention algorithms could be a way to avoid this issue. The purpose of computational attention is to predict what in a scene should attract human attention. This automatic analysis of visitors' mean paths provide a mix of the 4 canonical visiting styles which is not only of a great value for generating dynamic visitors' statistics, but also to retrieve visitors' personality dimensions. By analyzing a group of visitors performing alone and then with other visitors, two groups of people were found: those who moderately change their visiting style in presence of other visitors and those who highly change their style. Personality tests were conducted on these participants and those who exhibit little changes between visiting alone or with others scored significantly higher on sociability (i.e. a personality trait related to approach tendencies) whereas participants changing their visiting style scored significantly lower on sociability.

Cognitive systems should be able to conduct scene analysis but also to interact with visitors and provide them with a feedback. The cognitive system using computational attention could for example adapt animations or audio explanations about the artworks to the visitor's style (shorter if visitor style is fast), avoid artworks to be too much observed or not observed at all (visitor flow management) or to reinforce social interaction by proposing feedback which can be only modified by cooperation.

Computational attention algorithms are based on the rarity/contrast/surprise of some given features compared to the others and they are not efficient out of a context. Social interaction is also only interesting in a collective context and, moreover, social interaction can drastically react to events worthy of attention. The use of computational attention algorithms seems to fit well to social interaction and the museum scenario can be considered as a test-bed for studying and modelling social behaviour.

Social interaction and linguistic difussion

M. Paradowski

The Turing Game challenge for social interaction

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Social interactions will include interaction with robots in the future. It is crucial to develop tools and methods where this novel type of interaction can be practiced without causing any harm. The problem for machine learning is in the partially observed world, where the emotions and the intentions of the partner are relevant, hidden and uncertain. We have been tackling this issue both from the theoretical and the experimental point of view. On the theoretical side, we have been developing polynomial-time goal oriented learning algorithms that can deal with a number of variables simultaneously. Experimentally, we are developing the Turing Game, where the players' can express their emotions and this information can be used by their robot and human partners in the game. The robot or human nature of the partners in this multi-player game is hidden and we study the asymmetries of the emerging social network (who collaborates with whom).