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SOCIONICS: Introduction and Potential

Abstract

SOCIONICS is an interdisciplinary research framework which has been recently established for six years by the German Research Foundation (DFG). Up to 16 projects cooperating in a tandem-structure with at least one partner from Computer Science and one from Sociology will form a virtual research unit powered by the DFG. This report gives a brief introduction to Socionics and its basic research questions. A short discussion about the potentials and applications of a socionic based technology is presented.

Keywords:
Socionics, agent technology, multi-agents systems, sociology

Socionics: The basic idea

1.1

Until now research in Distributed Artificial Intelligence and Multi-Agent Systems has used social conceptions to describe the interplay of artificial agents in a multi-agent world. Sets of agents were ascribed to form "societies", "teams", "groups", "an organization" (cf. Malone 1990). The agents behave "socially", they help each other, they are selfish. Although such images are used seriously in order to present the idea of how distributed electronic systems work, it is often misleading for people who have a more profound understanding of such terms. It is necessary either to make clear that the use of such notions is for the limited purpose of simplifying the complex technical background of a distributed system, or, leaving the path of "folks-sociology", start a serious evaluation of sociological conceptions and theories for computer systems (Malsch 1997).

1.2

Socionics will take the second choice. Socionics, an artificial word - like bionic - combining Sociology and Informatics, aims to form a new research discipline with the aim of developing intelligent computer technologies by picking up paradigms of our social world. And vice versa, Socionics uses computer technology in order to verify and to develop sociological models of societies and organizations. In Germany, researchers from Sociology and Computer Sciences have started to form a new research network which concentrates on the following three problems:

- Modern society offers a rich reservoir of paradigms for modeling multi-agent systems, e.g. social roles and cultural values, norms and conventions, social movements and institutions, power and dominance distribution. Computer Science might learn from the adaptability, robustness, scalability and reflexivity of social systems and use their building blocks to come up with more powerful technologies.
- Vice versa, Sociology could profit from Computer Science by using DAI techniques as simulation tools for validating and extending their own terminology, models, and theories. New opportunities will be available to model the dynamic correlation between the levels of micro phenomena (social action) and of macro phenomena (structure of the society) and to check the results with computer experiments.
- Finally the emergence of "hybrid societies" needs to be examined. They will consist of real persons and electronic agents. Hybrid societies will be one of the most exciting challenges for the new discipline of Socionics and its parent disciplines. The practical use of artificial social agents, its effects on future technologies and its role in human environments needs to be explored in interdisciplinary cooperation.

Research Questions

2.1

In order to build highly complex and highly dynamical multi-agent systems it is necessary to study the principles of emergent evolution of structures and the basics of dynamical adaptability with the help of social systems as a paradigm. Therefore there is a need for a research collaboration between Distributed AI and Sociology which will not try to blindly perform a one-to-one mapping of sociological concepts to computer models (Gilbert and Conte 1995). The task will be a painful, mutual exchange and translation process between the two disciplines which includes the discussion about the frontiers of technical possibilities. Hence, Socionics aims at working out the advantages of collectively organized problem solving processes in order to come up with new forms of generating solutions which find their counterparts in the many facets of our social life and which have not been used significantly in technical contexts up to now.

2.2

Let's consider an artificial world of Personal Electronic Assistants (PEA) to exemplify the statement above. Suppose every person from child to seniors would be the owner of a team of electronic assistants. Every PEA would be associated with a social context of its owner , e.g. school, work, recreation, family et cetera. Further every PEA would know certain goals of its owner with respect to the specified social context. The aim of each

PEA would be to support its owner to reach these specific goals by gathering information, preparing activities, and providing plans. Comparable with its human owner in the human society, the electronic assistant would be part of an electronic society and as such part of the electronic "counter world". We are currently starting to build the electronic parallel-world of electronic societies. Suggestions for electronic assistants for appointment scheduling, car driver assistants, mobile Internet agents etc. may be found in the DAI literature in many variations (cf. FIPA 1998). So, supposing there will be such an electronic counter-world, what would happen to the billions of PEAs? The basic questions concerning such an electronic world would be:

- What types of societies would emerge? How would the electronic communities be created?
- Do PEAs have an explicit notion of what a society might be? How would the society integration-process work with PEAs?
- What would be the differences between the real society and the electronic society, especially in social contexts? What might be the reasons for the differences?

2.3

Now let's go one step further. There is an *a priori* connection between the real world and the electronic world, namely through the human owners and their electronic assistants. There would also be various kinds of connections and interactions between the PEAs and humans during the problem solving processes. Hence, hybrid societies would emerge and new questions will arise:

- What forms of hybrid societies would be reasonable?
- What kinds of human-machine interactions would be necessary to join hybrid communities?
- How could real persons and electronic assistants learn about the organizational structures of the corresponding and hybrid societies?

2.4

The abstract view, though inspiring, leaves open a number of technical how-to questions which could be only partially answered at this stage of research.

Fields Of Exploration

3.1

Taking a more scientific view, Socionics aims at generating answers in the context of (a) the emergence and dynamics of artificial social systems and (b) hybrid man-machine societies.

3.2

Within the first sub-field the following topics will be considered:

- Semantic modeling and interdisciplinary knowledge transfer
  In order to build complex and dynamic multi agent systems the principles of

emergent structure generation and dynamic adaptability have to be studied and modeled on the basis of existing social systems. At that point it will be essential to have interdisciplinary groups of social scientists and Distributed Artificial Intelligence researchers because a one-to-one transformation of real social structures to artificial social structures is obviously not reasonable.

- Emergence and scalability, i.e. the micro-macro problem
  The scaling problems of Distributed AI, while trying to realize "large scale open systems" as proposed by Hewitt ([1986](#)) and Gasser ([1991](#)), proposes socionic research on adapting solutions of the sociological micro-macro problem. That is, the mutual correlation of conditions and enabling mechanisms with respect to individual behaviour and higher social structures have to be studied at different levels of coordination:
  - On the interaction level, a social problem solving capability may be interpreted as a result of interaction processes between the agents.
  - On the organizational level, problem solving is part - and thus often pre-defined - of the organizational structure of the agents.
  - On the social structure level, there is a committed but flexible social order which stems from the individual decisions of the individual agents.

- The problem of social change induced by learnability and dynamics
  Time and temporalization of social systems is a key factor for explaining the dynamics and stability of societies (cf. Luhmann ([1984](#)), Giddens ([1992](#))). Obviously it influences the social change especially in the context of the learning ability of individual agents and the adaptability of the society (cf. Weiss ([1997](#)))

3.3

The second sub-field is dedicated to hybrid societies which may be the result of a scenario as described in the previous section. Another scenario where hybrid groups are reality are modern workflow management systems where not only humans are part of a company workflow, but also intelligent machines and programs like expert systems. Thus new research questions arise in the following contexts:

- User-oriented design of man-machine-interfaces
  Machines as part of a hybrid society need new types of interfaces. As humans adapt their communication behavior to the current social context, the intelligent agents have to adapt their outlook (interface) to the society they are currently part of.

  There is also another dimension in that the agents may be part of the interface management system of a machine, thus adapting the machine interface to the current user. In that view, the interface agents and the user form a (simple) society.

- Social acceptance of artificial agents
  The question of social intelligence concerns the socially conforming behaviour of the members of a society. Although there are cultural differences in social rules, there might be minimal social criteria which have to be fulfilled by each member in

order to be accepted by the society. It is rather unclear whether these criteria may also apply to artificial agents in a hybrid society or whether new interpretations have to be found.

- Rational action
  It will be a problem for artificial agents in a hybrid society to deal with inconsistent behavior of humans, because there is usually no precisely defined order of human preferences which control their behavior. Intentional agents on the other hand have been criticized for being over-rational, hyper-cognitive and over-cooperative ([Castelfranchi and Conte 1996](#)), i.e. completely transparent plans of action are assumed in current agent models.

- New types of socio-technical integration The last task deals with the process of integrating new members into a hybrid society. Adding a new agent to a multi-agent system is rather easy and the integration process is simple and predefined. Describing the integration process of a new member into a human team is a very complex task, especially because it is almost always different and context dependent. Integrating either human or artificial agents into hybrid societies will be one of the most thrilling challenges.

  There is also another dimension of this topic, namely the integration of a hybrid problem solving agency into human work processes.

Conclusion

4.1

Although the themes for research in Socionics are mainly basic research activities there will be a set of prototypical application scenarios. They will present the potential of the results as case studies in the domains of workflow management, the 'smart house', logistics, innovative communication infrastructures (internet, multi-media, virtual reality), and knowledge management. In particular, scenarios will be developed which allow the study of complementary organization paradigms such as the team-oriented cooperation of experts versus the hierarchical organization of functional hierarchies. Hence, the results of Socionics research will influence our future society, at work, at home, and in any context where we are connected to computers.

4.2

The total funding for the Socionics programme is equivalent to about 100 person-years over a period of six years. Project proposals are due to be submitted by late Autumn 1998, and an initial round of research is expected to begin in early Spring 1999. Most projects will last for two years, with the possibility of extension into a third year. Further calls will be made at intervals, timed so that the research will continue until 2005.

4.3

Further information about the Socionics framework may be found at its webpage, http://www.tu-harburg.de/tbg/SPP/Start_SPP.html. There is also an email distribution list

(with German as its working language). To subscribe, send an email with the message:

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subscribe spp-sozionik <YOUR-EMAIL-ADDRESS>
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to

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spp-sozionik-approval@tu-harburg.de
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