## Decomposition: autonomy and constraints

*Cees Witteveen (TUD)*

ABSTRACT
Often a problem has to be solved by distributed solvers who are not able to communicate with each other during the problem solving process. Examples range from reconnaissance missions and distributed violation detection in P2P systems to consistency maintenance in distributed databases.

In this talk, we consider the use of decomposition methods in obtaining a global result (the solution of the problem) by purely local computations (the outcomes of the distributed solvers). To study decomposition methods we model a problem as a collection of variables whose values are constrained by a set of constraints. To solve such a problem we have either to find an assignment of values to variables satisfying the constraints or to ensure that some global property such as consistency is preserved. Such a problem can also be solved in a distributed way. For example, in distributed constraint systems, the set of variables is partitioned and each block of variables is usually viewed as controllable by a separate local agent. Such an agent assigns values to the variables, and the aim is to provide distributed methods enabling a set of agents to come up with a global assignment (solution) that satisfies all the constraints.

Alternatively, the system might be understood as a distributed database. Here, the focus is on ensuring consistency of the global system if local constraints (the distributed parts of the database) change. In this setting, the aim is to determine whether the existence of a global solution can be guaranteed. We say that such a distributed constraint system is decomposed if we can find a global solution, or are able to preserve some global property, by allowing each agent to apply only local constraint processing steps without allowing for communication between the agents. In our talk we discuss some main issues arising in such distributed constraint solving processes without communication.

First, we develop a decomposition framework for distributed constraint systems. Next, we show that the problems of computing a solution a distributed way and the problem of maintaining a property (such as consistency) in a distributed way are in fact equivalent. Then we show that the problem of finding a solution for a constraint system and the problem of finding a suitable decomposition of a constraint system are polynomially related. This fact explains the popularity of decomposition applied to tractable constraint systems. Finally, we discuss some applications of decomposition in planning and scheduling.

## Contention

*Jaap van den Herik (UvT)*

ABSTRACT
Contention is a concept that perfectly applies to the academic world. In that world, it means (1) rivalry or competition, and (2) a point contended for in a scientific debate. In the lecture, we consider both meanings and discuss four cases. For all these cases, we examine whether a point of contention leads to a paradigm shift. Our four topics of research are as follows.

1. The world of games, the rivals are: minimax and Monte-Carlo Tree Search.

2. The development of supercomputers via grid technology to cloud computing, the rivals are: personal computing ( workstations inclusive) and cloud computing.

3. The development of WATSON, the rivals are: the human intellect and WATSON.

4. The development of eBay (60 million complaints per year), The rivals are: (a) human decisions, (b) computer decisions, and (c ) Crowdsourced Online Dispute Resolution.

My provisional conclusion (from these four cases) is that progress in science only seldomly leads to a paradigm shift. Nevertheless, I wholeheartedly welcome the launching of the NLeScienceCenter by NWO and SURF. They will provide an appropriate infrastructure and enable us to find new ways to new results, maybe new paradigms. You are all invited to contribute by finding new contentions to the scientific foundations of our research school SIKS. Ph.D. students are most challenged of all.

**Rationality and relevance in SIKS research**

*Roel Wieringa (UT)*

ABSTRACT

Design research is an iteration between two activities, namely designing new artifacts and investigating the properties of these artifacts. Examples of the artifacts designed and investigated in SIKS are search and retrieval algorithms, storage structures, network architectures, reasoning techniques, and human-machine interaction techniques. Design research must operate in a tension between rationality, which includes making all uncertainty and doubt of your results explicit, and relevance, which consists of fitness to solve a practical problem. In this talk I will investigate this tension as it appears in published SIKS theses. Which problems are investigated and how is their relevance motivated? How are research results validated? Can we maintain rationality in the face of mounting pressure for relevance?

## Search, Explore, Modify Engine

*Arjen de Vries (CWI/TUD)*

ABSTRACT
The role of search intermediaries and their interaction with users has the highest value in the "formative stages" of exploration and formulation of the information seeking process. However, one may wonder whether today's technology provides the search intermediary sufficient control to let them respond aptly to the users' articulation of their information need. Can we improve system support during the exploration of one or more richly annotated information sources and, perhaps even more importantly, can we provide search intermediaries with the means to decide for themselves how to navigate this "semantically" enriched document space? These two challenges areaddressed in the new interaction paradigm referred to as "search by strategy": separate search strategy definition (the "how") from the actual searching and browsing (the "what"). The envisioned iterative two-step process lets search intermediaries define (and in later iterations refine) their search strategy, using a visual query environment (the "search strategy builder"). The faceted browsing of (intermediate) result sets enables discovery of the semantic annotations most useful for the information seeking problem at hand.

The constructed search strategy provides a blue-print of the search engine that was generated in response, capturing the full details of the followed information seeking process; ready for reuse in future, highly similar tasks.