Call for Papers: Spatial Computing Workshop 2013

at 12th International Conference on Autonomous Agents and Multiagent Systems
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Submission Deadline: February 15th, 2013

Many self-organizing or self-adaptive multiagent systems are *spatial computers* – collections of local computational devices distributed through a physical space, in which:

- the difficulty of moving information between any two devices is strongly dependent on the distance between them, and
- the "functional goals" of the system are generally defined in terms of the system's spatial structure.

In multiagent systems, spatial relationships (location, region, frontier, neighborhood, obstruction, field, basin, communication, diffusion, propagation) are used to organize the interactions between agents where their location is important for the problem. Systems that can be viewed as spatial computers are abundant, both natural and man-made. For example, in wireless sensor networks and animal or robot swarms, inter-agent communication network topologies are determined by the distance between devices, while the agent collectives as a whole solve spatially-defined problems like "analyze and react to spatial temperature variance" or "surround and destroy an enemy". In biological embryos, each developing cell's behavior is controlled only by its local chemical and physical environment, but the eventual structure of the organism is a global property of the cellular arrangement. Moreover, a variety of successful established techniques for self-organization and self-adaptation arise from explicitly spatial metaphors, e.g., self-healing gradients.

On the other hand, not all spatially distributed systems are spatial computers. The Internet and peer-to-peer overlay networks may not in general best be considered as spatial computers, both because their communication graphs have little relation to the Euclidean geometry in which the participating devices are embedded, and because most applications for them are explicitly defined independent of network structure. Spatial computers, in contrast, tend to have more structure, with specific constraints and capabilities that can be used in the design and analysis of algorithms.

The goal of this workshop is to explicitly identify the idea of "spatial computing" as a theme in multiagent systems, and further to develop the study of spatial computation as a subject in its own right. We believe that progress towards identifying common principles, techniques, and research directions – and consolidating the substantial progress that is already being made – will benefit all of the fields in which spatial computing takes place. And, as the impact of spatial computing is recognized in many areas, we hope to set up frameworks to ensure portability and cross-fertilization between solutions in the various domains.

We are soliciting submissions on any aspect of spatial computing. Examples of topics of interest include, but are by no means limited to:

- Languages for programming spatial computers and describing spatial tasks and patterns
- Methods for compiling global programs to local rules that produce the desired global effect
- Characterization of spatial self-organization phenomena as algorithmic building blocks
- Relationships between agent interaction and spatial organisations
- Theoretical and practical limitations arising from spatial properties
- Characterization of error in spatial computers (e.g., error from approximating continuous space with networks of devices)
- Analysis of tradeoffs between system parameters (e.g., communication radius vs. device memory consumption)
- Studies of the relationship between time, propagation of information through the spatial computer, and computational complexity
- Application of spatial computing principles to novel areas, or generalization of area-specific techniques
- Device motion and collective motion in spatial computing algorithms
- Theoretical and empirical analysis of spatial applications

We encourage authors to submit papers in one of two formats: (1) Papers that develop "unifying" principles or techniques in spatial computing – these papers should be suitable in format and quality for a conference track, but avoid incrementalism. (2) Papers that demonstrate how a technique or problem from a specific area of application can usefully be generalized – these papers should be a combination of review paper and position paper, presenting the material from one area in a form comprehensible to researchers of another area, as well as a coherent technical argument generalizing the material to other areas. Although our interests are broad, we discourage authors from submitting reviews of particular application areas unless the paper explicitly connects the material to the larger technical issues of spatial computing.

For more information, see: `http://scw13.spatial-computing.org/`

Format, Submission and Publications. Papers should be no longer than 6 pages in standard ACM proceedings two-column format. All manuscripts should be submitted in PDF form to `scw13@spatial-computing.org` where all questions should be also addressed.

Workshop pre-proceedings will be published in a bundle with the main conference proceedings. *A special journal issue on spatial computing is planned for the post-proceedings at the end of 2013.*