

Participatory Semantics for Multi-Agent Systems

Carl Hewitt & Carl Manning

MIT AI Laboratory, 545 Technology Square, Cambridge, MA 02139-3931
 hewitt@ai.mit.edu, caroma@ai.mit.edu, <http://www.ai.mit.edu/projects/psg>

The study of participation in Multi-Agent Systems (MAS) can help develop scalable, plural, open information infrastructures, comprised of humans, equipment, and services. Participation by MAS depends on a synergy of interdependent, overlapping, and mutually supporting information infrastructures: availability infrastructures and participatory infrastructures (see figure). Availability infrastructures impact development of participatory infrastructures: e.g., mobile wireless infrastructure platforms can be immediately informed on-site about current whereabouts and participation, providing information needed for message screening infrastructures to manage interruptions. Participatory infrastructures impact development of availability infrastructures: e.g., message screening infrastructures reduce unwanted interruptions, which is needed for making wireless communications infrastructure more predictable and acceptable.

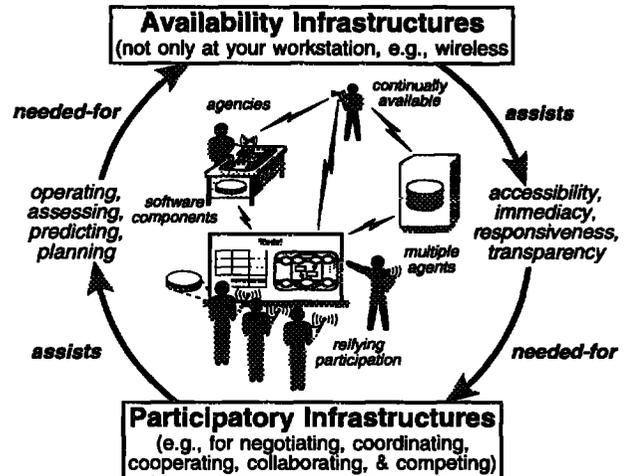
Availability Infrastructures make information services available, enabling MAS participants. Availability infrastructures provide:

- *Accessibility*: at hand as needed
- *Immediacy*: recorded on site as it happens
- *Responsiveness*: effective in real time
- *Transparency*: integrated naturally into the course of human activity

Participatory infrastructures provide services for participating and accounting for participation. They provide services which semantically link activities for our:

- *Operating* managing on-going participation.
- *Predicting*: anticipating potential contingencies
- *Assessing*: analyzing past participation.
- *Planning*: arranging future participating

We are developing foundations to address how participation is described and processed using telecomputer services. We call our approach *Participatory Semantics™*. Our approach concentrates on *participation*: how, when, who, what, where, etc. We take participation as distributed, open (multi-agent) activity. We take semantics of participation broadly: it includes influences on all subsequent participation. Criteria we have identified for participatory semantics are:



- *Concurrency*: deals with distributed open systems
 - *Scalability*: provides modularity and abstraction to manage increasing size and complexity.
 - *Plurality*: deals with multiple attributions of what was, is, or may be happening, which may conflict, or may be incommensurable, but are always incomplete.
 - *Openness*: deals with continually arriving new information, that needs to be taken into account.
- In participatory semantics, distributed open (multi-agent) activity is abstracted as *participations* in *Participatory Space-Time™*.
- *Participations* occupy *regions of space-time*. Roughly, our approach deals with *concurrency* by explicitly accounting for the arrangement of distributed activity in space-time. It deals with *scalability in size* by accounting for nested hierarchies of space-time regions.
 - *Participations* are annotated and related through *attributions*. Multiple participants may make attributions (*plurality*). New attributions can be added at any time (*openness*). Meanings are to be negotiated. Participations and attributions are software components which implement certain interfaces and protocols. *Scalability in complexity* can be addressed through behavior enhancement.