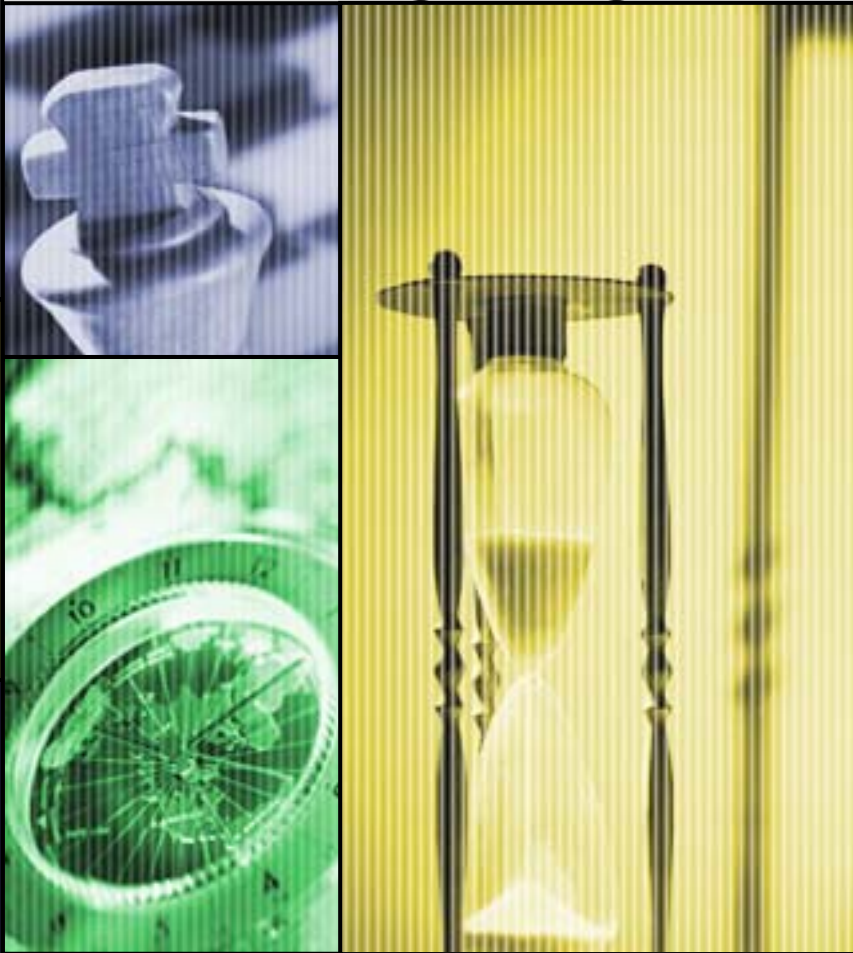


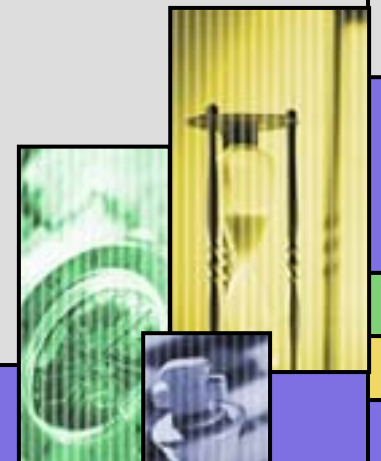
Semantics Framework – where we're going



Francis G. McCabe

Its my system, talking to yours

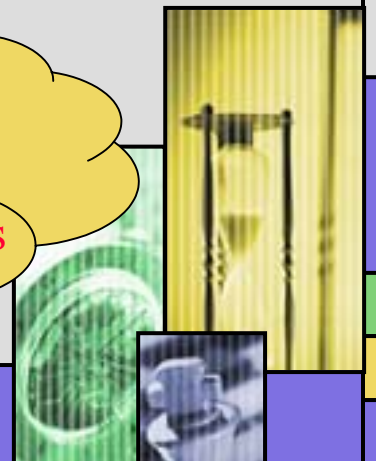
- The Internet acts as a public forum
- This changes many things
 - applications span ownership boundaries
 - require public semantics for interactions
 - require new ways of building software systems



Elements of Interoperability

- Institutions
 - defined by powers, rights, obligations, roles, capabilities
- Contracts
 - A formula that two or more agents agree that 'is the case'
- Conversations and transactions
 - A sequence of messages
- Communicative acts

Allows agents to share tasks to achieve goals across ownership boundaries



Speech Act Effects

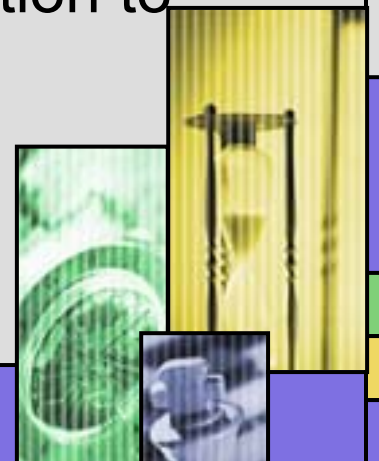
– Perlocutionary effect

- The effect that the speaker's speech acts have on the beliefs or actions of the hearer
 - includes the API view of the world

Neither is reducible
to the other

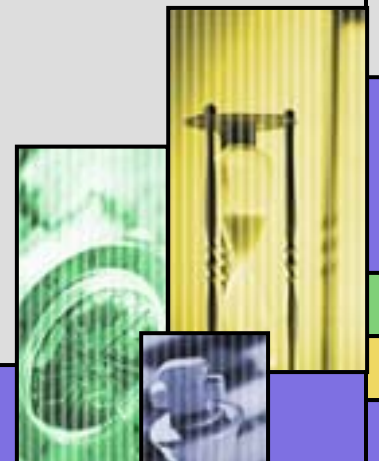
– Illocutionary effect

- Speaker intends to produce a certain effect by getting the hearer to recognize his intention to produce that effect
 - Declarations that change the world



An abstract agent

- Agent state
 - triple: (beliefs, goals, actions)
- Agent program
 - transition: $t((B,G,A),Act) \rightarrow (B,G,A)'$
- Agent action π in Act counts as
 - Attempt to ensure some \emptyset
 - Sees to it that some \emptyset



Institutions

- Permissions

- $\text{Per}_a \pi$ ($\pi \in (B, G, A)_a$ is an 'allowed' state)

- Obligations

- $\text{Obl}_a \pi$ ($\pi \in (B, G, A)_a$ is a 'required' state)

- {Institutional, Declarative} Power (Role)

- $\text{Pow}_a \rho$ is defined as: $E_a \phi \Rightarrow_I E_I \psi$

- $\text{Pow}_a \rho$ is defined as:

- $(E_a \zeta \ \& \ (E_a \zeta \Rightarrow_\sigma H_a \phi)) \Rightarrow_I E_I \phi$

I sees to it that ψ

a attempts to achieve ϕ



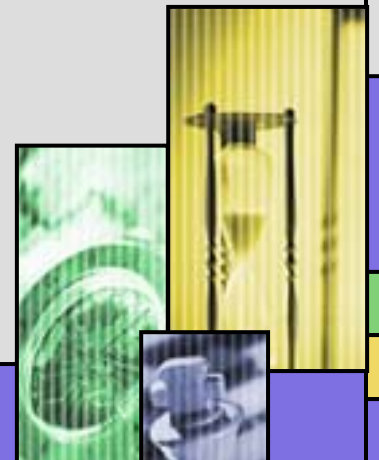
Contracts

- A formula that expresses the constraints on behaviour between two or more agents
- A contract is negotiated over
- A contract is signed using a declarative



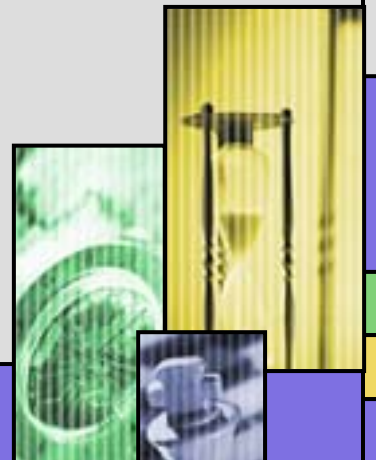
Conversations

- Sequence of messages
- Legal conversations
- A *transaction* consists of a combination of a conversation with an effect (a la rational effect) and precondition



Communicative Acts

- Defined in terms of publicly observable semantics
- Separate intention of speaker from interpretation of listener
- Meaning relative to the signaling system employed



An ideal inform

j informs *k* of *A*

In an ideal world
A is true

$E_j \text{ Done}(j, \text{inform}(k, A), _) \Rightarrow I^*A$

$B_k E_j \text{ Done}(j, \text{inform}(k, A), _)$

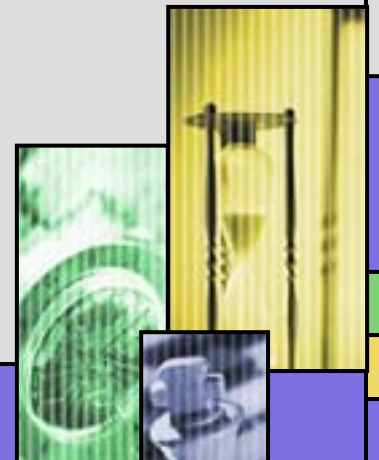
$B_k I^*A$

$B_k A$

if B_k reliable(*j*)

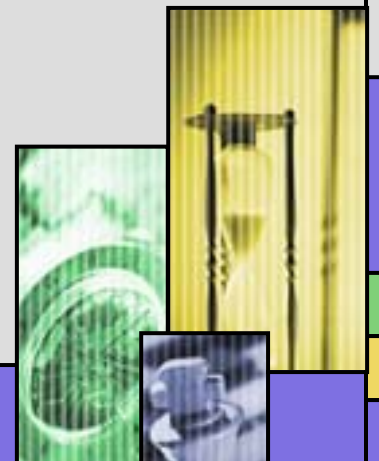
$B_k B_j A$

if B_k sincere(*j*)



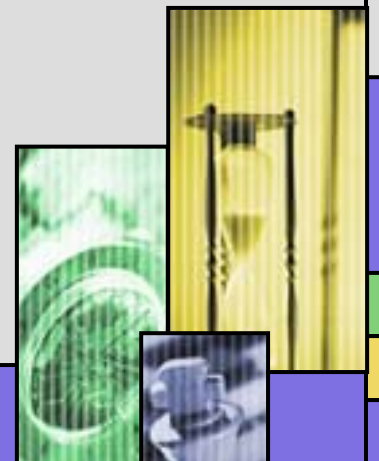
Agent Societies

- When an agent is part of a society
 - the agent has rights, obligations, power
- In the limit case, the power of a society comes either from the agents themselves or an external source



System security

- Foundation for explaining security:
 - An entry in an ACL (Access Control List)
 - Established by a policy statement
 - Policy enacted by an agent in a role
 - Exercising a power given to it
 - In the context of an institution
 - That is governed by a constitution



FIPA and the world

- Abstract Interoperability Architecture
 - promises a framework that accounts for agents achieving tasks in multi-owner situations
- Validated by logic notation that is part of semantic framework
- Should be reifiable in different concrete architectures

