Good Afternoon, Colleagues

Are there any questions?
Logistics

- Programming assignment 4 - any questions?
Logistics

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- Final project
ACL Desiderata
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**Form:** simple, readable, concise, easy to parse and generate, extensible
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**Environment:** interoperability with other languages

**Reliability:** reliable, secure, authentication possible, error handling
Three-layer organization

• Content: free-form (domain-dependent)
Three-layer organization

- **Content**: free-form (domain-dependent)
- **Communication**: who is sending, etc.
Three-layer organization

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- **Communication:** who is sending, etc.

- **Message:** performatives and fields (standard)
Three-layer organization

- Content: free-form (domain-dependent)
- Communication: who is sending, etc.
- Message: performatives and fields (standard)

(tell
  :sender stock-server
  :content (PRICE IBM 14)
  :receiver joe
  :in-reply-to ibm-stock
  :language LPROLOG
  :ontology NYSE-TICKS)
ACLs – Current Landscape

“Languages exist to serve a purpose, namely the communication between willing—and occasionally unwilling—participants”
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- There are different options
- Subtle differences
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- How are they created?
- Sample FIPA applications on resources page
Class Discussion

Mark Lewis on Team Communication
Locution: What is said (physical)
Locution: What is said (physical)

Illocution: What is meant
**Locution:** What is said (physical)

**Illocution:** What is meant

**Perlocution:** Intended effects
Locution: What is said (physical)

Illocution: What is meant

Perlocution: Intended effects

Example: “Please close the window.”
Beliefs, Desires, Intentions

- **Beliefs**: What the agent thinks to be true
- **Desires**: What it wants to be true
- **Intentions**: What it plans to do
BDI

Beliefs, Desires, Intentions

- Beliefs: What the agent thinks to be true
- Desires: What it wants to be true
- Intentions: What it plans to do

- A way of organizing an agent
- Not a well-defined method
Soccer server communication

- What is the soccer server communication protocol?
- How does it relate?
Soccer server communication

- What is the soccer server communication protocol?
- How does it relate?

An example protocol next week
STEAM

• An implementation/extension of joint intentions

• Goals
  – Anticipate teamwork failures
  – Flexibility and re-use
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• Joint intentions doesn’t do it all, though
STEAM

• An implementation/extension of joint intentions

• Goals
  – Anticipate teamwork failures
  – Flexibility and re-use

• Joint intentions doesn’t do it all, though
  – Coherence: all use same plan, commitment protocols
  – Communication cost — decision theoretic
  – Replanning — role dependencies
Team Operators

- Have preconditions, effects, termination rules
- Automatically establish joint intentions
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- To establish, “all team members must simultaneously select” a team operator to establish a joint intention
- Agents maintain “team state:” model of team’s mutual beliefs
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How should teams be formed initially?
Domains

- **Attack:**
  - Fly to holding point
  - Send out scouts
  - Shoot at enemy

- **Transport:**
  - Escorts protect transports

- **RoboCup**
Observed Problems

- Commander returns to home alone after failing, others stayed
Observed Problems

- Commander returns to home alone after failing, others stayed
- Scout never returned, others got into infinite loop
Observed Problems

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- One got orders first and went ahead alone
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- All out of ammunition, but failed to realize unachievable
Observed Problems

• Commander returns to home alone after failing, others stayed

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Solved generally with STEAM
Evaluation

• Used in 3 domains with different characteristics
Evaluation

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- STEAM rules can be re-used
- Flexibility: solves initial problems, can deal with small changes to environment
Evaluation

- Used in 3 domains with different characteristics
- STEAM rules can be re-used
- Flexibility: solves initial problems, can deal with small changes to environment
- Communication efficiency
- Encoding and modification effort
Pursuit Activity

**Group 1:** homogeneous, non-communicating

**Group 2:** homogeneous, communicating

**Group 3:** heterogeneous, non-communicating

**Group 4:** heterogeneous, communicating