Good Afternoon, Colleagues

Are there any questions?
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- Can an agent stop being an agent due to environment?
- Does it need to be persistent?
- Is social ability essential?
- What does “autonomy” mean?
- How can you categorize discrete/continuous?
Logistics

• First assignment: how did it go?
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• Next soccer assignment: score a goal
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  - Help each other with C issues — parsing strings
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  - Evaluating mostly on the logic — does the agent “do the right thing?”
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- 2D or 3D?
Self-Introductions

- Speak loudly
Self-Introductions

- Speak loudly
- Name, year, major
Self-Introductions

- Speak loudly
- Name, year, major
- At least one other thing about yourself
Discussion

An autonomous agent is a system situated within and a part of an environment that senses that environment and acts on it, over time, in pursuit of its own agenda and so as to affect what it senses in the future.

- Is this a good definition?
- The authors claim it is a “formal” definition of agents. Is it?
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• Can you do better?
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- Is this a good definition?
- The authors claim is is a “formal” definition of agents. Is it?
- Can you do better?
- Do they need to be social? persistent?
- Can they cease to be agents in a different environment?
- Autonomy
Varieties of Autonomy

- Do we have complete freedom over our beliefs, goals, and actions?
Varieties of Autonomy

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- Software service has no autonomy — does what it’s told.
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  - Decide how to act so as to accomplish delegated goals
Varieties of Autonomy

- Do we have complete freedom over our beliefs, goals, and actions?
- Software service has no autonomy — does what it’s told.
- What’s Wooldridge’s take on where autonomous agents lie on the spectrum?
  - Decide how to act so as to accomplish delegated goals
- Also mentions adjustable autonomy
My Requirements of Agents

- They must **sense** their environment.

- They must **decide** what action to take (“think”).

- They must **act** in their environment.
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**Complete Agents**
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**Multiagent systems:** Interact with other agents
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**Learning agents:** Improve performance from experience
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**Learning agents:** Improve performance from experience

- Autonomous Bidding, Cognitive Systems, Traffic management, **Robot Soccer**
Environments

Environment $\rightarrow$ sensations, actions
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- fully observable vs. partially observable (accessible)
Environments

Environment $\implies$ sensations, actions

- fully observable vs. partially observable (accessible)
- deterministic vs. non-deterministic
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- single-agent vs. multiagent
The Decision
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• reactive vs. deliberative
The Decision

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- multiagent reasoning?
The Decision

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- multiagent reasoning?
- learning?
Formalizing My Example

Knowns:
• $O = \{\text{Blue, Red, Green, Black, ...}\}$
• Rewards in $\mathbb{R}$
• $A = \{\text{Wave, Clap, Stand}\}$

Unkowns:
• $S = 4 \times 3$ grid
• $R : S \times A \to \mathbb{R}$
• $P : S \to O$
• $T : S \times A \to S$

\[
o_i = P(s_i) \quad r_i = R(s_i, a_i) \quad s_{i+1} = T(s_i, a_i)
\]
Standard/Reactive/State-based Agents

- Standard agent:
Standard/Reactive/State-based Agents

- Standard agent: \( \text{action} : P^* \mapsto A \)
**Standard/Reactive/State-based Agents**

- Standard agent: $\text{action} : \mathcal{P}^* \mapsto \mathcal{A}$

- Reactive agent:
Standard/Reactive/State-based Agents

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Standard/Reactive/State-based Agents

- Standard agent: \( action : P^* \mapsto A \)

- Reactive agent: \( action : P \mapsto A \)
  - Decision based entirely on the present
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Standard/Reactive/State-based Agents

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It is worth observing that state-based agents as defined here are in fact no more powerful than the standard agents we introduced earlier. In fact, they are identical in their expressive power.
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Reactive agents for next Thursday’s assignment task?
What new autonomous agents do you expect to see in the next 10 years?