Good Afternoon, Colleagues

Are there any questions?
Good Afternoon, Colleagues

Are there any questions?

• Will there be a definition? Does it matter?
Programming Assignment 2

- How did it go?
- Do we need a C tutorial?
- (1 more in C, then C++)
Logistics

- Next programming assignment: communication
Logistics

• Next programming assignment: communication

• Discussion list: Thomas, Ben
Logistics

- Next programming assignment: communication
- Discussion list: Thomas, Ben
- Littman talk
Class Discussion

Aashish Parekh on the future of Agent Intelligence
Environments

Environment $\rightarrow$ sensations, actions
Environments

- Environment $\rightarrow$ sensations, actions

- fully observable vs. partially observable (accessible)
- deterministic vs. non-deterministic
- episodic vs. non-episodic
- static vs. dynamic
- discrete vs. continuous
- single-agent vs. multiagent
Your Agent Examples
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**Physical control:** automated lawn mower, vacuum cleaner, security system, cruise control (3), finless rocket
Your Agent Examples

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Software control: java garbage collector, pccardd, computer virus, popup blocker, popup generator, stockbroker
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**Biological:** dog, human heart, human body minus brain
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**Human interaction:** Book finder, Amazon.com recommender, telephone voice control operator, chatbot, car navigation system, domino game-player

**Biological:** dog, human heart, human body minus brain

**Other:** National government (foreign relations)
My Example

- $S = \{\text{Blue, Red, Green, Black, \ldots}\}$
My Example

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- $A = \{\text{Wave, Clap, Stand}\}$
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- $P = S$, $\text{see}(s) = s$
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- $P = S$, $\text{see}(s) = s$
- $T : S \times A \mapsto S$ (\(T\) unknown to you)
My Example

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- $T : S \times A \mapsto S$ (T unknown to you)
- $R : S \times A \mapsto \mathbb{R}$ (R unknown to you)
My Example

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- $A = \{\text{Wave, Clap, Stand}\}$
- $P = S$, $\text{see}(s) = s$
- $T : S \times A \mapsto S$ \hspace{1cm} (T unknown to you)
- $R : S \times A \mapsto \mathbb{R}$ \hspace{1cm} (R unknown to you)

$s_0, p_0, a_0, r_0, s_1, p_1, a_1, r_1, s_2, \ldots$
My Example

• $S = \{\text{Blue, Red, Green, Black, \ldots}\}$
• $A = \{\text{Wave, Clap, Stand}\}$
• $P = S$, $\text{see}(s) = s$
• $T : S \times A \rightarrow S$ \hspace{1cm} (T unknown to you)
• $R : S \times A \rightarrow \mathbb{R}$ \hspace{1cm} (R unknown to you)

\[
\begin{array}{c}
s_0, p_0, a_0, r_0, s_1, p_1, a_1, r_1, s_2, \ldots
\end{array}
\]

• $p_i = \text{see}(s_i)$
My Example

- \( S = \{ \text{Blue, Red, Green, Black, \ldots} \} \)
- \( A = \{ \text{Wave, Clap, Stand} \} \)
- \( \mathcal{P} = S, \text{see}(s) = s \)
- \( \mathcal{T} : S \times A \mapsto S \quad (\mathcal{T} \text{ unknown to you}) \)
- \( \mathcal{R} : S \times A \mapsto \mathbb{R} \quad (\mathcal{R} \text{ unknown to you}) \)

\[
\begin{align*}
& s_0, p_0, a_0, r_0, s_1, p_1, a_1, r_1, s_2, \ldots \\
& p_i = \text{see}(s_i) \\
& r_i = \mathcal{R}(s_i, a_i)
\end{align*}
\]
My Example

- $S = \{\text{Blue, Red, Green, Black,} \ldots\}
- A = \{\text{Wave, Clap, Stand}\}
- P = S, \text{ see}(s) = s
- T : S \times A \mapsto S \quad (T \text{ unknown to you})
- R : S \times A \mapsto \mathbb{R} \quad (R \text{ unknown to you})

\begin{align*}
s_0, p_0, a_0, r_0, s_1, p_1, a_1, r_1, s_2, \ldots
\end{align*}

- $p_i = \text{see}(s_i)$
- $r_i = R(s_i, a_i)
- s_{i+1} = T(s_i, a_i)$
My Example

• \( S = \{\text{Blue, Red, Green, Black, \ldots}\} \)
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• \( P = S, \text{see}(s) = s \)
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The Decision
The Decision

- reactive vs. deliberative
The Decision

- reactive vs. deliberative
- multiagent reasoning?
The Decision

- reactive vs. deliberative
- multiagent reasoning?
- learning?
Standard vs. State-based Agents

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.
Standard vs. State-based Agents

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- Standard agent: \( \text{action} : S^* \rightarrow A \)
Reactive Agents

- action: \(\mathcal{P} \rightarrow \mathcal{A}\)

- Decision based entirely on the present
Reactive Agents

- action: $P \rightarrow A$

- Decision based entirely on the present

Reactive agents for today’s assignment task?
Agents and Objects
Agents and Objects

- Autonomy
- Flexibility
- Own thread of control