Good Afternoon, Colleagues

Are there any questions?
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Are there any questions?

- Progress in the teamwork challenge? (off-line review, on-line tracking)
- Infrastructure challenge: rescue too?
Logistics

• How did it go?
Logistics

- How did it go?

- Next soccer assignment: communication
Logistics

- How did it go?
- Next soccer assignment: communication
  - 1 more in C, then C++
Logistics

- How did it go?
- Next soccer assignment: communication
  - 1 more in C, then C++
- Optional: do rescue assignments 2 and 3 instead
Environments

Environment $\rightarrow$ sensations, actions
Environments

Environment $\implies$ sensations, actions

- fully observable vs. partially observable (accessible)
Environments

Environment $\rightarrow$ sensations, actions

- fully observable vs. partially observable (accessible)
- deterministic vs. non-deterministic
Environments

Environment $\rightarrow$ sensations, actions

- fully observable vs. partially observable (accessible)
- deterministic vs. non-deterministic
- static vs. dynamic
Environments

Environment $\rightarrow$ sensations, actions

- fully observable vs. partially observable (accessible)
- deterministic vs. non-deterministic
- static vs. dynamic
- discrete vs. continuous
Environments

- Environment $\Rightarrow$ sensations, actions

- fully observable vs. partially observable (accessible)
- deterministic vs. non-deterministic
- static vs. dynamic
- discrete vs. continuous
- episodic vs. non-episodic
Environments

- Environment $\rightarrow$ sensations, actions

- fully observable vs. partially observable (accessible)
- deterministic vs. non-deterministic
- static vs. dynamic
- discrete vs. continuous
- episodic vs. non-episodic
- single-agent vs. multiagent
Your Agent Examples
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**Physical control:** Automatic gear shift, roomba (2), traffic light control, Mars rover
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**Software control:** DVR (2), web crawler, spam filter, computer virus, smoke alarm (2), GPL locator
Your Agent Examples

**Physical control:** Automatic gear shift, roomba (2), traffic light control, Mars rover

**Software control:** DVR (2), web crawler, spam filter, computer virus, smoke alarm (2), GPL locator

**Human interaction:** Game AI agent, chatbot, political demonstrator
Your Agent Examples

**Physical control:** Automatic gear shift, roomba (2), traffic light control, Mars rover

**Software control:** DVR (2), web crawler, spam filter, computer virus, smoke alarm (2), GPL locator

**Human interaction:** Game AI agent, chatbot, political demonstrator

**Biological:** real virus
My Example

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

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

- \( S = \{\text{Blue, Red, Green, Black, \ldots}\} \)
- \( A = \{Wave, Clap, Stand\} \)
- \( P = S, \; see(s) = s \)
My Example

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

- $S = \{\text{Blue, Red, Green, Black, } \ldots\}$
- $A = \{\text{Wave, Clap, Stand}\}$
- $\mathcal{P} = S$, $\text{see}(s) = s$
- $\mathcal{T} : S \times A \mapsto S$ \hspace{1em} ($\mathcal{T}$ unknown to you)
- $\mathcal{R} : S \times A \mapsto \mathbb{R}$ \hspace{1em} ($\mathcal{R}$ unknown to you)
My Example

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

\[
\begin{align*}
& s_0, \, p_0, \, a_0, \, r_0, \, s_1, \, p_1, \, a_1, \, r_1, \, s_2, \, \ldots
\end{align*}
\]
My Example

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

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

- $p_i = \text{see}(s_i)$
My Example

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

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

- \( p_i = \text{see}(s_i) \)
- \( r_i = R(s_i, a_i) \)
My Example

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

\[
\begin{array}{c}
s_0, p_0, a_0, r_0, s_1, p_1, a_1, r_1, s_2, \ldots \\
p_i = \text{see}(s_i) \\
r_i = \mathcal{R}(s_i, a_i) \\
s_{i+1} = \mathcal{T}(s_i, a_i)
\end{array}
\]
My Example

- \( S = \{ \text{Blue, Red, Green, Black, \ldots} \} \)
- \( A = \{ \text{Wave, Clap, Stand} \} \)
- \( P = S, \ \text{see}(s) = s \)
- \( T : S \times A \mapsto S \quad (T \text{ unknown to you}) \)
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\[
\begin{align*}
s_0, p_0, a_0, r_0, s_1, p_1, a_1, r_1, s_2, & \ldots \\
p_i &= \text{see}(s_i) \\
r_i &= R(s_i, a_i) \\
s_{i+1} &= T(s_i, a_i)
\end{align*}
\]