CS344M
Autonomous Multiagent Systems
Spring 2008

Prof: Peter Stone
TA: Doran Chakroborty

Department of Computer Sciences
The University of Texas at Austin

Final RoboCup Tournament
Wednesday, May 7th, 2008

Agents

1. Sense
2. Decide ("think")
3. Act

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3. Act

Situated in an Environment

Environments

Environment $\Rightarrow$ sensations, actions

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Environment $\Rightarrow$ sensations, actions

- fully observable vs. partially observable
- deterministic vs. non-deterministic
- episodic vs. non-episodic
- static vs. dynamic
- discrete vs. continuous
- single-agent vs. multiagent

RoboCup

An international AI and Robotics research initiative

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- Use **soccer** as a rich and realistic test-bed

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  - 2 teams of agents on a field with 2 goals
  - **Purpose:** direct ball into opponent's goal

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- Robot and simulation **competitions**

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- Use **soccer** as a rich and realistic test-bed
  - 2 teams of agents on a field with 2 goals
  - **Purpose:** direct ball into opponent's goal
- Robot and simulation **competitions**
- Workshops; RoboCup-Jr; RoboCup-Rescue

Research Challenges

- Multiple **teammates** with a common goal
- Multiple **adversaries** — not known in advance

Research Challenges

- Multiple **teammates** with a common goal
- Multiple **adversaries** — not known in advance
- **Real-time** decision making necessary
- **Noisy** sensors and actuators
- Enormous state-space

RoboCup Simulator

-

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- Distributed: each player a separate client
- Server models dynamics and kinematics

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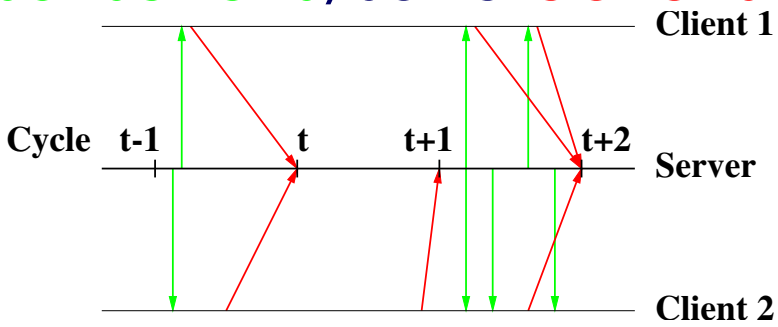

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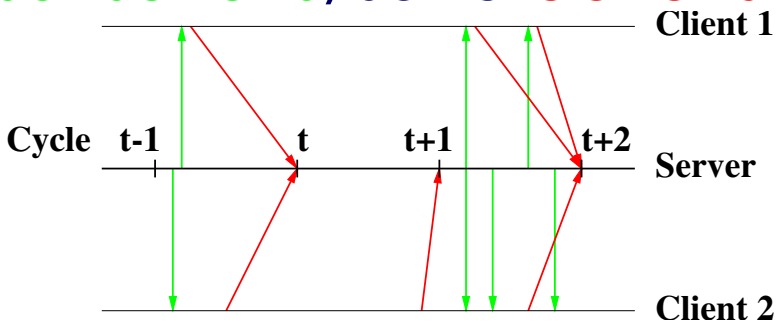

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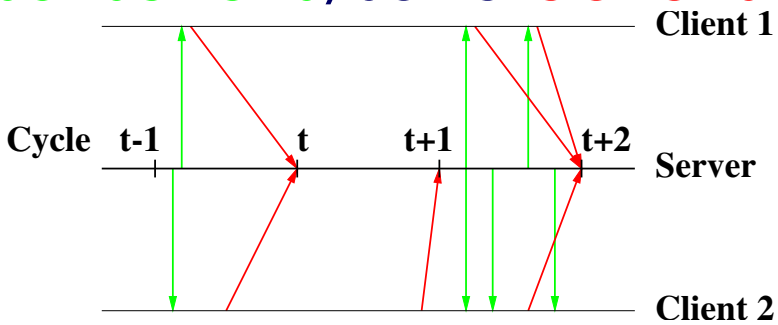

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- Abstract, noisy sensors, hidden state
  - Hear sounds from limited distance
  - See relative distance, angle to objects ahead

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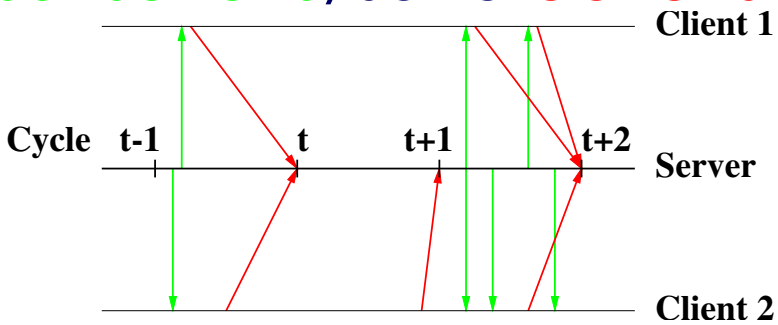

- Parametric actions: dash, turn, kick, say
- Abstract, noisy sensors, hidden state
  - Hear sounds from limited distance
  - See relative distance, angle to objects ahead
- $> 10^{9^{23}}$ states
- Limited resources : stamina
- Play occurs in real time ($\approx$ human parameters)

Schedule

- Overview
- **Tournament part 1**
- Video: real soccer robots
- Tournament part 2
- Challenge matches: winner vs.:
  Base code, UvA-trilearn 2005 team

The Teams

• Agent Kings	Gillan
• Mighty Griffins	Alton
• Mapfields	Ashok/Li
• ML4Defense	Gowrisankar
• Team Ballhogs	Setapen
• Warpigs	Copple/Falcon
• Directoids	Jordan
• Lazy Eye	Kou
• PASsifists	Stout
• Shane-anigans	Hogan
• T. H. Huxley's Herd	Blakeley
• Walli	Lai

The Tournament

- Two groups of 6 with round robins (30 games)

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  - Semifinals: 1 vs. 2, 2 vs. 1 $\longrightarrow$ finals, 3rd place
  - 5th, 7th, 9th, 11th place games

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  - 5th, 7th, 9th, 11th place games
- Run **off-line**, but results kept secret

Group 1 Round Robin

	A	B	C	D	E	F	Pts
A Kings	—						
B Griffins		—					
C Mapfields			—				
D ML4Defense				—		*	
E Ballhogs					—		
F Warpigs				*		—	

Group 1 Round Robin

	A	B	C	D	E	F	Pts
A Kings	—						
B Griffins		—			*		
C Mapfields			—				
D ML4Defense				—		0–5	**0**
E Ballhogs		*			—		
F Warpigs				5–0		—	**3**

Group 1 Round Robin

	A	B	C	D	E	F	Pts
A Kings	—				*		
B Griffins		—			0–0		1
C Mapfields			—				
D ML4Defense				—		0–5	0
E Ballhogs	*	0–0			—		1
F Warpigs				5–0		—	3

Group 1 Round Robin

	A	B	C	D	E	F	Pts
A Kings	—				5–0		**3**
B Griffins		—			0–0		**1**
C Mapfields			—	*			
D ML4Defense			*	—		0–5	**0**
E Ballhogs	0–5	0–0			—		**1**
F Warpigs				5–0		—	**3**

Group 1 Round Robin

	A	B	C	D	E	F	Pts
A Kings	—				5–0		**3**
B Griffins		—			0–0	*	**1**
C Mapfields			—	0–0			**1**
D ML4Defense			0–0	—		0–5	**1**
E Ballhogs	0–5	0–0			—		**1**
F Warpigs		*		5–0		—	**3**

Group 1 Round Robin

	A	B	C	D	E	F	Pts
A Kings	—				5–0		**3**
B Griffins		—			0–0	0–12	**1**
C Mapfields			—	0–0	*		**1**
D ML4Defense			0–0	—		0–5	**1**
E Ballhogs	0–5	0–0	*		—		**1**
F Warpigs		12–0		5–0		—	**6**

Group 1 Round Robin

	A	B	C	D	E	F	Pts
A Kings	—				5–0		**3**
B Griffins		—			0–0	0–12	**1**
C Mapfields			—	0–0	2-0		**1**
D ML4Defense			0–0	—		0–5	**1**
E Ballhogs	0–5	0–0	0–2		—		**1**
F Warpigs		12–0		5–0		—	**6**

Group 1 Round Robin

	A	B	C	D	E	F	Pts
A Kings	—	5–0	4–0	2–0	5–0	*	**12**
B Griffins	0–5	—	1–0	0–2	0–0	0–12	**4**
C Mapfields	0–4	0–1	—	0–0	5–0	0–1	**4**
D ML4Defense	0–2	2–0	0–0	—	5–0	0–5	**7**
E Ballhogs	0–5	0–0	0–5	0–5	—	0–6	**1**
F Warpigs	*	12–0	1–0	5–0	6–0	—	**12**

Group 1 Round Robin

	A	B	C	D	E	F	Pts
A Kings	—	5–0	4–0	2–0	5–0	4–0	**15**
B Griffins	0–5	—	1–0	0–2	0–0	0–12	**4**
C Mapfields	0–4	0–1	—	0–0	5–0	0–1	**4**
D ML4Defense	0–2	2–0	0–0	—	5–0	0–5	**7**
E Ballhogs	0–5	0–0	0–5	0–5	—	0–6	**1**
F Warpigs	0–4	12–0	1–0	5–0	6–0	—	**12**

Group 1 Rankings

	A	B	C	D	E	F	Rank
A Kings	—	5–0	4–0	2–0	5–0	4–0	**1**
B Griffins	0–5	—	1–0	0–2	0–0	0–12	**4**
C Mapfields	0–4	0–1	—	0–0	5–0	0–1	**5**
D ML4Defense	0–2	2–0	0–0	—	5–0	0–5	**3**
E Ballhogs	0–5	0–0	0–5	0–5	—	0–6	**6**
F Warpigs	0–4	12–0	1–0	5–0	6–0	—	**2**

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Schedule

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- Tournament part 1
- Video: real soccer robots
- **Tournament part 2**
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Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—						
B Lazy Eye		—					
C PASsifists			—				
D Shane-anigans				—		*	
E Huxley's Herd					—		
F Walli				*		—	

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—					*	
B Lazy Eye		—					
C PASsifists			—				
D Shane-anigans				—		4–0	**3**
E Huxley's Herd					—		
F Walli	*			0–4		—	**0**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—		*			3–0	**3**
B Lazy Eye		—					
C PASsifists	*		—				
D Shane-anigans				—		4–0	**3**
E Huxley's Herd					—		
F Walli	0–3			0–4		—	**0**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—		1–2		*	3–0	**3**
B Lazy Eye		—					
C PASsifists	2–1		—			16–0	**6**
D Shane-anigans				—		4–0	**3**
E Huxley's Herd	*				—		
F Walli	0–3		0–16	0–4		—	**0**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—		1–2		0–2	3–0	**3**
B Lazy Eye		—			*		
C PASsifists	2–1		—			16–0	**6**
D Shane-anigans				—		4–0	**3**
E Huxley's Herd	2–0	*			—		**3**
F Walli	0–3		0–16	0–4		—	**0**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—	*	1–2		0–2	3–0	**3**
B Lazy Eye	*	—			5–0		**3**
C PASsifists	2–1		—			16–0	**6**
D Shane-anigans				—		4–0	**3**
E Huxley's Herd	2–0	0–5			—		**3**
F Walli	0–3		0–16	0–4		—	**0**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—	0–4	1–2		0–2	3–0	**3**
B Lazy Eye	4–0	—			5–0		**6**
C PASsifists	2–1		—			16–0	**6**
D Shane-anigans				—	*	4–0	**3**
E Huxley's Herd	2–0	0–5		*	—		**3**
F Walli	0–3		0–16	0–4		—	**0**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—	0–4	1–2		0–2	3–0	**3**
B Lazy Eye	4–0	—			5–0		**6**
C PASsifists	2–1		—			16–0	**6**
D Shane-anigans				—	3–0	4–0	**6**
E Huxley's Herd	2–0	0–5		0–3	—		**3**
F Walli	0–3		0–16	0–4		—	**0**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—	0–4	1–2	1–3	0–2	3–0	**3**
B Lazy Eye	4–0	—		*	5–0	13–0	**9**
C PASsifists	2–1		—		5–0	16–0	**9**
D Shane-anigans	3–1	*		—	3–0	4–0	**9**
E Huxley's Herd	2–0	0–5	0–5	0–3	—	0–0	**4**
F Walli	0–3	0–13	0–16	0–4	0–0	—	**1**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—	0–4	1–2	1–3	0–2	3–0	**3**
B Lazy Eye	4–0	—		1–0	5–0	13–0	**12**
C PASsifists	2–1		—	*	5–0	16–0	**9**
D Shane-anigans	3–1	0–1	*	—	3–0	4–0	**9**
E Huxley's Herd	2–0	0–5	0–5	0–3	—	0–0	**4**
F Walli	0–3	0–13	0–16	0–4	0–0	—	**1**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—	0–4	1–2	1–3	0–2	3–0	**3**
B Lazy Eye	4–0	—	*	1–0	5–0	13–0	**12**
C PASsifists	2–1	*	—	5–1	5–0	16–0	**12**
D Shane-anigans	3–1	0–1	1–5	—	3–0	4–0	**9**
E Huxley's Herd	2–0	0–5	0–5	0–3	—	0–0	**4**
F Walli	0–3	0–13	0–16	0–4	0–0	—	**1**

Group 2 Round Robin

	A	B	C	D	E	F	Pts
A Directoids	—	0–4	1–2	1–3	0–2	3–0	**3**
B Lazy Eye	4–0	—	2–5	1–0	5–0	13–0	**12**
C PASsifists	2–1	5–2	—	5–1	5–0	16–0	**15**
D Shane-anigans	3–1	0–1	1–5	—	3–0	4–0	**9**
E Huxley's Herd	2–0	0–5	0–5	0–3	—	0–0	**4**
F Walli	0–3	0–13	0–16	0–4	0–0	—	**1**

Round Robin Rankings

	A	B	C	D	E	F	Rank
A Kings	—	5–0	4–0	2–0	5–0	4–0	**1**
B Griffins	0–5	—	1–0	0–2	0–0	0–12	**4**
C Mapfields	0–4	0–1	—	0–0	5–0	0–1	**5**
D ML4Defense	0–2	2–0	0–0	—	5–0	0–5	**3**
E Ballhogs	0–5	0–0	0–5	0–5	—	0–6	**6**
F Warpigs	0–4	12–0	1–0	5–0	6–0	—	**2**

	A	B	C	D	E	F	Rank
A Directoids	—	0–4	1–2	1–3	0–2	3–0	**5**
B Lazy Eye	4–0	—	2–5	1–0	5–0	13–0	**2**
C PASsifists	2–1	5–2	—	5–1	5–0	16–0	**1**
D Shane-anigans	3–1	0–1	1–5	—	3–0	4–0	**3**
E Huxley's Herd	2–0	0–5	0–5	0–3	—	0–0	**4**
F Walli	0–3	0–13	0–16	0–4	0–0	—	**6**

Playoffs

11th Place: Ballhogs vs. Walli *

9th Place: Mapfields vs. Directoids

7th Place: Griffins vs. Huxley's Herd

5th Place: ML4Defense vs. Shane-anigans

Semifinal: AgentKings vs. Lazy Eye

Semifinal: Warpigs vs. PASsifists

3rd Place: ? vs. ?

1st Place: ? vs. ?

Playoffs

11th Place: Ballhogs vs. Walli 1–0

9th Place: Mapfields vs. Directoids *

7th Place: Griffins vs. Huxley's Herd

5th Place: ML4Defense vs. Shane-anigans

Semifinal: AgentKings vs. Lazy Eye

Semifinal: Warpigs vs. PASsifists

3rd Place: ? vs. ?

1st Place: ? vs. ?

Playoffs

11th Place: Ballhogs vs. Walli 1–0

9th Place: Mapfields vs. Directoids 0–0

7th Place: Griffins vs. Huxley's Herd *

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Playoffs

11th Place: Ballhogs vs. Walli 1–0

9th Place: Mapfields vs. Directoids 0–0

7th Place: Griffins vs. Huxley's Herd 0–0

5th Place: ML4Defense vs. Shane-anigans *

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3rd Place: ? vs. ?

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Playoffs

11th Place: Ballhogs vs. Walli 1–0

9th Place: Mapfields vs. Directoids 0–0

7th Place: Griffins vs. Huxley's Herd 0–0

5th Place: ML4Defense vs. Shane-anigans 0–2

Semifinal: AgentKings vs. Lazy Eye *

Semifinal: Warpigs vs. PASsifists

3rd Place: ? vs. ?

1st Place: ? vs. ?

Playoffs

11th Place: Ballhogs vs. Walli 1–0

9th Place: Mapfields vs. Directoids 0–0

7th Place: Griffins vs. Huxley's Herd 0–0

5th Place: ML4Defense vs. Shane-anigans 0–2

Semifinal: AgentKings vs. Lazy Eye 3–2

Semifinal: Warpigs vs. PASsifists *

3rd Place: Lazy Eye vs. ?

1st Place: AgentKings vs. ?

Playoffs

11th Place: Ballhogs vs. Walli	1–0
9th Place: Mapfields vs. Directoids	0–0
7th Place: Griffins vs. Huxley's Herd	0–0
5th Place: ML4Defense vs. Shane-anigans	0–2
Semifinal: AgentKings vs. Lazy Eye	3–2
Semifinal: Warpigs vs. PASsifists	0–3
3rd Place: Lazy Eye vs. Warpigs *	
1st Place: AgentKings vs. PASsifists	

Playoffs

11th Place: Ballhogs vs. Walli	1–0
9th Place: Mapfields vs. Directoids	0–0
7th Place: Griffins vs. Huxley's Herd	0–0
5th Place: ML4Defense vs. Shane-anigans	0–2
Semifinal: AgentKings vs. Lazy Eye	3–2
Semifinal: Warpigs vs. PASsifists	0–3
3rd Place: Lazy Eye vs. Warpigs	3–0
1st Place: AgentKings vs. PASsifists *	

Playoffs

11th Place: Ballhogs vs. Walli	1–0
9th Place: Mapfields vs. Directoids	0–0
7th Place: Griffins vs. Huxley's Herd	0–0
5th Place: ML4Defense vs. Shane-anigans	0–2
Semifinal: AgentKings vs. Lazy Eye	3–2
Semifinal: Warpigs vs. PASsifists	0–3
3rd Place: Lazy Eye vs. Warpigs	3–0
1st Place: AgentKings vs. **PASsifists**	2–4

Final Standings

1.	**PASsifists**	Stout
2.	**Agent Kings**	Gillan
3.	**Lazy Eye**	Kou
4.	**Warpigs**	Copple/Falcon
5.	**Shane-anigans**	Hogan
6.	**ML4Defense**	Gowrisankar
7.	**Mighty Griffins**	Alton
7.	**T. H. Huxley's Herd**	Blakeley
9.	**Mapfields**	Ashok/Li
9.	**Directoids**	Jordan
11.	**Team Ballhogs**	Setapen
12.	**Walli**	Lai

Challenge Matches

- PASsifists vs. UVA base code *
- PASsifists vs. UVA Trilearn 2005

Challenge Matches

- PASsifists vs. UVA base code 3–2
- PASsifists vs. UVA Trilearn 2005 * (10th place)

Challenge Matches

- PASsifists vs. UVA base code 3–2
- PASsifists vs. UVA Trilearn 2005 0–28

For More Information

- www.robocup.org
- www.cs.utexas.edu/~AustinVilla
- www.cs.utexas.edu/~pstone

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Layered Learning in Multiagent Systems: A Winning Approach to Robotic Soccer
Peter Stone. MIT Press, 2000.