CS378: Autonomous Multiagent Systems

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Final RoboCup Tournament
December 17th, 2002

Agents

1. Sense

2. Decide (“think”)

3. Act

$\boxed{\text{Situated in an Environment}}$

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Environments

$$\boxed{\text{Environment} \Rightarrow \text{sensations, actions}}$$

- 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

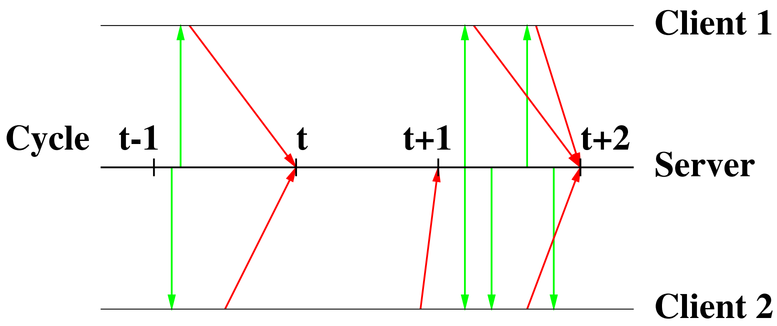
- Use soccer as a rich and realistic test-bed
  - 2 teams of agents on a field with 2 goals
  - Purpose: direct ball into opponent's goal
- Robotic and simulation competitions
- Workshops; RoboCup-Jr; RoboCup-Rescue

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

- Distributed: each player a separate client
- Server models dynamics and kinematics
- Clients receive sensations, send actions



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

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Schedule

1. Overview
2. **Tournament preliminaries**
3. Video: real soccer robots
4. Tournament playoffs
5. Challenge match: winner vs. United-2002
6. *(More videos)*

The Teams

Team	Members
The Ants	Chris Lemprecht
Galen's Awesome Goalie and 10 other guys	Menzel
Harami No1	Bharat Kejriwal and Ali Niaz
The Iron Curtain	Cyrus Astaneh
NeuKastle	Brett Neuman and Joshua Kasper
OD02	Wade Williams
Proust	James Marrs
The Red Devils	Henrard Christophe
Shichi Fujukin	Justin Lallinger
Spastic Tameless Horses	David Villa
Yellow Polka Dots	Usman Qadir

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Shichi Fujukin	Justin Lallinger
Spastic Tameless Horses	David Villa
Yellow Polka Dots	Usman Qadir

Other Class Members: Gautam Agarwal, Grant Gavares

Thanks: Vinay Sampath Kumar

The Tournament

- Break into 2 groups of 5 and 6 for round robins
- 2 from each group go to semifinals
- Run off-line, but results guarded

The Groups

	A	B	C	D	E
A Ants	—				
B NeuKastle		—			
C OD02			—		
D Shichi				—	
E YellowPolka					—

	F	G	H	I	J	K
F Galen	—					
G HaramiNo1		—				
H Iron Curtain			—			
I Proust				—		
J Red Devils					—	
K STH						—

Group 1

	A	B	C	D	E
A Ants	—				
B NeuKastle		—			*
C OD02			—		
D Shichi				—	
E YellowPolka					—

Group 1

	A	B	C	D	E
A Ants	—			*	
B NeuKastle		—			1–11
C OD02			—		
D Shichi				—	
E YellowPolka		11–1			—

Group 1

	A	B	C	D	E
A Ants	—			1–7	
B NeuKastle		—			1–11
C OD02			—		
D Shichi	7–1			—	
E YellowPolka		11–1			—

Group 1

	A	B	C	D	E
A Ants	—	46-0	*	1–7	
B NeuKastle	0-46	—			1–11
C OD02			—		
D Shichi	7–1			—	
E YellowPolka		11–1			—

Group 1

	A	B	C	D	E
A Ants	—	46-0	3–3	1–7	
B NeuKastle	0-46	—			1–11
C OD02	3–3		—		
D Shichi	7–1			—	
E YellowPolka		11–1			—

Group 1

	A	B	C	D	E
A Ants	—	46–0	3–3	1–7	
B NeuKastle	0–46	—	0–17	0–41	1–11
C OD02	3–3	17–0	—	1–7	
D Shichi	7–1	0–41	7–1	—	*
E YellowPolka		11–1			—

Group 1

	A	B	C	D	E
A Ants	—	46–0	3–3	1–7	
B NeuKastle	0–46	—	0–17	0–41	1–11
C OD02	3–3	17–0	—	1–7	
D Shichi	7–1	0–41	7–1	—	0–1
E YellowPolka		11–1		1–0	—

Group 1

	A	B	C	D	E
A Ants	—	46-0	3–3	1–7	0–13
B NeuKastle	0–46	—	0–17	0–41	1–11
C OD02	3–3	17–0	—	1–7	1–6
D Shichi	7–1	0–41	7–1	—	0–1
E YellowPolka	13–0	11–1	6–1	1–0	—

Group 1

	A	B	C	D	E	Rank
A Ants	—	46–0	3–3	1–7	0–13	**5**
B NeuKastle	0–46	—	0–17	0–41	1–11	**3**
C OD02	3–3	17–0	—	1–7	1–6	**4**
D Shichi	7–1	0–41	7–1	—	0–1	**2**
E YellowPolka	13–0	11–1	6–1	1–0	—	**1**

Group 2

	F	G	H	I	J	K
F Galen	—					
G HaramiNo1		—				
H Iron Curtain			—			*
I Proust				—		
J Red Devils					—	
K STH						—

Group 2

	F	G	H	I	J	K
F Galen	—					
G HaramiNo1		—		*		
H Iron Curtain			—			3–0
I Proust				—		
J Red Devils					—	
K STH			0–3			—

Group 2

	F	G	H	I	J	K
F Galen	—					
G HaramiNo1		—		3–4		
H Iron Curtain			—			3–0
I Proust		4–3		—		
J Red Devils					—	
K STH			0–3			—

Group 2

	F	G	H	I	J	K
F Galen	—					*
G HaramiNo1		—	25–0	3–4		
H Iron Curtain		0–25	—			3–0
I Proust		4–3		—		
J Red Devils					—	
K STH			0–3			—

Group 2

	F	G	H	I	J	K
F Galen	—					14–3
G HaramiNo1		—	25–0	3–4		
H Iron Curtain		0–25	—			3–0
I Proust		4–3		—		
J Red Devils					—	*
K STH	3–14		0–3			—

Group 2

	F	G	H	I	J	K
F Galen	—					14–3
G HaramiNo1		—	25–0	3–4		
H Iron Curtain		0–25	—			3–0
I Proust		4–3		—		
J Red Devils					—	12–0
K STH	3–14		0–3		0–12	—

Group 2

	F	G	H	I	J	K
F Galen	—		8–1		*	14–3
G HaramiNo1		—	25–0	3–4		16–0
H Iron Curtain	1–8	0–25	—	0–14	0–1	3–0
I Proust		4–3	14–0	—		26–0
J Red Devils			1–0		—	12–0
K STH	3–14	0–16	0–3	0–26	0–12	—

Group 2

	F	G	H	I	J	K
F Galen	—		8–1		6–4	14–3
G HaramiNo1		—	25–0	3–4		16–0
H Iron Curtain	1–8	0–25	—	0–14	0–1	3–0
I Proust		4–3	14–0	—		26–0
J Red Devils	4–6		1–0		—	12–0
K STH	3–14	0–16	0–3	0–26	0–12	—

Group 2

	F	G	H	I	J	K
F Galen	—		8–1	7–9	6–4	14–3
G HaramiNo1		—	25–0	3–4		16–0
H Iron Curtain	1–8	0–25	—	0–14	0–1	3–0
I Proust	9–7	4–3	14–0	—	*	26–0
J Red Devils	4–6		1–0		—	12–0
K STH	3–14	0–16	0–3	0–26	0–12	—

Group 2

	F	G	H	I	J	K
F Galen	—		8–1	7–9	6–4	14–3
G HaramiNo1		—	25–0	3–4		16–0
H Iron Curtain	1–8	0–25	—	0–14	0–1	3–0
I Proust	9–7	4–3	14–0	—	2–1	26–0
J Red Devils	4–6		1–0	1–2	—	12–0
K STH	3–14	0–16	0–3	0–26	0–12	—

Group 2

	F	G	H	I	J	K
F Galen	—	*	8–1	7–9	6–4	14–3
G HaramiNo1		—	25–0	3–4	6–0	16–0
H Iron Curtain	1–8	0–25	—	0–14	0–1	3–0
I Proust	9–7	4–3	14–0	—	2–1	26–0
J Red Devils	4–6	0–6	1–0	1–2	—	12–0
K STH	3–14	0–16	0–3	0–26	0–12	—

Group 2

	F	G	H	I	J	K
F Galen	—	2–4	8–1	7–9	6–4	14–3
G HaramiNo1	4–2	—	25–0	3–4	6–0	16–0
H Iron Curtain	1–8	0–25	—	0–14	0–1	3–0
I Proust	9–7	4–3	14–0	—	2–1	26–0
J Red Devils	4–6	0–6	1–0	1–2	—	12–0
K STH	3–14	0–16	0–3	0–26	0–12	—

Group 2

	F	G	H	I	J	K	Rank
F Galen	—	2–4	8–1	7–9	6–4	14–3	**3**
G HaramiNo1	4–2	—	25–0	3–4	6–0	16–0	**2**
H Iron Curtain	1–8	0–25	—	0–14	0–1	3–0	**5**
I Proust	9–7	4–3	14–0	—	2–1	26–0	**1**
J Red Devils	4–6	0–6	1–0	1–2	—	12–0	**4**
K STH	3–14	0–16	0–3	0–26	0–12	—	**6**

Playoffs

Semifinal: HaramiNo1 vs. YellowPolkaDots *

5th Place: Galen vs. Ants

11th Place: STH vs. NeuKastle

7th Place: RedDevils vs. OD02

Semifinal: Proust vs. ShichiFujukin

9th Place: Iron Curtain vs. ?

3rd Place: ? vs. ?

1st Place: ? vs. ?

Playoffs

Semifinal: HaramiNo1 vs. YellowPolkaDots 0–7

5th Place: Galen vs. Ants *

11th Place: STH vs. NeuKastle

7th Place: RedDevils vs. OD02

Semifinal: Proust vs. ShichiFujukin

9th Place: Iron Curtain vs. ?

3rd Place: HaramiNo1 vs. ?

1st Place: YellowPolkaDots vs. ?

Playoffs

Semifinal: HaramiNo1 vs. YellowPolkaDots 0–7

5th Place: Galen vs. Ants 3–19

11th Place: STH vs. NeuKastle *

7th Place: RedDevils vs. OD02

Semifinal: Proust vs. ShichiFujukin

9th Place: Iron Curtain vs. ?

3rd Place: HaramiNo1 vs. ?

1st Place: YellowPolkaDots vs. ?

Playoffs

Semifinal: HaramiNo1 vs. YellowPolkaDots 0–7

5th Place: Galen vs. Ants 3–19

11th Place: STH vs. NeuKastle 0–1

7th Place: RedDevils vs. OD02 *

Semifinal: Proust vs. ShichiFujukin

9th Place: Iron Curtain vs. NeuKastle

3rd Place: HaramiNo1 vs. ?

1st Place: YellowPolkaDots vs. ?

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Playoffs

Semifinal:	HaramiNo1 vs. YellowPolkaDots	0–7
5th Place:	Galen vs. Ants	3–19
11th Place:	STH vs. NeuKastle	0–1
7th Place:	RedDevils vs. OD02	0–13
Semifinal:	Proust vs. ShichiFujukin *	
9th Place:	Iron Curtain vs. NeuKastle	
3rd Place:	HaramiNo1 vs. ?	
1st Place:	YellowPolkaDots vs. ?	

Playoffs

Semifinal:	HaramiNo1 vs. YellowPolkaDots	0–7
5th Place:	Galen vs. Ants	3–19
11th Place:	STH vs. NeuKastle	0–1
7th Place:	RedDevils vs. OD02	0–13
Semifinal:	Proust vs. ShichiFujukin	0–16
9th Place:	Iron Curtain vs. NeuKastle *	
3rd Place:	HaramiNo1 vs. Proust	
1st Place:	YellowPolkaDots vs. ShichiFujukin	

Playoffs

Semifinal:	HaramiNo1 vs. YellowPolkaDots	0–7
5th Place:	Galen vs. Ants	3–19
11th Place:	STH vs. NeuKastle	0–1
7th Place:	RedDevils vs. OD02	0–13
Semifinal:	Proust vs. ShichiFujukin	0–16
9th Place:	Iron Curtain vs. NeuKastle	0–1
3rd Place:	HaramiNo1 vs. Proust *	
1st Place:	YellowPolkaDots vs. ShichiFujukin	

Playoffs

Semifinal:	HaramiNo1 vs. YellowPolkaDots	0–7
5th Place:	Galen vs. Ants	3–19
11th Place:	STH vs. NeuKastle	0–1
7th Place:	RedDevils vs. OD02	0–13
Semifinal:	Proust vs. ShichiFujukin	0–16
9th Place:	Iron Curtain vs. NeuKastle	0–1
3rd Place:	HaramiNo1 vs. Proust	6–4
1st Place:	YellowPolkaDots vs. ShichiFujukin *	

Playoffs

Semifinal:	HaramiNo1 vs. YellowPolkaDots	0–7
5th Place:	Galen vs. Ants	3–19
11th Place:	STH vs. NeuKastle	0–1
7th Place:	RedDevils vs. OD02	0–13
Semifinal:	Proust vs. ShichiFujukin	0–16
9th Place:	Iron Curtain vs. NeuKastle	0–1
3rd Place:	HaramiNo1 vs. Proust	6–4
1st Place:	YellowPolkaDots vs. ShichiFujukin	0-3

Final Standings

1. ShichiFujukin:	Justin Lallinger
2. Yellow Polka Dots:	Usman Qadir
3. Harami No1:	Bharat Kejriwal and Ali Niaz
4. Proust:	James Marrs
5. The Ants:	Chris Lemprecht
6. Galen's Awesome Goalie and 10 other guys:	Menzel
7. OD02:	Wade Williams
8. Red Devils:	Christophe Henrard
9. NeuKastle:	Brett Neuman and Joshua Kasper
10. The Iron Curtain:	Cyrus Astaneh
11. Spastic Tameless Horses:	David Villa

Challenge Match

ShichiFujukin vs. United-2002

For More Information

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

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