

Multiagent Systems

Introductory

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Textbooks & Materials

- [Michael Wooldridge](#) “An introduction to multiagent systems” 2nd edition 2009.
 - Lecture notes,
 - Online materials.
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- Extra textbook:- Gerhard Weiss, “Multiagent Systems” 2nd edition 2013.



Grading System

1	Attendance	5%
2	Technical reports/ Assignments	10%
3	Midterm exam	20%
4	Quizzes	5%
5	Final Exam	60%
Total		100%

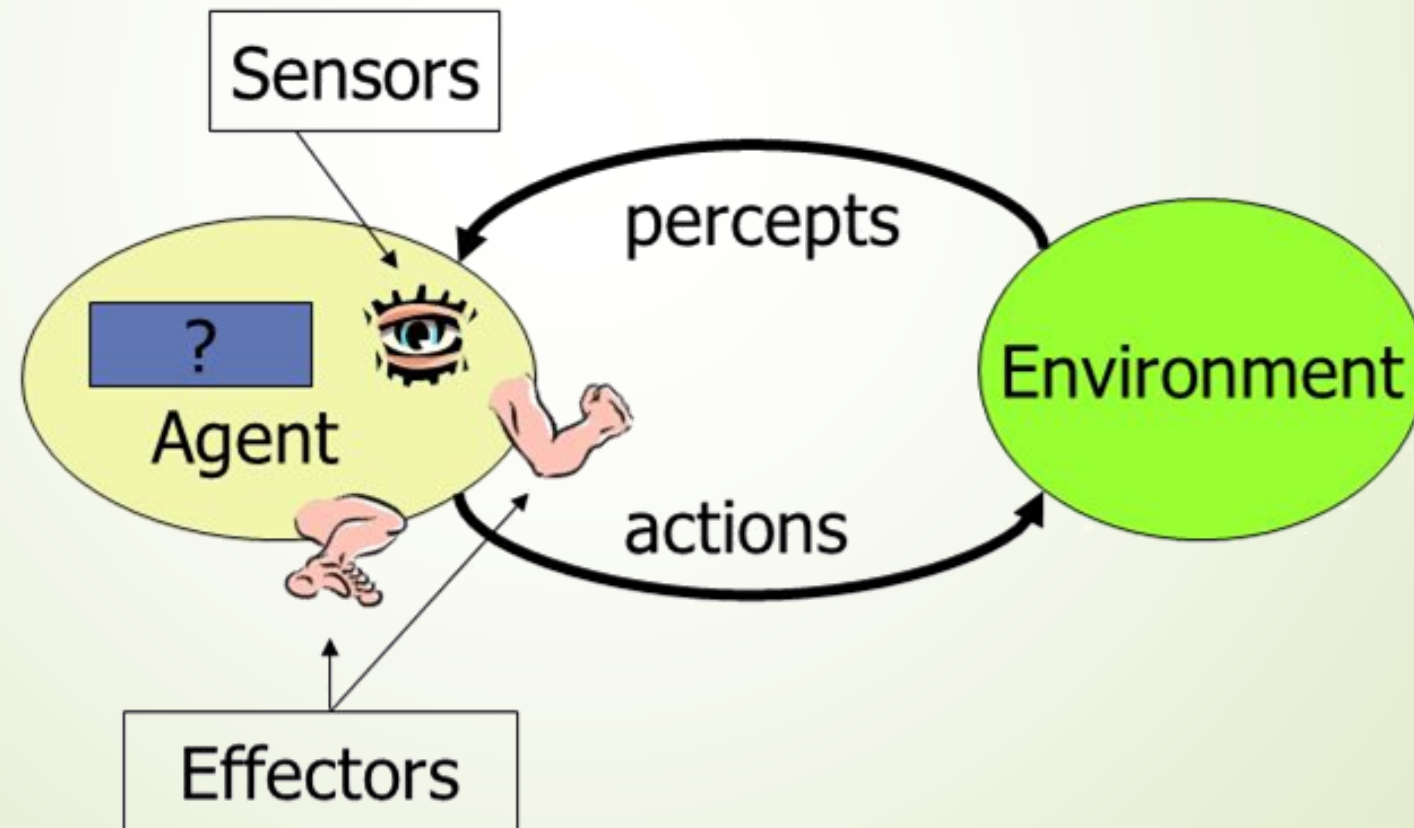
Basic Requirements (MAS)

➤ Computing power

- *Ubiquity*: The continual reduction in cost of computing capability has made it possible to introduce processing power into places and devices that would have once been uneconomic
- *Interconnection* :networked into large distributed systems.
- *Intelligence*: AI
- *Delegation*: to computer systems (fly-by-wire cars, intelligent braking systems, cruise control that maintains distance from car in front)
- *Human-orientation*: machine code- assembly language-machine-independent programming languages- sub-routines-procedures & functions-abstract data types – objects- to agents.

What Are Agents?

An agent is a computer system that is situated in some environment, and that is capable of autonomous action in this environment in order to achieve its delegated objectives.



Environment Properties

- Accessible vs. *inaccessible*

Agent has :-

1. complete,
2. accurate,
3. up-to-date information about the environment's state



Environment Properties

- Accessible vs. *inaccessible*
- Deterministic vs. non-deterministic



there is no uncertainty about the state that will result from performing an action

Environment Properties

- Accessible vs. *inaccessible*
- Deterministic vs. non-deterministic
- *Episodic* vs. *non-episodic*

the agent can decide what action to perform based only on the current episode





Environment Properties

- Accessible vs. *inaccessible*
- Deterministic vs. non-deterministic
- *Episodic* vs. *non-episodic*
- *Static* vs. *dynamic*



remain unchanged except for the performance of actions by the agent. A dynamic environment is one that has other processes operating on it,



Environment Properties

- Accessible vs. *inaccessible*
- Deterministic vs. non-deterministic
- *Episodic* vs. *non-episodic*
- *Static* vs. *dynamic*
- *Discrete* vs. *continuous*



chess game vs. autonomous vehicle



Intelligent Agents

- what is Artificial Intelligent (AI)?
- Intelligent Agent?
- Properties of IA (intelligent agent).
- Architecture of IA
 - LOGIC-BASED AGENTS
 - Reactive Architectures



What is AI ?

The branch of computer science concerned with making computers behave like humans.

— John McCarthy 1956

The science of making machines do things that would require intelligence if done by men.

— Marvin Minsky

Types of AI

- Strong AI
 - The strong AI view holds that it is possible to create intelligent machines that can really reason and solve problems. Such machines are considered to be conscious and self-aware, can independently think about problems and work out optimal solutions to problems, have their own system of values and world views, and have all the same instincts as living things, such as survival and security needs. It can be regarded as a new civilization in a certain sense.
- Weak AI
 - The weak AI view holds that intelligent machines cannot really reason and solve problems. These machines only look intelligent, but do not have real intelligence or self-awareness.

Classification of Intelligent Robots

- Currently, there is no unified definition of AI research. Intelligent robots are generally classified into the following four types:
 - "Thinking like human beings": weak AI, such as Watson and AlphaGo
 - "Acting like human beings": weak AI, such as humanoid robot, iRobot, and Atlas of Boston Dynamics
 - "Thinking rationally": strong AI (Currently, no intelligent robots of this type have been created due to the bottleneck in brain science.)
 - "Acting rationally": strong AI

Acting Like people



Proactiveness: (properties of intelligent agent)

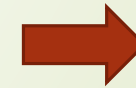
- intelligent agents are able to exhibit goal-directed behavior by *taking the initiative* in order to satisfy their delegated objectives;

*Assumptions
(precautions)*



*Effect
(postcautions)*

???



???

*Uncertainty in
The environment*

Reactivity: (properties of intelligent agent)

- ▶ intelligent agents are able to perceive their environment, and respond in a timely fashion to changes that occur in it in order to satisfy their delegated objectives;



Have a good end!!

Goal-directed behavior vs. Reactivity

Reactivity: (properties of intelligent agent)

- ▶ intelligent agents are able to perceive their environment, and respond in a timely fashion to changes that occur in it in order to satisfy their delegated objectives;

Goal-directed behavior vs. Reactivity



Social ability: (properties of intelligent agent)

- ▶ intelligent agents are capable of interacting with other agents (and possibly humans) in order to satisfy their design objectives.





Readings

➤ Chapter 1, **Introduction**:-

(**Michael Wooldridge, An Introduction to MultiAgent Systems, Second Edition**)

