

Knowledge Management

Prepared by Dr. Mohamed Eassa

IT 383
Knowledge Management

Lecture 10



Artificial Intelligence

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Artificial Intelligence



What is Artificial Intelligence?

Artificial intelligence (AI) is the science and engineering of making intelligent machines.

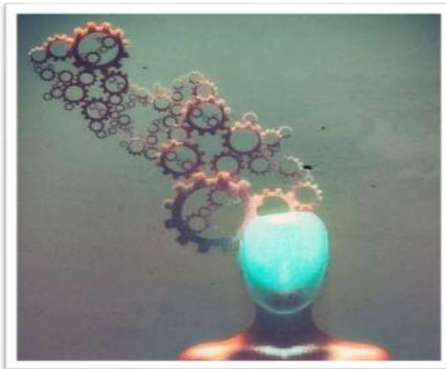


Lecture Objectives

- **Identify Intelligent and Artificial intelligence (AI).**
- **Identify Branches, Goals and Application of AI.**
- **Understanding Agent and Environment relations**
- **Understanding the Rational Agent.**
- **Understanding the Advantage, Disadvantage and Limitation of AI.**

What is Artificial Intelligence (AI)?

ARTIFICIAL



Produced by human art or effort, rather than originating naturally.

INTELLIGENCE



The capacity to learn and solve problems

ARTIFICIAL
INTELLIGENCE



AI is the simulation of human intelligence by machines. The ability to:

- Solve problems, act rationally, act like humans

➤ Differences between Human and Machine Intelligence?

- **Humans** perceive by patterns whereas **machines** perceive by a set of rules and data.
- **Humans** store and recall information by patterns, **machines** do it by searching algorithms. For example, the number 40404040 is easy to remember, store and recall as its pattern is simple.
- **Humans** can figure out the complete object even if some part of it is missing or distorted; whereas the **machines** cannot correctly.

➤ What is Intelligence?

Intelligence is the computational part of the ability to achieve goals in the world.

Intelligence:

- capacity to learn and solve problems
- the ability to act rationally

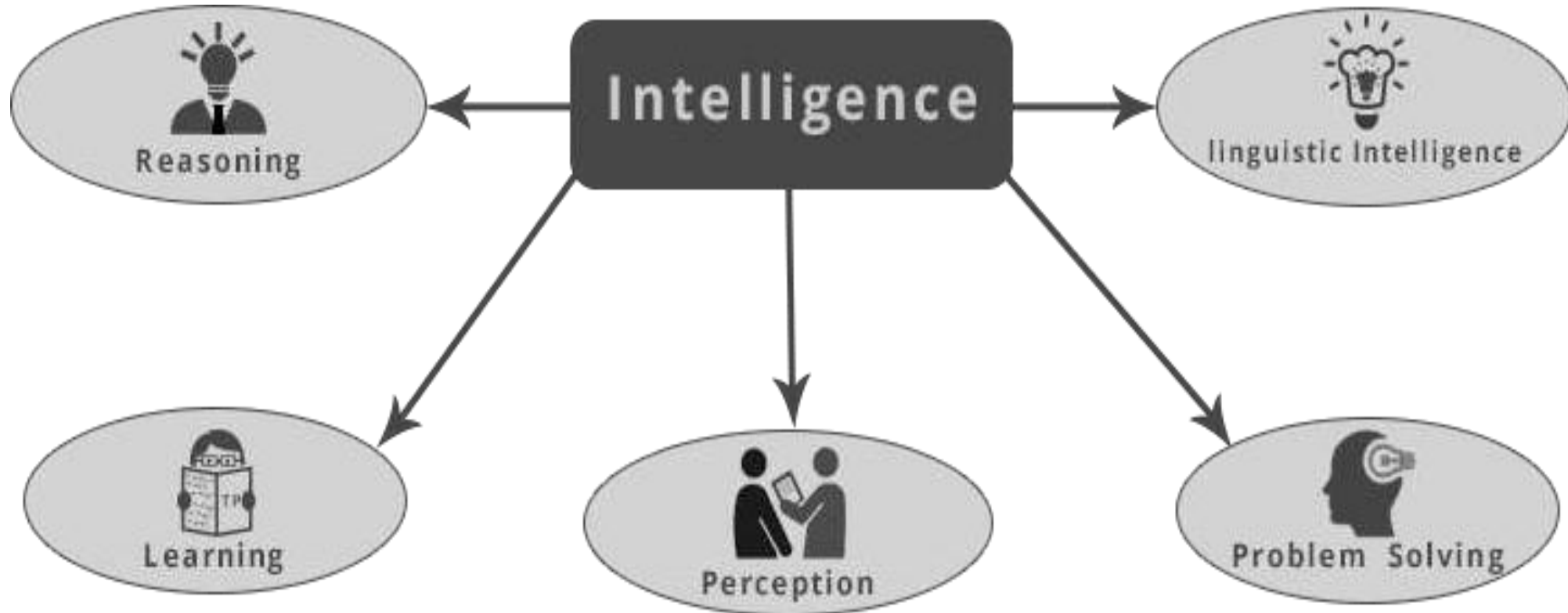
Varying kinds and degrees of intelligence occur in people, many animals, and some machines.

➤ Intelligence Component

The intelligence is intangible. It is composed of:

- Reasoning
- Learning
- Problem Solving
- Perception
- Linguistic Intelligence

➤ Intelligence Component



➤ What is Artificial Intelligence?

Artificial intelligence (AI) is the science and engineering of making intelligent machines.

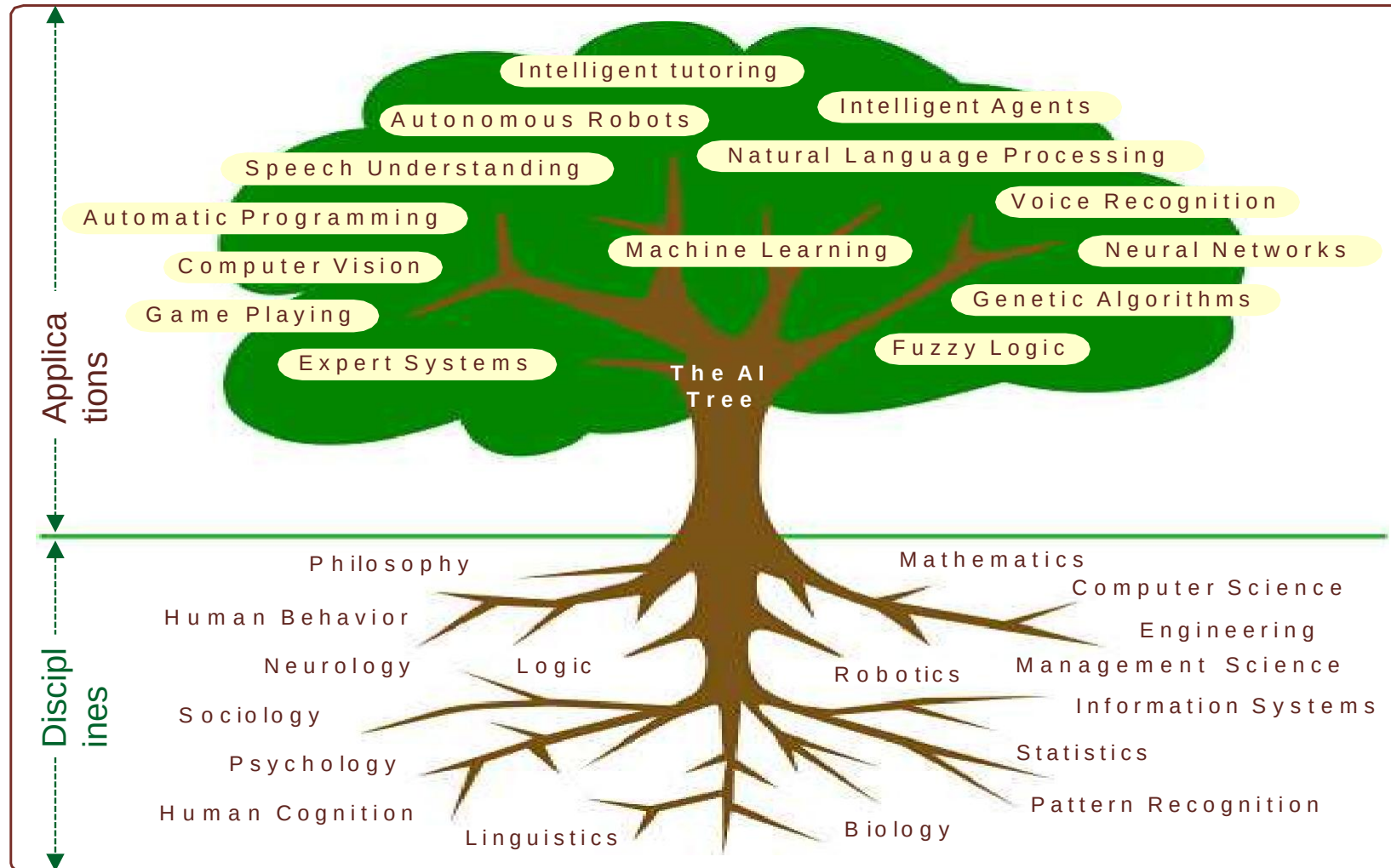
Artificial intelligence (AI) is technology and a branch of computer science that studies and develops intelligent machines and software

Major AI researchers and textbooks define the field as "the study and design of intelligent agents, where an intelligent agent is a system that perceives its **environment** and takes **actions** that **maximize** its chances of success.

➤ Branches of AI

- Expert Systems
- Machine Learning
- Natural Language Processing
- Computer Vision
- Robotics

Branches of AI



➤ AI Goals:

- **Create Expert Systems:** The systems which exhibit intelligent behavior, learn, demonstrate, explain, and advise their users.
- **To Implement Human Intelligence in Machines:** Creating systems that understand, think, learn, and behave like humans.

➤ AI Techniques:

- In the real world, the knowledge has some unwelcomed properties:
 - ✓ Its volume is huge, next to unimaginable.
 - ✓ It is not well-organized or well-formatted.
 - ✓ It keeps changing constantly.
- AI Technique is a manner to organize and use the knowledge efficiently in such a way that:
 - ✓ It should be perceivable by the people who provide it.
 - ✓ It should be easily modifiable to correct errors.
 - ✓ It should be useful in many situations though it is incomplete or inaccurate.
- AI techniques elevate the speed of execution of the complex program it is equipped with.

Definitions of AI

- ☐ **Think like human**
- ☐ **Act like human**
- ☐ **Think Rationally**
- ☐ **Act Rationally**

➤ Think like human

- The automation of activities that we associate with human thinking, activities such as decision making, problem solving, learning.
- Make computer think.
- Machines with mind.

➤ Act like human

- The art of creating machines that performs function that require intelligence when performed by people.
- The study of how to make computers do things at which, people are better.

➤ Think Rationally

- **The study of mental facilities through the use of computational models.**
- **The study of the computations that make it possible to perceive, reason and act.**

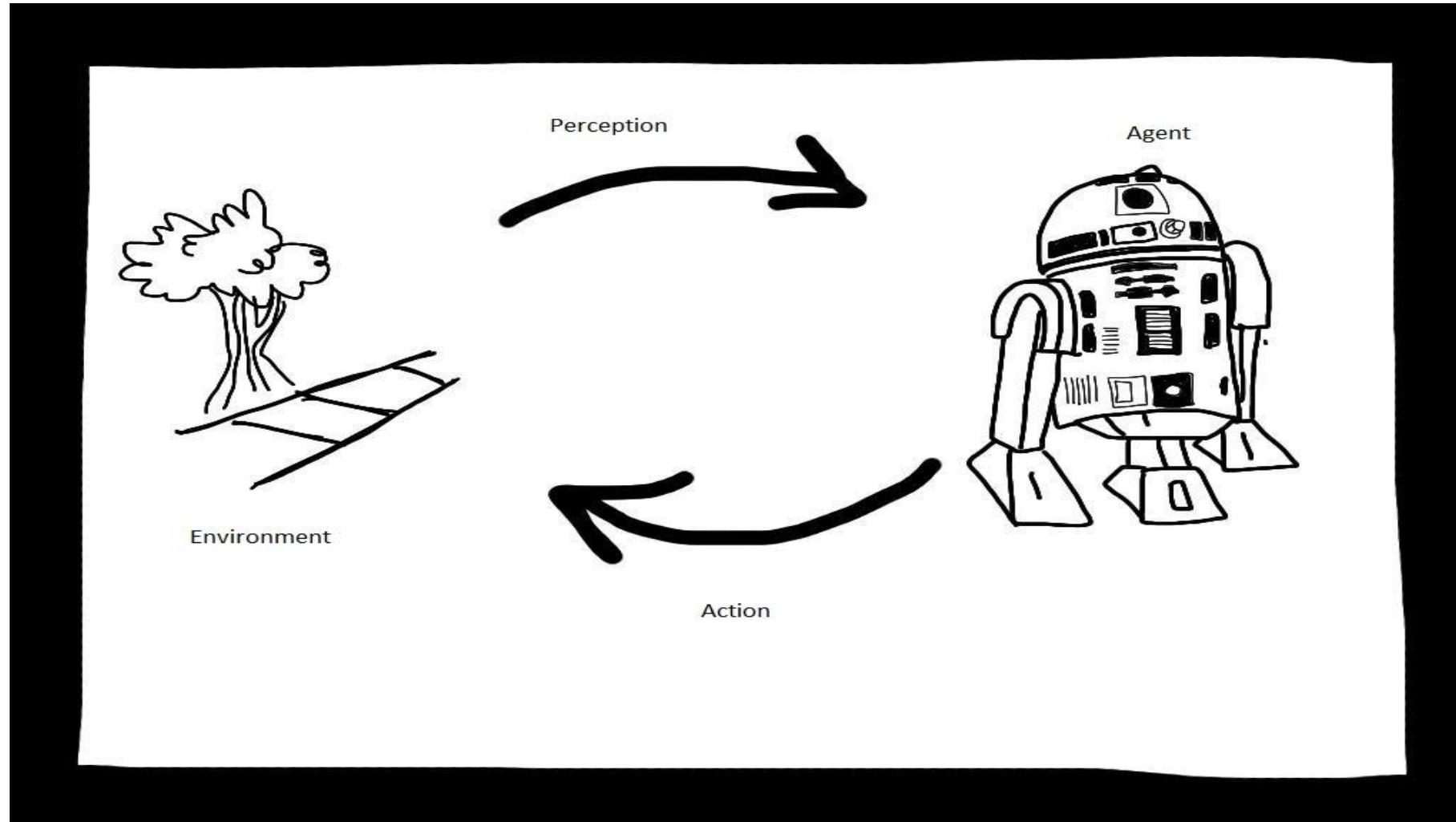
➤ Act Rationally

- The field of study that seeks to explain and emulate intelligence behavior in terms of computational process.
- The branch of computer science that is concerned with the automation of intelligent behavior.

➤ What are Agent and Environment?

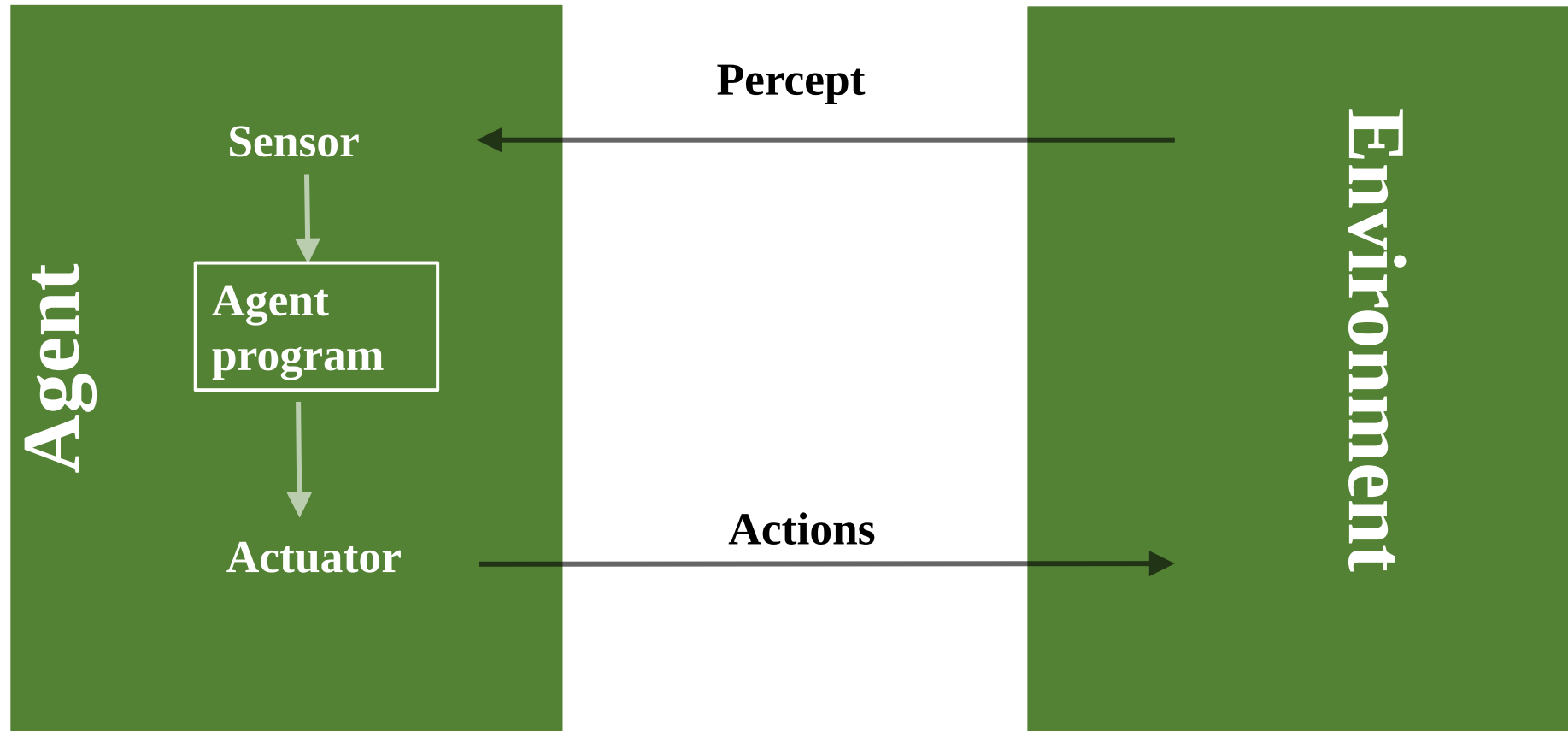
- An AI system is composed of an agent and its environment. The agents act in their environment. The environment may contain other agents.
- An **agent** is anything that can perceive its environment through **sensors** and acts upon that **environment** through **effectors**.
 - A **human agent** has sensory organs such as **eyes, ears, nose, tongue**, and **skin** parallel to the **sensors**, and other organs such as hands, legs, and mouth, for **effectors**.
 - A **robotic agent** replaces **cameras** and **infrared range finders** for the **sensors**, and various **motors** and **actuators** for **effectors**.
 - A **software agent** has **encoded bit strings** as its programs and actions.

Agent & Environment Relation



Agent and Environment relations

Agent & Environment Relation



- For example, for human the sensors are eyes, ears,.. Etc., and the actuators are hand , legs Etc., the agent program implements the agent function in the form of condition action rules.

Agent and Environment relations

➤ **Agent = Agent program + agent architecture (hardware).**

➤ **Model is agent function.**

➤ **Steps is agent rules.**

➤ It is clear that, if the **agent can do** the right action , it is called a rational agent.

➤ **Rational agent** : the right action is defined as the one that will cause the agent to be most successful.

➤ **The rationality depend on four things:**

- **The performance measure that defines the criterion of success.**
- **The agent's prior knowledge of the environment.**
- **The actions that the agent can perform.**
- **The agent's percept sequence to date.**

The **rational agent** can be defined as: for each possible percept sequence, a **rational agent** should select an action that is expected to maximize its performance measure, given the evidence provided by the percept sequence and whatever built-in knowledge the agent has.

After the definition of rationality, and the rational agent, we must think about the task environment which represent the problem to which rational agents are solution.

➤ **The task environment is specified by four elements (PEAS):**

- 1- Performance measure.**
- 2- Environment.**
- 3- Agent's actuator.**
- 4- Agent's sensor.**

The four elements are grouped together under the name **PEAS** (**performance, Environment, Actuators, Sensors**). The first step in designing an agent is to specify the task environment as fully as possible.

➤ Application of AI

Expert Systems

There are some applications which integrate machine, software, and special information to impart reasoning and advising. They provide explanation and advice to the users.

Gaming

AI plays crucial role in strategic games such as chess, poker, tic-tac-toe, etc., where machine can think of large number of possible positions based on heuristic knowledge.

➤ Application of AI

Natural Language Processing

It is possible to interact with the computer that understands natural language spoken by humans.

Speech Recognition

Some intelligent systems are capable of hearing and comprehending the language in terms of sentences and their meanings while a human talks to it. It can handle different accents, slang words, noise in the background, change in human's noise due to cold, etc.

➤ Application of AI

Handwriting Recognition

The handwriting recognition software reads the text written on paper by a pen or on screen by a stylus. It can recognize the shapes of the letters and convert it into editable text.

Intelligent Robots

Robots are able to perform the tasks given by a human. They have sensors to detect physical data from the real world such as light, heat, temperature, movement, sound, bump, and pressure. They have efficient processors, multiple sensors and huge memory, to exhibit intelligence. In addition, they are capable of learning from their mistakes and they can adapt to the new environment.

➤ Advantage of AI

- **Efficiency and Automation**
- **Accuracy and Precision**
- **Data Handling and Analysis**
- **Risk Reduction**
- **Learning and Improvement**

➤ Disadvantage of AI

- **High Initial Costs**
- **Job Displacement**
- **Dependency**
- **Bias and Discrimination**
- **Security Risks**
- **Lack of Creativity**

Limitations of AI

➤ Limitations of AI

1. Lack of Common Sense and General Intelligence

- AI lacks general human intelligence or “common sense” reasoning.
- Can't fully understand context or emotions like a human does.

2. Data Dependency

- AI needs large, high-quality datasets to learn effectively.
- Poor data = poor AI performance.

3. Black Box Problem

- Some AI models (like deep neural networks) make decisions in ways that are hard to interpret or explain.

4. Learning from Incorrect Data

- AI systems can be misled by biased, incomplete, or incorrect data, which impacts decision-making

Summary

- **Definition of intelligent and Artificial intelligence (AI).**
- **Understanding the Application and branches of AI**
- **Understanding The Goal of AI.**
- **Understanding Agent and Environment relations**
- **Understanding the Rational Agent.**
- **Understanding the Advantage, Disadvantage and Limitation of AI.**



Thank You