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COIMBATORE-641 035, TAMIL NADU

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

19AMB303-FULL STACK AI UNIT 1

1.1 INTRODUCTION

INTELLIGENCE	ARTIFICIAL INTELLIGENCE
It is a natural process.	It is programmed by humans.
It is actually hereditary.	It is not hereditary.
Knowledge is required for intelligence.	KB and electricity are required to generate output.
No human is an expert. We may get better solutions from other humans.	Expert systems are made which aggregate many person's experience and ideas.

1.2 DEFINITION

The study of how to make computers do things at which at the moment, people are better. **"Artificial Intelligence is the ability of a computer to act like a human being".**

· Systems that think like humans

· Systems that act like humans

· Systems that think rationally. Systems that act rationally.

"The exciting new effort to make computers think ... *machines with minds*, in the full and literal sense" (Haugeland, 1985) "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning ..." (Bellman, 1978)	"The study of mental faculties through the use of computational models" (Charniak and McDermott, 1985) "The study of the computations that make it possible to perceive, reason, and act" (Winston, 1992)
"The art of creating machines that perform functions that require intelligence when performed by people" (Kurzweil, 1990) "The study of how to make computers do things at which, at the moment, people are better" (Rich and Knight, 1991)	"A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes" (Schalkoff, 1990) "The branch of computer science that is concerned with the automation of intelligent behavior" (Luger and Stubblefield, 1993)

Figure 1.1 Some definitions of artificial intelligence, organized into four categories

(a) Intelligence - Ability to apply knowledge in order to perform better in an environment.

(b) Artificial Intelligence - Study and construction of agent programs that perform well in a given environment, for a given agent architecture**.**

(c) Agent - An entity that takes action in response to precepts from an environment**. (d) Rationality** - property of a system which does the "right thing" given what it knows.

(e) Logical Reasoning - A process of deriving new sentences from old, such that the new sentences are necessarily true if the old ones are true.

Four Approaches of Artificial Intelligence:

- Acting humanly: The Turing test approach.
- Thinking humanly: The cognitive modelling approach.
- Thinking rationally: The laws of thought approach.
- Acting rationally: The rational agent approach.

1.3 ACTING HUMANLY: THE TURING TEST APPROACH

The Turing Test, proposed by Alan Turing (1950), was designed to provide a satisfactory operational definition of intelligence. A computer passes the test if a human interrogator, after posing some written questions, cannot tell whether the written responses come from a person or from a computer.

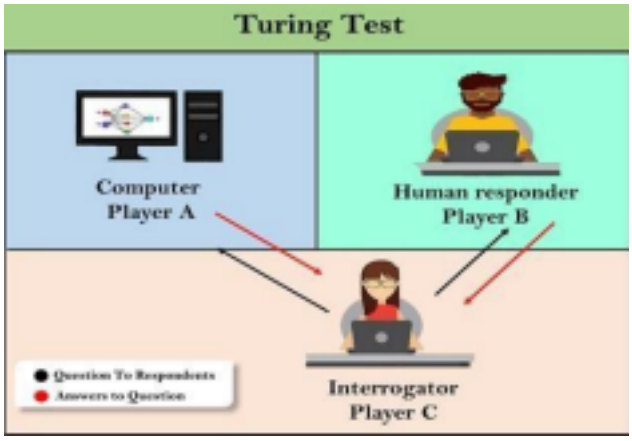

Figure 1.2 Turing Test

· **natural language processing** to enable it to communicate successfully in English; · **knowledge representation** to store what it knows or hears;

· **automated reasoning** to use the stored information to answer questions and to draw new conclusions

· **machine learning** to adapt to new circumstances and to detect and extrapolate patterns.

Total Turing Test includes a video signal so that the interrogator can test the subject's perceptual abilities, as well as the opportunity for the interrogator to pass physical objects "through the hatch." To pass the total Turing Test, the computer will need

• **computer vision** to perceive objects, and **robotics** to manipulate objects and move about**.**

Thinking humanly: The cognitive modelling approach

Analyse how a given program thinks like a human, we must have some way of determining how humans think. The interdisciplinary field of **cognitive science** brings together computer models from AI and experimental techniques from psychology to try to construct precise and testable theories of the workings of the human mind.

Although cognitive science is a fascinating field in itself, we are not going to be discussing it all that much in this book. We will occasionally comment on similarities or differences between AI techniques and human cognition. Real cognitive science, however, is necessarily based on experimental investigation of actual humans or animals, and we assume that the reader only has access to a

computer for experimentation. We will simply note that AI and cognitive science continue to fertilize each other, especially in the areas of vision, natural language, and learning.

Thinking rationally: The “laws of thought” approach

The Greek philosopher Aristotle was one of the first to attempt to codify ``right thinking," that is, irrefutable reasoning processes. His famous syllogisms provided patterns for argument structures that always gave correct conclusions given correct premises.

For example, ``Socrates is a man; all men are mortal; therefore Socrates is mortal."

These laws of thought were supposed to govern the operation of the mind, and initiated the field of ***logic.***

Acting rationally: The rational agent approach

Acting rationally means acting so as to achieve one's goals, given one's beliefs. An agent is just something that perceives and acts.

The right thing: that which is expected to maximize goal achievement, given the available information

Does not necessary involve thinking.

For Example - blinking reflex- but should be in the service of rational action.

1.4 FUTURE OF ARTIFICIAL INTELLIGENCE

- **Transportation:** Although it could take a decade or more to perfect them, autonomous cars will one day ferry us from place to place.
- **Manufacturing:** AI powered robots work alongside humans to perform a limited range of tasks like assembly and stacking, and predictive analysis sensors keep equipment running smoothly.
- **Healthcare:** In the comparatively AI-nascent field of healthcare, diseases are more quickly and accurately diagnosed, drug discovery is sped up and streamlined, virtual nursing assistants monitor patients and big data analysis helps to create a more personalized patient experience.
- **Education:** Textbooks are digitized with the help of AI, early-stage virtual tutors assist human instructors and facial analysis gauges the emotions ofstudents to help determine who’s struggling or bored and better tailor the experience to their individual needs.

· **Media:** Journalism is harnessing AI, too, and will continue to benefit from it. Bloomberg uses Cyborg technology to help make quick sense of complex financial reports. The Associated Press employs the natural language abilities of Automated Insights to produce 3,700 earning reports stories per year — nearly four times more than in the recent past

· **Customer Service:** Last but hardly least, Google is working on an AI assistant that can place human-like calls to make appointments at, say, your neighborhood hair salon. In addition to words, the system understands context and nuance.

1.5 CHARACTERISTICS OF INTELLIGENT AGENTS

Situatedness

The agent receives some form of sensory input from its environment, and it performs some action that changes its environment in some way.

Examples of environments: the physical world and the Internet.

· Autonomy

The agent can act without direct intervention by humans or other agents and that it has control over its own actions and internal state.

· Adaptivity

The agent is capable of

(1) reacting flexibly to changes in its environment;

(2) taking goal-directed initiative (i.e., is pro-active), when appropriate; and (3) Learning from its own experience, its environment, and interactions with others.

· Sociability

The agent is capable of interacting in a peer-to-peer manner with other agents or humans **1.6 AGENTS AND ITS TYPES**

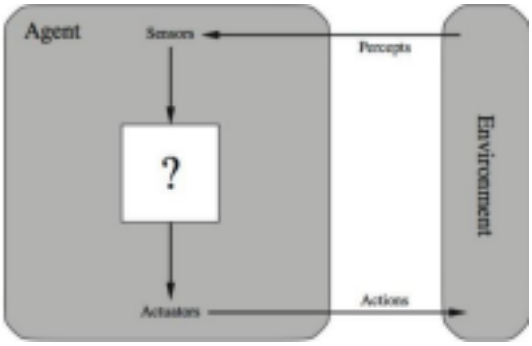

Figure 1.3 Agent types

An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators.

· Human Sensors:
· Eyes, ears, and other organs for sensors.
· Human Actuators:
· Hands, legs, mouth, and other body parts.
· Robotic Sensors:
· Mic, cameras and infrared range finders for sensors
· Robotic Actuators:
· Motors, Display, speakers etc An agent can be:

Human-Agent: A human agent has eyes, ears, and other organs which work for sensors and hand, legs, vocal tract work for actuators.

Robotic Agent: A robotic agent can have cameras, infrared range finder, NLP for sensors and various motors for actuators.

Software Agent: Software agent can have keystrokes, file contents as sensory input and act on those inputs and display output on the screen.

Hence the world around us is full of agents such as thermostat, cell phone, camera, and even we are also agents. Before moving forward, we should first know about sensors, effectors, and actuators.

Sensor: Sensor is a device which detects the change in the environment and sends the information to other electronic devices. An agent observes its environment through sensors.

Actuators: Actuators are the component of machines that converts energy

into motion. The actuators are only responsible for moving and controlling a system. An actuator can be an electric motor, gears, rails, etc.

Effectors: Effectors are the devices which affect the environment. Effectors can be legs, wheels, arms, fingers, wings, fins, and display screen.

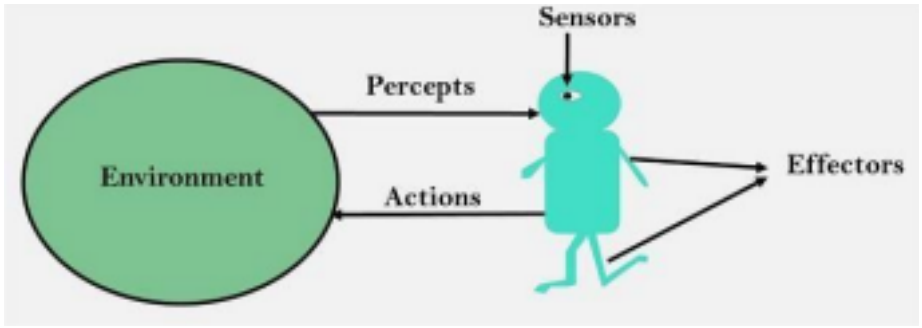

Figure 1.4 Effectors