

Artificial Intelligence for Beginners

Task Domains of Artificial Intelligence		
Mundane (Ordinary) Tasks	Formal Tasks	Expert Tasks
Perception <ul style="list-style-type: none"> • Computer Vision • Speech, Voice 	<ul style="list-style-type: none"> • Mathematics • Geometry • Logic • Integration and Differentiation 	<ul style="list-style-type: none"> • Engineering • Fault finding • Manufacturing • Monitoring
Natural Language Processing <ul style="list-style-type: none"> • Understanding • Language Generation • Language Translation 	Games <ul style="list-style-type: none"> • Go • Chess (Deep Blue) • Checkers 	Scientific Analysis
Common Sense	Verification	Financial Analysis
Reasoning	Theorem Proving	Medical Diagnosis
Planning		Creativity
Robotics <ul style="list-style-type: none"> • Locomotive 		

Humans learn **mundane (ordinary) tasks** since their birth. They learn by perception, speaking, using language, and locomotives. They learn Formal Tasks and Expert Tasks later, in that order.

For humans, the mundane tasks are easiest to learn. The same was considered true before trying to implement mundane tasks in machines. Earlier, all work of AI was concentrated in the mundane task domain.

Later, it turned out that the machine requires more knowledge, complex knowledge representation, and complicated algorithms for handling mundane tasks. This is the reason **why AI work is more prospering in the Expert Task** domain now, as the expert task domain needs expert knowledge without common sense, which can be easier to represent and handle.

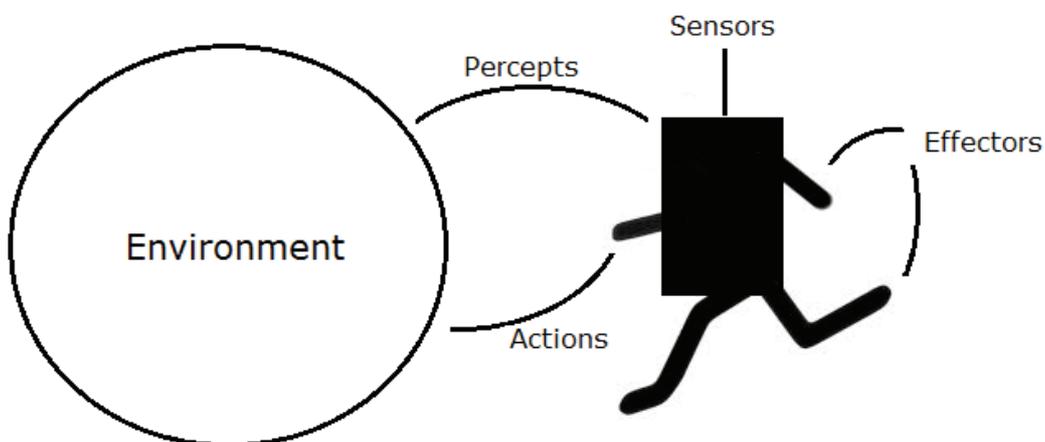
4. AGENTS AND ENVIRONMENTS

An AI system is composed of an agent and its environment. The agents act in their environment. The environment may contain other agents.

What are Agent and Environment?

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, 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.



Agents Terminology

- **Performance Measure of Agent:** It is the criteria, which determines how successful an agent is.
- **Behavior of Agent:** It is the action that agent performs after any given sequence of percepts.

- **Percept:** It is agent's perceptual inputs at a given instance.
- **Percept Sequence:** It is the history of all that an agent has perceived till date.
- **Agent Function:** It is a map from the precept sequence to an action.

Rationality

Rationality is nothing but status of being reasonable, sensible, and having good sense of judgment.

Rationality is concerned with expected actions and results depending upon what the agent has perceived. Performing actions with the aim of obtaining useful information is an important part of rationality.

What is Ideal Rational Agent?

An ideal rational agent is the one, which is capable of doing expected actions to maximize its performance measure, on the basis of:

- Its percept sequence
- Its built-in knowledge base

Rationality of an agent depends on the following:

1. The **performance measures**, which determine the degree of success.
2. Agent's **Percept Sequence** till now.
3. The agent's **prior knowledge about the environment**.
4. The **actions** that the agent can carry out.

A rational agent always performs right action, where the right action means the action that causes the agent to be most successful in the given percept sequence. The problem the agent solves is characterized by Performance Measure, Environment, Actuators, and Sensors (PEAS).

The Structure of Intelligent Agents

Agent's structure can be viewed as:

- Agent = Architecture + Agent Program
- Architecture = the machinery that an agent executes on.
- Agent Program = an implementation of an agent function.

Simple Reflex Agents