Assignement 1 :

1 :

A. Intelligence: The ability an organism must adapt to new environments and find a solution to problems.

B. Artificial Intelligence: A program can have the ability to solve problems by itself.

C.Agent : An agent is an entity (either software or hardware) that perceives its environment through sensors and acts upon that environment using actuators.

D. Rationality: the quality of an agent to make decisions or take actions that makes it achieve its goals.

E. Logical Reasoning: The process of getting conclusions thanks to a certain number of facts.

F. Agent Function: a function that determines which actions will be used in response to an agent's perception.

G. Agent Program: this is the main implementation of an agent function

H. Autonomy: The ability an agent must work independently, without the help of external intervention.

2: Are reflex actions (such as flinching from a hot stove) rational? Are they intelligent? (For the purpose of this question, consider the “intelligent“ to mean applying knowledge or applying thought and reasoning.)

According to me, reflex actions are rational because this action is very necessary if you want to be able to use your hand again. In this case, it is intelligent, some knowledge is applied, and a reaction is following.

3: (10 points) Many of the computational models of cognitive activities that have been proposed involve quite complex mathematical operations, such as convolving an image with a Gaussian or finding a minimum of the entropy function. Most humans (an certainly all animals) never learn this kind of mathematics at all, almost no one learns it before college, and almost no one can compute the convolution of a function with a Gaussian in their head. What sense does it make to say that the “vision system“ is doing this kind of mathematics whereas the actual person has no idea how to do it?

The main idea here is to understand which languages the computer you are working on talks. You cannot make it understand that it must use its sensors to “see” thing and analyze it afterwards. You must use some mathematical function because it’s the only language it can understand.

4:

A: The simple vacuum-cleaner agent is rational because it cleans a square when it detects dirt and moves when it doesn’t. This strategy maximizes the number of clean squares over 1000 time steps, which directly improves its performance measure.

B: With movement costing one point, the agent should clean dirty squares immediately and stay in place if the square is clean unless it knows of another dirty square. This requires internal state to remember previously encountered dirty squares and minimize unnecessary movement, which costs points.

C: If clean squares can become dirty again, the agent should continuously monitor and patrol, learning where dirt reappears frequently. In unknown geography, the agent should explore and map the environment, learning to optimize its movements. In both cases, learning improves performance by reducing redundant actions and focusing on areas that matter.

5:

a. Playing soccer

Performance measure: Goals, teamwork

Environment: Field, ball, players

Actuators: Legs, arms

Sensors: Vision, hearing

Characterization: Partially observable, dynamic, multi-agent, continuous

b. Exploring Titan’s ocean:

Performance measure: Data collection, navigation

Environment: Underwater landscape

Actuators: Propellers, tools

Sensors: Sonar, cameras

Characterization: Partially observable, dynamic, single-agent, continuous

c. Shopping for used AI books

Performance measure: Best price, right book

Environment: Websites, listings

Actuators: Keyboard, mouse

Sensors: Web data

Characterization: Partially observable, static, single-agent, discrete

d. Playing a tennis match

Performance measure: Winning points

Environment: Court, ball, opponent

Actuators: Arms, legs

Sensors: Vision, hearing

Characterization: Partially observable, dynamic, multi-agent, continuous

e. Practicing tennis against a wall

Performance measure: Ball control

Environment: Wall, ball

Actuators: Arms, legs

Sensors: Vision

Characterization: Fully observable, static, single-agent, continuous

f. Performing a high jump

Performance measure: Height cleared

Environment: Bar, ground

Actuators: Legs

Sensors: Vision

Characterization: Fully observable, static, single-agent, continuous

g. Knitting a sweater

Performance measure: Sweater quality

Environment: Yarn, needles

Actuators: Hands

Sensors: Vision, touch

Characterization: Fully observable, static, single-agent, discrete

h. Bidding at an auction

Performance measure: Winning bid

Environment: Auction platform

Actuators: Keyboard, mouse

Sensors: Bid updates

Characterization: Partially observable, dynamic, multi-agent, discrete

6:

a. A reflex agent acts based solely on the current situation it perceives, without considering past experiences or future outcomes. It uses simple rules to respond directly to its environment.

b. A model-based agent keeps track of the state of the environment by maintaining an internal model, which helps it make decisions based on both current observations and knowledge of how the environment works.

c. A goal-based agent takes actions with the purpose of achieving specific goals. It doesn't just react to its environment but plans its actions in ways that help it reach the desired end state.

d. A utility-based agent not only aims to achieve goals but also evaluates different outcomes to maximize its happiness or utility. It chooses actions that result in the most preferred outcomes based on a utility function.

e. A learning agent improves its performance over time by learning from its experiences. It can adjust its behavior based on feedback from its actions and the changes it observes in the environment.

7:

The agent must account for both action failure (25%) and incorrect sensor readings (10%). It should recheck squares after cleaning and may need to perform Suck multiple times. A model-based agent can handle this uncertainty by maintaining an internal model with probabilities for action success and sensor accuracy.

A rational agent would continuously patrol the environment, cleaning squares that may have become dirty. A goal-based agent could prioritize unvisited squares and revisit them based on dirt probability. Learning from past patterns could help optimize the cleaning route.