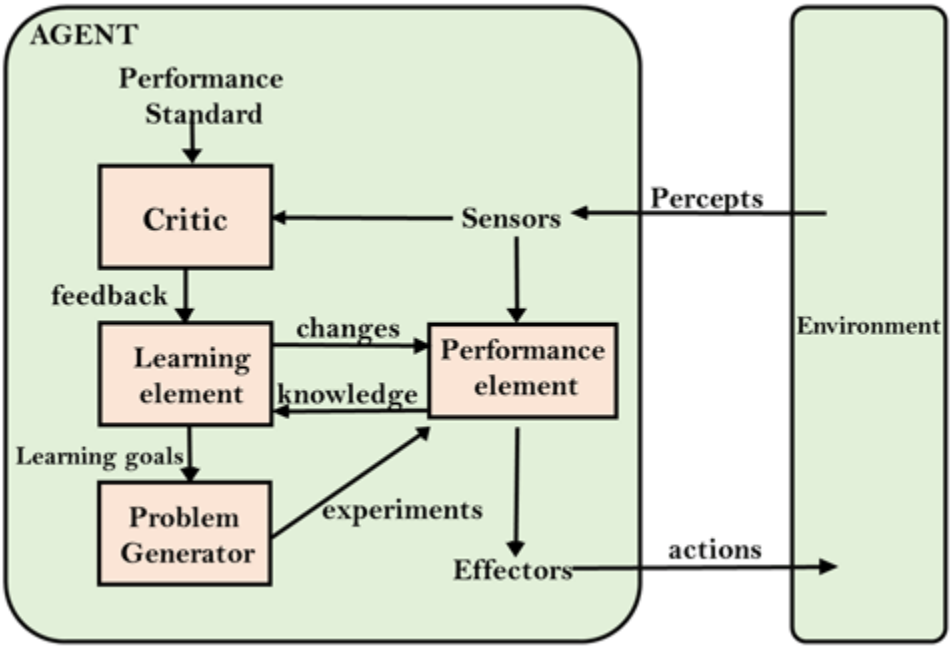
ways to improve the performance.



- **Environment Types**

An environment is everything in the world which surrounds the agent, but it is not a part of an agent itself. An environment can be described as a situation in which an agent is present.

The environment is where the agent lives, operates and provides the agent with something to sense and act upon it.

As per Russell and Norvig, an environment can have various features from the point of view of an agent:

- Fully observable vs Partially Observable
- Static vs Dynamic
- Discrete vs Continuous
- Deterministic vs Stochastic

- Single-agent vs Multi-agent
- Episodic vs sequential
- Known vs Unknown
- Accessible vs Inaccessible

1. Fully observable vs Partially Observable:

If an agent sensor can sense or access the complete state of an environment at each point of time then it is a fully observable environment, else it is partially observable.

A fully observable environment is easy as there is no need to maintain the internal state to keep track of the history of the world.

An agent with no sensors in all environments then such an environment is called as unobservable.

2. Deterministic vs Stochastic:

If an agent's current state and selected action can completely determine the next state of the environment, then such an environment is called a deterministic environment.

A stochastic environment is random in nature and cannot be determined completely by an agent.

In a deterministic, fully observable environment, an agent does not need to worry about uncertainty.

3. Episodic vs Sequential:

In an episodic environment, there is a series of one-shot actions, and only the current percept is required for the action.

However, in a Sequential environment, an agent requires memory of past actions to determine the next best actions.

4. Single-agent vs Multi-agent

If only one agent is involved in an environment, and operating by itself then such an environment is called a single agent environment.

However, if multiple agents are operating in an environment, then such an environment is called a multi-agent environment.

The agent design problems in the multi-agent environment are different from single agent environments.

5. Static vs Dynamic:

If the environment can change itself while an agent is deliberating then such an environment is called a dynamic environment else it is called a static environment.

Static environments are easy to deal with because an agent does not need to continue looking at the world while deciding for an action.

However, for a dynamic environment, agents need to keep looking at the world at each action.

Taxi driving is an example of a dynamic environment whereas Crossword puzzles are an example of a static environment.

6. Discrete vs Continuous:

If in an environment there are a finite number of percepts and actions that can be performed within it, then such an environment is called a discrete environment; else it is called continuous environment.

A chess game comes under a discrete environment as there is a finite number of moves that can be performed.

A self-driving car is an example of a continuous environment.

7. Known vs Unknown

Known and unknown are not actually a feature of an environment, but it is an agent's state of knowledge to perform an action.

In a known environment, the results for all actions are known to the agent. While in an unknown environment, an agent needs to learn how it works in order to perform an action.

It is quite possible for a known environment to be partially observable and an Unknown environment to be fully observable.