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**Task 03 :**

**Documentation: Simple Reflex Agent (Temperature Control System)**

**Overview**

This program represents a **Simple Reflex Agent** that controls the air conditioning (AC) system in different rooms based on the room temperature.  
The agent compares the current temperature of a room with a fixed desired temperature and decides whether to **turn ON** or **turn OFF** the AC.  
The program also stores the agent’s previous decisions in a file called **"history.txt"**, allowing it to remember and retrieve past actions.

The main goal of this program is to demonstrate the working of an intelligent agent that reacts to environmental changes using simple logic and stored data.

**1. Concept Explanation**

A **Simple Reflex Agent** is an artificial intelligence concept where an agent makes decisions based only on the current situation, not on the future.  
It senses the environment, decides what to do based on predefined rules, and performs an action accordingly.

In this program, the environment is the **room temperature**, and the agent reacts by turning the AC **ON** or **OFF** depending on whether the temperature is above or below the fixed value.

* **Environment:** Different rooms with varying temperatures
* **Agent:** The SimpleReflexAgent class
* **Sensor:** Measures or receives the current temperature
* **Actuator:** Takes action (turn ON or OFF the AC)
* **Performance Measure:** Decides the correct action and stores it in memory

**2. Components of the Program**

This agent program consists of several key components that work together to perform its function effectively.

**a. Initialization**

The agent is initialized with a **fixed temperature value**.  
This fixed temperature acts as the target or ideal temperature that the agent tries to maintain.  
When the agent is created, it also defines a file called **“history.txt”** that stores all the past actions and temperature readings for reference.

**b. Memory Storage**

The agent has the ability to remember its past actions.  
Whenever it makes a decision (for example, “Turn ON AC” or “Turn OFF AC”), it stores this information in **history.txt**.  
Each line in the file contains the temperature and the action taken, separated by a comma.  
For instance:

30, Turn ON AC

22, Turn OFF AC

This storage system helps the agent recall what it has done previously in similar temperature situations.

**c. Memory Retrieval**

Before taking any new action, the agent can **retrieve past data** from the history file.  
It reads all previous temperature-action pairs so that it can decide whether it has already experienced this temperature before.  
If the temperature exists in the history, it uses the same action again instead of making a new decision.

**3. Sensor Function**

The sensor part of the agent is responsible for detecting or receiving the **current room temperature**.  
This temperature is compared with the fixed temperature that the agent has been set to maintain.  
The sensor does not take any action by itself—it simply provides the input (temperature data) to the rest of the system.

**4. Performance Function**

The performance function determines what action should be taken based on the input temperature.  
The logic is simple:

* If the current temperature is **greater** than the fixed temperature, the agent decides to **turn ON the AC**.
* If the current temperature is **less than or equal to** the fixed temperature, it decides to **turn OFF the AC**.

Every time the performance function makes a decision, it also saves this decision to the history file so that the information can be used later.  
This allows the agent to build a memory of its performance over time.

**5. Actuator Function**

The actuator is the part of the agent that actually **performs the action**.  
It reads the previously stored memory and checks whether the current temperature has already been encountered before.

* If the temperature exists in the memory, the agent **reuses the same action** it took last time for that temperature.
* If the temperature is new (not found in the memory), the agent **runs the performance function** to decide a new action, then performs it and stores the result.

Finally, the actuator displays the room’s current temperature and the action taken.  
For example:

Living Room -> 22'C => Action Turn OFF AC

Kitchen -> 30'C => Action Turn ON AC

**6. Multiple Rooms Simulation**

In the program, there are multiple rooms such as Living Room, Bedroom, Kitchen, Bathroom, Dining Room, Study Room, Guest Room, Office, Garage, and Basement.  
Each room has its own temperature value.  
The agent is applied to each room separately.

For each room:

1. The agent senses the temperature.
2. It checks if this temperature has been recorded before.
3. It decides whether to turn the AC ON or OFF.
4. It displays the action on the screen.

This allows the program to simulate how an intelligent AC system could automatically manage temperature across multiple rooms in a building.

**7. Example of Agent’s Decision-Making**

Suppose the fixed temperature is 25°C.  
If the agent checks a room with a current temperature of 30°C:

* Since 30 > 25, the agent turns ON the AC and stores the action in memory.

If another room has 20°C:

* Since 20 < 25, the agent turns OFF the AC and stores that in memory.

If later the temperature 30°C appears again:

* The agent does not calculate again; it reads from the file and automatically performs “Turn ON AC”.

This process shows that the agent learns from its environment through stored data, making it more efficient over time.

**8. Purpose and Practical Use**

The main purpose of this program is educational.  
It helps demonstrate how **Simple Reflex Agents** work in artificial intelligence.  
In a real-world scenario, such a system could be used to:

* Automatically control air conditioning in smart homes.
* Adjust temperatures in offices or factories based on current readings.
* Create energy-efficient systems that remember past actions and optimize performance.

Although this is a simple version, similar logic is used in **smart thermostats** like Google Nest or Ecobee, where AI systems adjust temperature automatically based on learned behavior.

**9. Key Takeaways**

1. A **Simple Reflex Agent** reacts directly to current conditions.
2. It uses **sensors** to receive input and **actuators** to perform actions.
3. It can store and retrieve memory for better performance.
4. The decision-making process is based on **if-else logic** rather than prediction or learning algorithms.
5. The program structure helps explain fundamental AI behavior in a clear and practical way.

**10. Conclusion**

This program successfully demonstrates how a simple intelligent system can sense its environment, make logical decisions, and remember past outcomes.  
The Simple Reflex Agent reacts to temperature changes, decides whether to activate or deactivate the air conditioning, and stores these decisions for future reference.

By combining sensing, decision-making, and action, it represents the core idea of intelligent agents in artificial intelligence.  
Although simple in design, it forms the foundation for more advanced AI systems that use learning, prediction, and optimization in real-world applications.