



SNS COLLEGE OF ENGINEERING

(Autonomous)

DEPARTMENT OF CSE-IoT ENGINEERING



Artificial Intelligence & Natural Language Processing

Agent and Environment

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Agents and Environments

Definition: "An agent perceives its environment through sensors and acts through actuators."

Types of Agents:

- Simple Reflex Agents
- Model-Based Agents
- Goal-Based Agents
- Utility-Based Agents
- Learning Agents



Simple Reflex Agents

Definition:

- These agents make decisions based on the **current perception** and follow pre-defined rules.
- They **do not store past experiences** or adapt to new situations.
- They work well in **fully observable environments** where every necessary detail is available.

How They Work:

- Uses **condition-action rules (IF-THEN statements)** to react to environmental changes.
- Example: **A thermostat** turning on/off based on temperature readings.

Limitations:

- Cannot handle **partially observable** environments.
- Fails in complex situations where simple rules are insufficient.



Model-Based Reflex Agents

Definition:

- These agents **maintain an internal model** of the environment to track unobserved aspects.
- They can handle **partially observable environments** by using memory.

How They Work:

- Stores previous states and uses that data to make better decisions.
- Example: A **self-driving car** maintaining a map of surroundings and reacting accordingly.

Advantages:

- Works better in **dynamic** and **uncertain** environments.
- Can predict future outcomes based on past knowledge.

Limitations:

- Requires more **computational power** and **storage capacity** than simple reflex agents.



Goal-Based Agents

Definition:

- These agents take actions to **achieve specific goals** instead of just reacting to conditions.
- They evaluate possible actions and **choose the one that leads to a desired goal**.

How They Work:

- Uses **search algorithms** and **planning techniques** to determine the best path to achieve a goal.
- Example: **Google Maps Navigation** selecting the best route to a destination.

Advantages:

- More **flexible** than reflex agents.
- Can **plan ahead** instead of reacting instantly.

Limitations:

- Requires **more processing power** to evaluate multiple options.
- May be **inefficient** if the goal is unclear or unreachable.



Utility-Based Agents

Definition:

- These agents **not only aim to achieve a goal** but also **maximize performance or efficiency** by choosing the best possible action.
- Instead of simply reaching a goal, they consider **how well** they achieve it.

How They Work:

- Uses **utility functions** to rank different possible actions.
- Example: **A stock trading AI** choosing the best stock to maximize profits instead of just buying any available stock.

Advantages:

- Optimized decision-making for **complex** and **multi-step problems**.
- Helps in scenarios where there are **multiple correct answers** but one is **better** than others.

Limitations:

- Requires a **well-defined utility function** to evaluate choices.
- Can be **computationally expensive**.



Learning Agents

Definition:

- These agents **learn from past experiences** and improve their decision-making over time.
- Uses **machine learning algorithms** to adjust behavior.

How They Work:

- Initially follows basic rules, but improves by **analyzing feedback**.
- Example: **Chatbots like ChatGPT**, which learn from past interactions to provide better responses.

Advantages:

- Can **adapt** to new situations without reprogramming.
- More **efficient** than static agents in changing environments.

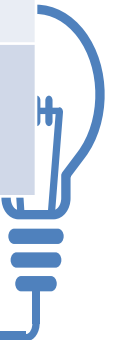
Limitations:

- Requires **large datasets** to train.
- May take **time to learn** and optimize performance.



Comparison Table of Different Agents

| Agent Type | Memory | Goal-Oriented? | Adaptive? | Example |
|---------------------|--------|----------------|-----------|------------------|
| Simple Reflex Agent | ✗ No | ✗ No | ✗ No | Thermostat |
| Model-Based Agent | ✓ Yes | ✗ No | ✗ No | Self-driving car |
| Goal-Based Agent | ✓ Yes | ✓ Yes | ✗ No | Google Maps |
| Utility-Based Agent | ✓ Yes | ✓ Yes | ✗ No | Stock trading AI |
| Learning Agent | ✓ Yes | ✓ Yes | ✓ Yes | ChatGPT |



Thank
you