University of Chittagong

Department of Computer Science & Engineering

Assignment on Intelligent Agent (Chapter 2)

Artificial Intelligence

CSE 713

Submitted To

Dr. Mohammad Shahadat Hossain

Professor

Computer Science & Engineering

University of Chittagong

Submitted By

Toasean Elmah Tasean

Department of Computer Science and Engineering

University of Chittagong

ID : 20701051

August 22, 2025

1 MARS Robot

1.1 PAGE Description

- **Percept:** Terrain images, atmospheric data, temperature, dust, rock samples, and sensor readings (pressure, chemical composition, radiation).
- **Action:** Move forward, backward, rotate, collect rock/soil samples, analyze samples, transmit data to Earth, recharge.
- **Goal:** Conduct scientific exploration of Mars (analyzing soil, detecting water traces, studying terrain).
- **Environment:** Vast Martian surface with rocks, craters, dust storms, extreme temperatures, and communication delays with Earth.

1.2 Environmental Characteristics

1.3 Recommended Agent Architecture

Goal-Based Agent
Rationale:

- Mars robots must accomplish specific scientific objectives.
- They need to plan complex sequences of exploration and sample analysis.
- Must evaluate long-term consequences of current actions (battery use, navigation choices).
- Plans must adapt to environmental changes such as dust storms or terrain shifts.
- Due to communication delays with Earth, the robot must act autonomously with goal-directed reasoning.

2 Obstacle Avoidance Robot

2.1 PAGE Description

- **Percept:** Sensors detect nearby obstacles.
- **Action:** Move forward, turn left, turn right.
- **Goal:** Navigate safely while avoiding collisions.
- **Environment:** Indoor room or maze with walls and obstacles.

Table 1: MARS Robot Environmental Characteristics

Characteristic	Classification	Argument
Accessible vs Inaccessible	Inaccessible	Sensors cannot provide complete state information. Hidden subsurface terrain, dust storms, and distant areas remain unknown.
Deterministic vs Nondeterministic	Nondeterministic	Weather patterns, dust storms, and equipment failures are unpredictable. Terrain conditions may change due to seismic activity.
Episodic vs Nonepisodic	Nonepisodic	Current actions affect future outcomes (battery depletion, sample collection paths). Past data guides next steps.
Static vs Dynamic	Dynamic	Weather changes, dust accumulation on solar panels, and shifting terrain affect performance.
Discrete vs Continuous	Continuous	Infinite positions and continuous motion/sensor data. Analog sensor readings (temperature, pressure, etc.).
With/Without Adversaries	Without Adversaries	No intelligent opponents exist. Challenges are natural, not adversarial.

2.2 Environmental Characteristics

2.3 Recommended Agent Architecture

Reactive Agent

Rationale:

- Obstacle avoidance requires immediate response to sensor inputs.
- Does not require long-term planning or memory of past states.
- Fast decision-making is essential for safe navigation.
- Suitable for simple environments like rooms with static/moving obstacles.

Table 2: Obstacle Avoidance Robot Environmental Characteristics

Characteristic	**Classification**	**Argument**
Accessible vs Inaccessible	Accessible	Sensors provide sufficient local environment information (obstacles nearby).
Deterministic vs Nondeterministic	Deterministic	Actions have predictable outcomes (e.g., turning left will always result in a left turn).
Episodic vs Nonepisodic	Episodic	Each obstacle-avoidance decision can be made independently of the previous one.
Static vs Dynamic	Dynamic	Moving obstacles or humans may alter the environment while the robot navigates.
Discrete vs Continuous	Continuous	Continuous motion and sensor readings as the robot moves.
With/Without Adversaries	Without Adversaries	No opponents; only physical barriers are present.

References

[1] Owen, J. (2021). *How does a Mars Rover work? (Perseverance)* [Video]. YouTube. Available at: `https://www.youtube.com/watch?v=0-oQRSViZQE`

[2] Hossain, M. S. (2024). *Robot1.mp4* [Video]. Google Drive. Available at: `https://drive.google.com/file/d/1EfICM63kbDPTtrnUf2qH1wcesBlO9pZe/view`