University of Chittagong

Department of Computer Science & Engineering

Assignment on Intelligent Agent (Chapter 2)

Artificial Intelligence

CSE 714

Submitted To

Dr. Mohammad Shahadat Hossain

Professor

Department of Computer Science & Engineering

University of Chittagong

Submitted By

Jannatul Maoua Saima

ID : 20701081

Department of Computer Science and Engineering

University of Chittagong

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1 Mars Rovers

1.1 PAGE Description

- **Percept:** Detect terrain, atmospheric conditions, and chemical composition
- **Action:** Navigating terrain, collecting samples, transmitting data
- **Goal:** Explore Martian surface and gather scientific data
- **Environment:** Extraterrestrial landscape (Mars)

1.2 Environmental Characteristics Analysis

Characteristic	Classification	Argument
Accessible vs Inaccessible	**INACCESSIBLE**	The sensors cannot provide complete state information about the vast Martian environment. Hidden obstacles, subsurface conditions, and distant terrain remain unknown. Weather conditions and dust storms can obscure visibility.
Deterministic vs Non-deterministic	**NON-DETERMINISTIC**	Weather patterns (dust storms) are unpredictable. Equipment failures can occur randomly. Terrain conditions may change due to weather or seismic activity. Communication success depends on atmospheric conditions.
Episodic vs Non-episodic	**NON-EPISODIC**	Current actions affect future capabilities (battery usage, equipment wear). Sample collection locations influence future exploration paths. Previous exploration data guides subsequent mission decisions.
Static vs Dynamic	**DYNAMIC**	Weather conditions change continuously. Dust accumulation affects solar panel efficiency. Temperature variations affect equipment performance. Terrain may change due to dust storms.
Discrete vs Continuous	**CONTINUOUS**	Infinite possible positions and orientations. Continuous sensor readings (temperature, pressure, etc.). Continuous motion control and navigation. Analog sensor data processing.
With/Without Adversaries	**WITHOUT ADVERSARIES**	No intelligent opponents on Mars. Challenges come from environmental factors, not strategic opponents.

Table 1: MARS Robot Environmental Characteristics

1.3 Recommended Agent Architecture

GOAL-BASED AGENT

Rationale:

- Mars robots must work toward specific scientific objectives (goals)
- Must plan complex sequences of actions for sample collection and analysis
- Need to consider future consequences of current actions
- Must adapt plans based on changing environmental conditions
- Communication delays prevent real-time human control, requiring autonomous goal-directed behavior

2 Obstacle Avoidance Robot

2.1 PAGE Description

- **Percept:** Recognizes obstacles
- **Action:** Moving left, right, forward.
- **Goal:** Avoiding obstacles
- **Environment:** Room

2.2 Environmental Characteristics Analysis

Characteristic	Classification	Argument
Accessible vs Inaccessible	**INACCESSIBLE**	Sensors have limited range and field of view. Obstacles may be hidden behind other objects. Cannot simultaneously monitor all directions. Some obstacles may be outside sensor detection range.
Deterministic vs Non-deterministic	**NON-DETERMINISTIC**	Dynamic obstacles (people, animals) move unpredictably. Sensor readings may have noise and uncertainty. Environmental conditions (lighting) can affect sensor performance.
Episodic vs Non-episodic	**EPISODIC**	Each obstacle avoidance action is relatively independent. Previous obstacle encounters don't significantly impact current decisions. Each moment of navigation can be treated as a separate episode.
Static vs Dynamic	**DYNAMIC**	Moving obstacles change positions continuously. People and animals move unpredictably. Lighting conditions may change. Environmental layout may be modified.
Discrete vs Continuous	**CONTINUOUS**	Infinite possible positions and orientations. Continuous sensor readings (distance, speed). Smooth motor control and movement. Analog sensor data processing.
With/Without Adversaries	**WITHOUT ADVERSARIES**	Obstacles are not trying to strategically interfere with the robot. People and animals move for their own purposes, not to challenge the robot.

Table 2: Obstacle Avoidance Robot Environmental Characteristics

2.3 Recommended Agent Architecture

SIMPLE REFLEX AGENT with INTERNAL STATE

Rationale:

- Obstacle avoidance primarily requires immediate reactive responses
- Fast reaction time is crucial for safety

- Simple condition-action rules are sufficient: "If obstacle detected at distance X, then move(left, right, forward)/turn/stop"
- Internal state needed to track current position and recent movements to avoid getting stuck
- Episodic nature means complex long-term planning is unnecessary
- Real-time response requirements favor simple, fast decision-making over complex reasoning

References

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