

Report

Aim

The aim of this project is to design and implement the Wumpus World game using Prolog, a logic programming language widely used in Artificial Intelligence (AI). The objective is to simulate a reasoning-based environment where an intelligent agent navigates a cave to find gold while avoiding hazards such as the Wumpus (a monster), pits, and bats. The project demonstrates how logical rules and inferences can be applied to model decision-making in uncertain environments.

Stack

Programming Language: Prolog

Concept Used: Artificial Intelligence (Knowledge Representation and Logical Reasoning)

Paradigm: Declarative Programming

Key Features:

- Logical rules and facts for environment definition
- Dynamic predicates for real-time game state updates
- Rule-based reasoning for perceptions and actions

Software Requirements: SWI-Prolog or any compatible Prolog interpreter

Hardware Requirements: Standard computer system capable of running Prolog

Algorithm

1. Initialize the Game Environment:

- Create interconnected rooms using adjacency rules.
- Assign rooms for Wumpus, pits, bats, and gold.
- Initialize player in a safe starting room (Room 0).

2. Perception Generation:

- Player perceptions based on adjacent rooms (stench, breeze, rustling, glitter).

3. Player Movement and Actions:

- Player can move to adjacent rooms or shoot arrows.
- Validations and results managed by Prolog rules.

4. Game Logic and Reasoning:

- Dynamic facts track player, gold, and Wumpus state.
- Logical inference to determine safe or dangerous rooms.

5. Game Termination:

- Game ends upon player's death, gold retrieval, or arrow exhaustion.

Steps of Working or Working Mechanism

1. Start the Game using `init_game`.
2. Explore Rooms using `move(RoomNumber)`.
3. Shoot Arrows using `shoot(RoomNumber)`.
4. Check Game State using `status` or `visited_rooms`.
5. AI Reasoning with inference rules (`possible_wumpus_location`, `definitely_safe`).
6. Win by collecting gold or lose by entering hazardous rooms.

Conclusion

The Wumpus World Prolog game successfully demonstrates the principles of Artificial Intelligence through logical reasoning and inference-based problem solving. It models an intelligent agent that perceives, reasons, and acts in a simulated environment. The project highlights the power of declarative logic programming in representing knowledge, deriving inferences, and making decisions under uncertainty.