COMP9016 Assignment #1

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# 1.1 Building Your World

## Task Environment Description

* Define the 2D world (grid-based, game-like environment)
* Describe the mechanics: movement, goals, obstacles, rewards
* Completion conditions for the game

## Agent Types and PEAS Descriptions

Introduce and describe three distinct agent types:

### Agent 1: Simple Reflex Agent

* **PEAS**:
  + **Performance**: Number of goals achieved
  + **Environment**: 2D grid
  + **Actuators**: Move (Up, Down, Left, Right), Act
  + **Sensors**: Current cell status
* **Advantages**: Fast, simple logic
* **Disadvantages**: No memory, poor in partially observable environments

### Agent 2: Model-Based Reflex Agent

* **PEAS**:
  + **Performance**: Efficiency in goal completion
  + **Environment**: 2D grid with partial observability
  + **Actuators**: Same as above
  + **Sensors**: Current cell + internal state
* **Advantages**: Handles partial observability
* **Disadvantages**: More complex, needs accurate model

### Agent 3: Goal-Based Agent

* **PEAS**:
  + **Performance**: Reaching defined goal states
  + **Environment**: Dynamic 2D grid
  + **Actuators**: Same
  + **Sensors**: Current cell + goal state
* **Advantages**: Flexible, goal-oriented
* **Disadvantages**: Requires search/planning

## Agent Evaluation

* Performance comparison in different world sizes
* Use tables/graphs to show success rates, efficiency
* Discuss underperformance scenarios

# 1.2 Searching Your World (Search Techniques)

## Problem Formulation

* Define initial state, actions, transition model, goal test, path cost
* Explain why search is necessary in your world

## Uninformed Search Techniques

Select and describe three techniques:

### Breadth-First Search (BFS)

* Complete, optimal (if step cost = 1)
* Time/space complexity:

### Uniform-Cost Search

* Optimal for varying path costs
* Uses priority queue based on path cost

### Depth-First Search (DFS)

* Low memory usage
* May not be complete or optimal

## Informed Search Techniques

Select and describe three techniques:

### Greedy Best-First Search

* Uses heuristic to guide search
* Fast but not always optimal

### A Search\*

* Combines path cost and heuristic
* Complete and optimal if heuristic is admissible

### Iterative Deepening A\*

* Combines benefits of DFS and A\*
* Good for large state spaces

## Performance Evaluation

* Compare techniques using:
  + Completeness
  + Optimality
  + Time complexity
  + Space complexity
* Use experimental results (tables/graphs)

# Conclusion

* Summarize key findings
* Reflect on agent suitability and search efficiency
* Suggest improvements or future work