AI Searching Techniques

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Learning Objectives

- Introduce the students to different search techniques and algorithms

- Present a general approach to model and represent problems as search problems

- Demonstrate how to implement AI search techniques and algorithms

Last-Time

- What is Intelligence?

- What is Artificial Intelligence?

- How do we measure Intelligence?

- How do we measure Artificial Intelligence?

- Branches of AI and Its Applications

Outlines

- Introduction to AI Search Techniques

- Uninformed Search (blind or brute-force)

- Informed Search (Heuristic)

- Local Search

Introduction To Search Techniques

What is Search?

- Examine a large number of possibilities
- An algorithm that retrieves information stored within some data structure
- Can you give examples of search algorithms?
  - Linear Search
  - Binary Search
- What is the time complexity of linear search and binary search?

Search Common Terminologies

- **Search Space:** aka problem space or state space. The set of all possible solutions of the search problem.
- **Problem Instance:** The initial state and the goal state.
- **Goal State:** The desired outcome (problem solution)
- **State Space Search:** all of the information necessary to predict the effects of an action and to determine if it is a goal state.
- **Space Complexity:** The maximum number of states that are stored
- **Time Complexity:** The maximum number of states to examine to reach the goal state

Search Problems

Search Problems share some common characteristics:

1. Start by the initial situation, and we want to reach a certain goal.
2. For any current state, we have a set of simple actions or steps.
3. Executing a set or a subset of steps may or may not lead to the goal
4. Search is the process of investigating and selecting one or more actions to reach the goal
5. In general, executing one or more actions is associated with a certain cost. If the goal of a search problem is to find the goal and with a given cost, then this is an optimization problem.

Uninformed Search

Uninformed Search

- Also known as blind or brute-force search

- It can only distinguish between goal and not goal state

- High time and space complexity

- The most simple search algorithm in term of implementation and knowledge.

- They do not require domain-specific knowledge

- Generates the search tree without using any domain specific knowledge.

Uninformed Search

Is guessing a sign of Intelligence?

Is trying or examining all possible states to the goal an act of intelligence?

In Class Activity: Check Your Group

If you have a group work with your group on the today in-class activity if you do not join or form a group and work on the in-class activity.

The first 5 groups to finish the activity get (1 bonus point)

Next-Time

Uninformed Search

Constraint satisfaction problem

Backtracking algorithm