Artificial Intelligence and Applications – Task 2: Searching, Scheduling and Planning

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Search:

In artificial Intelligence, the goal is to create an agent that can act rationally and think as if it were a human. A huge part of AI is search algorithms. Search algorithms, such as beath breadth first, depth first or Dijkstra’s algorithm, can be used to show how nodes are connected within a network. This might be a road network, or a network of connected routers and it might be useful to know the weight of all the paths through the network. It is common for AI to use these search algorithms. For example, google maps could use this to show you the best route to the location you are looking to find.

A search problem consists of:

* **A State Space.**Set of all possible states where you can be.
* **A Start State.**The state from where the search begins.
* **A Goal Test.**A function that looks at the current state returns whether it is the goal state.

The **Solution**to a search problem is a sequence of actions, called the **plan**that transforms the start state to the goal state.

This plan is achieved through search algorithms.

Planning:

Planning is the task of finding a procedural course of action for a declaratively described system to reach its goals while optimizing overall performance measures. Automated planners find the transformations to apply in each given state out of the possible transformations for that state. In contrast to the classification problem, planners provide guarantees on the solution quality [2]. Planning involves assembling a sequence of actions that lead to the solution of your goal [14]. All problems require planning to reach a conclusion. We can think of planning as a chain of states, the computer moves from one state to the next until it reaches its conclusion. Planning often involves checking if there is any possible solution and then optimizing it and altering it to fit the problem at hand.

Scheduling:

Scheduling is like planning, but instead of being concerned about what to do it focuses on when to do them. For this reason, planning and scheduling go hand in hand. Planning and scheduling are a vital element in creating Artificial Intelligent systems as it allows the system to move from one state to another, which is the main goal of the system [1].

Questions:

1. What are the most common search algorithms?

* Dijkstra’s Algorithm
* A\*
* Breath first search
* Depth first search

1. What are the different types of planning in relation to Artificial Intelligence?

There are two main types of planning:

* Forward State Space **Planning** (FSSP) FSSP behaves in a similar fashion like forward state space search. ...
* Backward State Space **Planning** (BSSP) BSSP behaves in a similar fashion like backward state space search [3].

1. What is Forward State Planning?

Forward state planning refers to the action of starting at an initial state i, and implementing a certain set of instructions to reach the goal state, g.

1. What is Backward state planning?

Like forward state planning, backward state planning is the process of going from one state to another however, with backward state planning we begin at the goal state, g and we move backwards towards a sub-goal g’ [3].

1. What are the different types of search algorithms?

Graphical user interface, application

Description automatically generated

Picture of the two types of search algorithms as seen on geekforgeek.com [4]

References

[1] <https://www.intelligentautomation.network/decision-ai/articles/a-basic-guide-to-planning-scheduling-and-optimization>

[2] <https://researcher.watson.ibm.com/researcher/view_group.php?id=8432>

[14] <https://users.aalto.fi/~rintanj1/jussi/planning.html>

[3] <https://www.geeksforgeeks.org/what-is-the-role-of-planning-in-artificial-intelligence/>

[4] <https://www.geeksforgeeks.org/search-algorithms-in-ai/>