

Assignment ATR-4

Title: Hill Climbing

Problem Statement

Use heuristic search to implement Hill-Climbing approach

Objective

To understand and implement Hill Climbing algorithm

Outcome

To be able to implement Hill Climbing algorithm

Software and Hardware requirements

Python 3, Code editor, UNIX / LINUX based OS, 64 bit CPU, 8GB RAM

Theory related concepts

In numerical analysis, hill climbing is a mathematical optimization technique which belongs to the family of local search. It is an iterative algorithm that starts with an arbitrary solution to a problem, then attempts to find a better solution by making an incremental change to the solution. If the change produces a better solution, another incremental change is made to the new solution, until no further improvements can be found.

It is a heuristic search algorithm and given a large set of inputs and a good heuristic function it tries to find a

sufficiently good solution to the problem. However the solution might not be global optimum.

'Heuristic search' implies that optimal solutions are not guaranteed, however, a good solution will be reached in a reasonable time.

A heuristic function will rank all the possible alternatives at any branching step in a search algorithm based on available information i.e. it helps the algorithm select the best route out of all possible routes.

Hill climbing is a variant of the generate and test algorithm, it also uses a greedy approach.

Simple hill climbing examines the neighbouring nodes one by one, and selects the first neighbouring node which optimizes the current cost as next node.

Algorithm

1. Evaluate initial state

If it is a goal state, then stop and return success

Else make initial state as current state

2. Loop until the solution state is found or there are no new operators present which can be applied to the current state.

i) Select a state that has not yet been applied to the current state and apply it to produce a new state.

ii) Evaluate new state by

a) If the current state is a goal state, stop and return success

b) If it is better than current state, then make it

current state and proceed further.

c) If it is not better than current state, The continue in a loop until a solution is found.

3. Exit

Conclusion

The Hill climbing algorithm was understood and successfully implemented