Group Homework Credit

COSC 4368 Spring 2024

Groups B and C Tasks

Remark: both Groups will present on Mo., Feb. 12!

Group B Task

Design and implement a simulated annealing approach which minimizes the following function:

fFrog(x,y)= xcos(sqrt(|x+y+1|))sin(sqrt(|yx+1|)) +

(1+y)sin(sqrt(|x+y+1|))cos(sqrt(|yx+1|))

with x,y∈[512,512]

Assumptions

1. You run the simulated annealing algorithm for 8000 steps (step=1,…,8000)
2. Assume the neighborhood size is z=5; that is, new solutions will be constructed by the SA implementation by adding random numbers in [-5,+5] to the current solution *current*=(x,y)

Steps to be Conducted:

1. Come up with cooling function, named *cool*, which computes the probability prop of accepting a downward move, based on step and ΔE: prop= *cool*,(step, ΔE)
2. Implement a SA algorithm using *cool*,.
3. Run the SA algorithm using starting position (444,444), outputting (current,fFrog(current)) every 80 steps (101 outputs)
4. Potentially enhance the *cool* function and repeat step 3! (optional task)
5. Assess the performance of your SA algorithm.
6. Summarize the challenges in using SA for minimizing fFrog.

Summarize your task findings and present them in appox. 12 minutes during the Feb. 12, 2024 class!

Group C Task

Applying Various Search Strategies to a State Space

Assume that you have the following search graph, where S is the start node and G1 and G2 are goal nodes. Arcs are labeled with the cost of traversing them and the estimated cost to a goal is reported inside nodes. Apply the search strategies listed below to the search graph:, (a) indicate which goal state is reached if any, (b) list, in order, the states expanded, and (c) show the final contents of the OPEN and CLOSED lists. (Recall that a state is expanded when it is removed from the OPEN list.) When there is a tie with respect to which node has to be expanded next, nodes should be expanded in alphabetical order. The used search strategies include;

1. *depth-first*
2. best-first (using f = h)
3. A\* (using f = g + h)

#### 

**3**

#### General Pseudocode for Depth/Breath/Best First Search

OPEN = { startNode } // Nodes under consideration.

CLOSED = { } // Nodes we're done with.

while OPEN is not empty

{

remove an item from OPEN based on search strategy used

- call it X

if goalState?(X) return the solution found

otherwise // Expand node X.

{

1) add X to CLOSED

2) generate the immediate neighbors (ie, children of X)

3) eliminate those children already in OPEN or CLOSED

4) add REMAINING children to OPEN

}

}

return FAILURE // Failed if OPEN exhausted without a goal being found.

#### General Pseudocode for SMA\*/A\*Search

OPEN = { startNode } // Nodes under consideration.

CLOSED = { } // Nodes we're done with.

while OPEN is not empty

{

remove an item from OPEN based on search strategy used

- call it X

if goalState?(X) return the solution found

otherwise // Expand node X.

{

1) add X to CLOSED

2) generate the immediate neighbors (ie, children of X)

3) add all children to OPEN

}

}

return FAILURE // Failed if OPEN exhausted without a goal being found.**Submission Guidelines:**

The solution needs to be summarized as follows:

|  |  |
| --- | --- |
| GOAL Reached first |  |
| Expanded states sequence |  |
| OPEN List at the end |  |
| CLOSE List at the end |  |