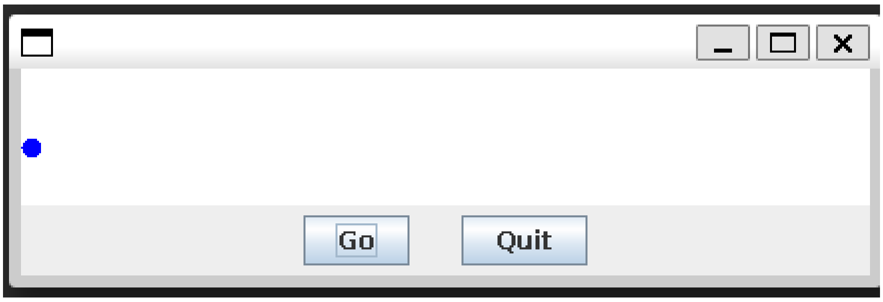
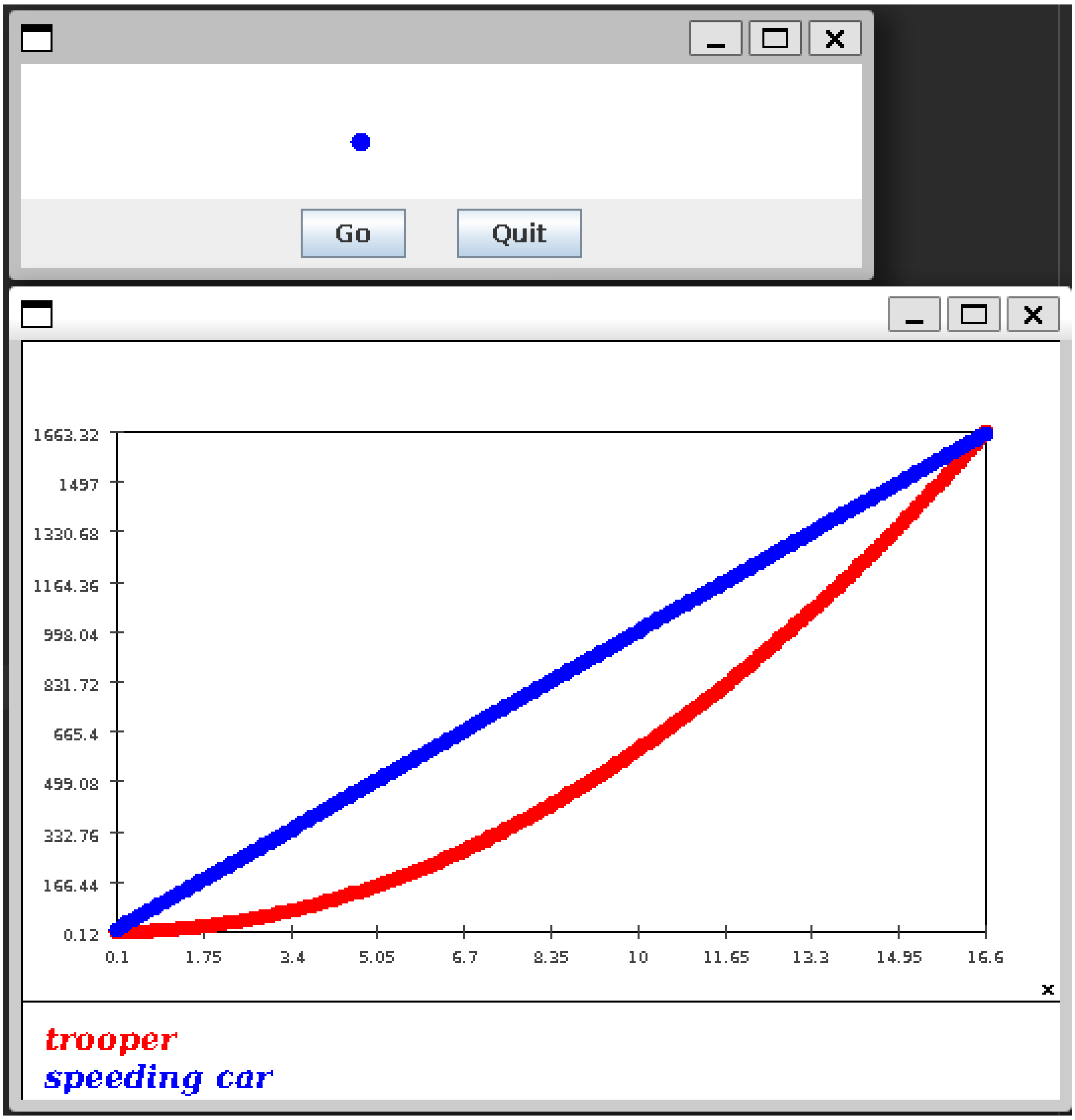
Assignment3

1

- Instruction
- cd into the folder containing my homework java files
- compile and run the code as follows

-
  ```
  javac StateTrooperRoger.java
  java StateTrooperRoger
  ```
- You should see the GUI now.
- 

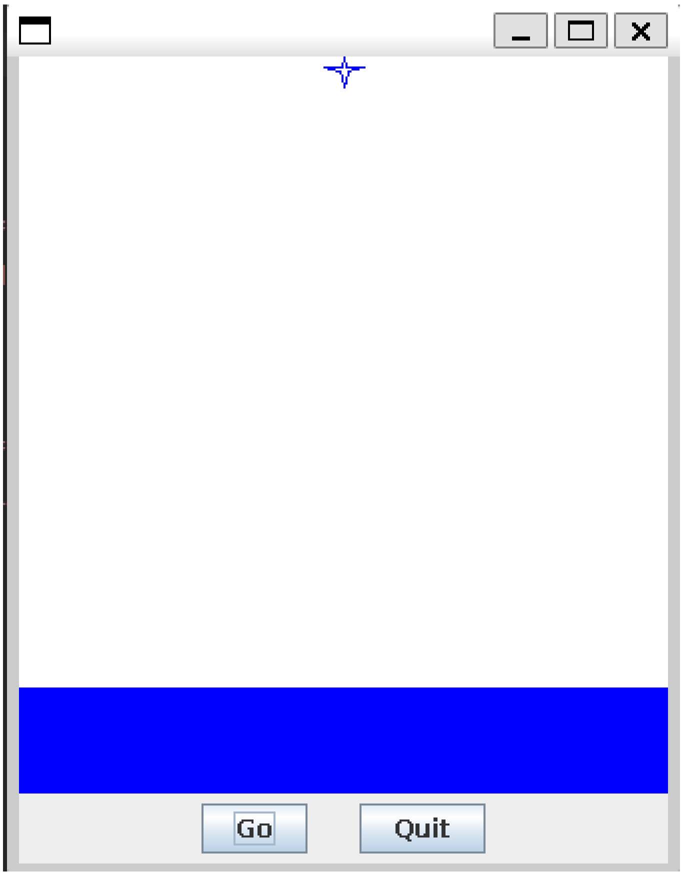
- Hit the `Go` button when you are ready.
- Sample result
  - 

- Answers to the questions are in the console output

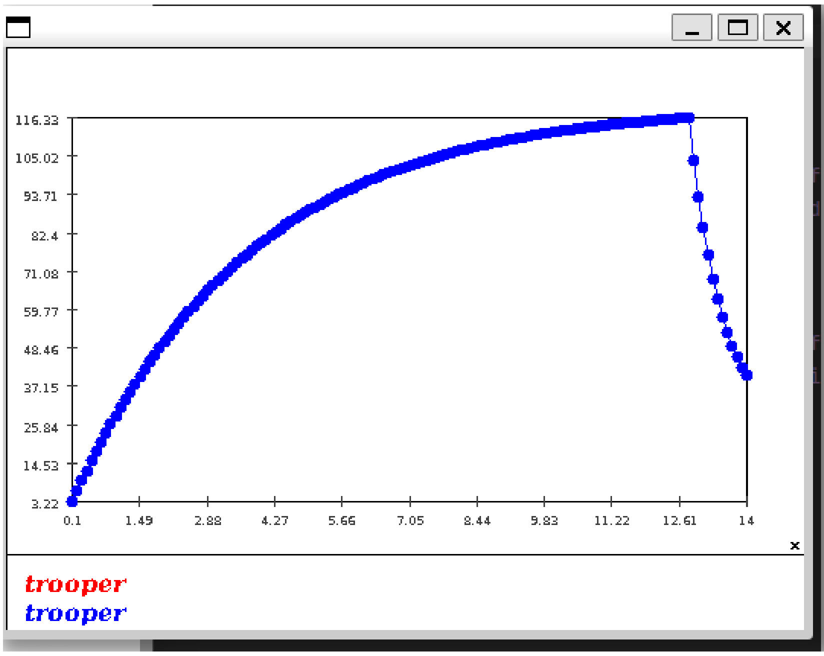
-
  ```
  time used:16.599999999999966
  distance used:1663.32
  trooper's speed:199.19999999999953
  ```
- For the distance, the program is using second * Miles/hour, so we need a conversion to make sense
  - 1663.32 (mile/h*second) = 0.462 mile

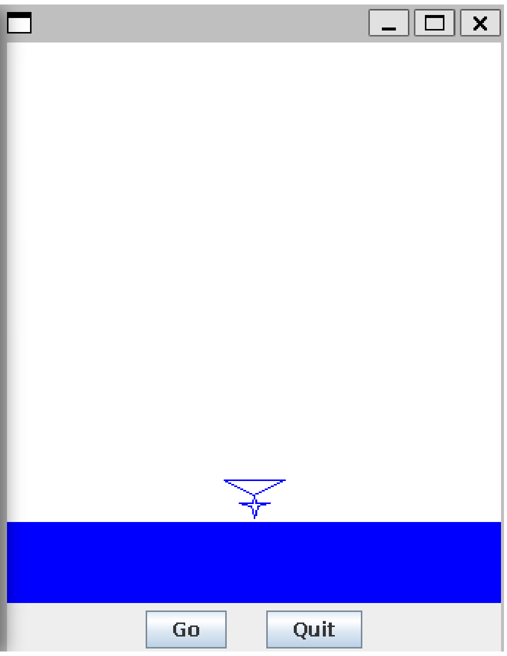
2

- cd into folder containing my homework java files
- compile and run the code as follows

-
  ```
  javac SkydiverRoger.java
  java SkydiverRoger
  ```
- You should see the GUI now.
- 

- Hit the `Go` button when you are ready.
- Sample result& velocity plot
-





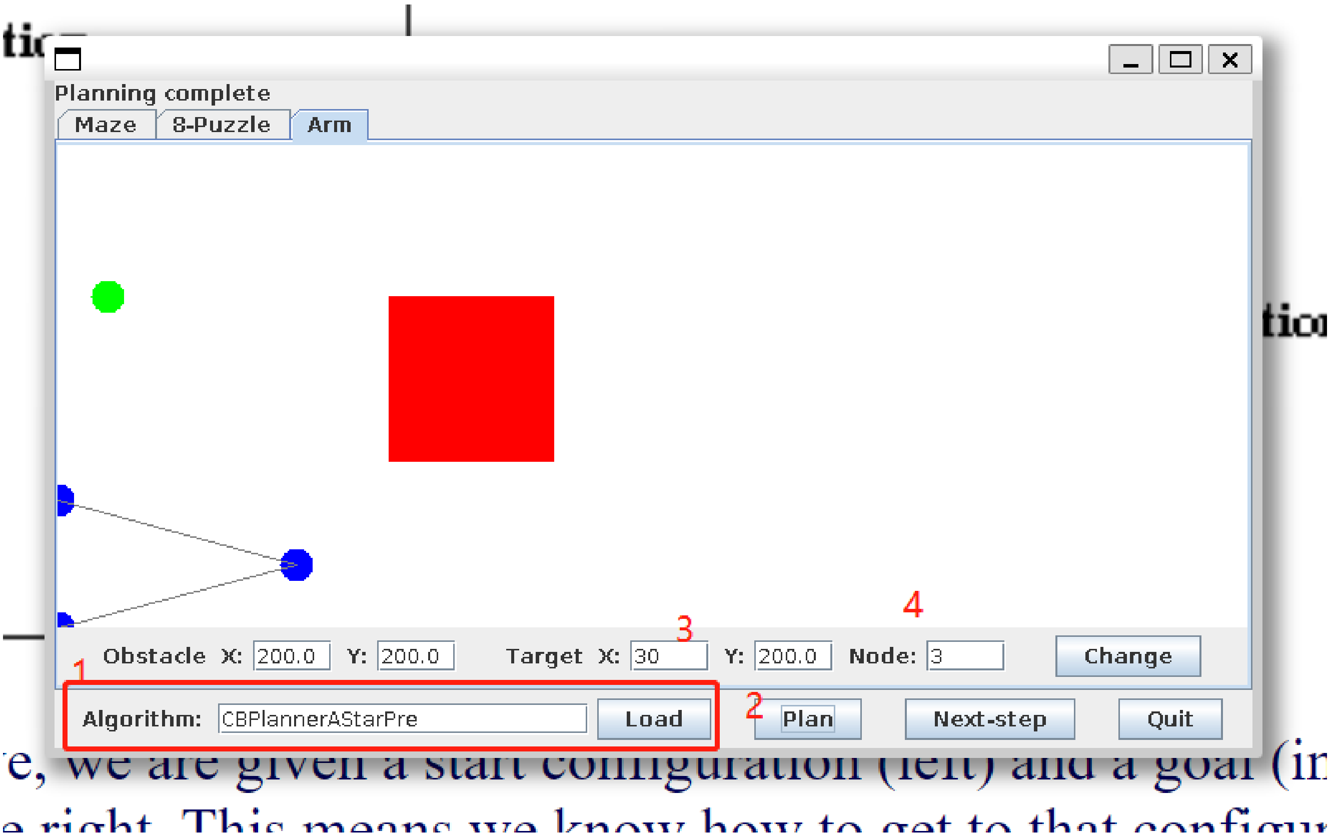
- You can see the skydiver's icon has a chute on it once it's deployed.
- The chute should be opened at 12.8s for the skydiver to land with a velocity less than 40 feet/sec

3

See `CBPlannerAStarPre.java` for code integration

Instruction for running codes

- cd into the unzipped folder
- run the following code to compile and run the GUI

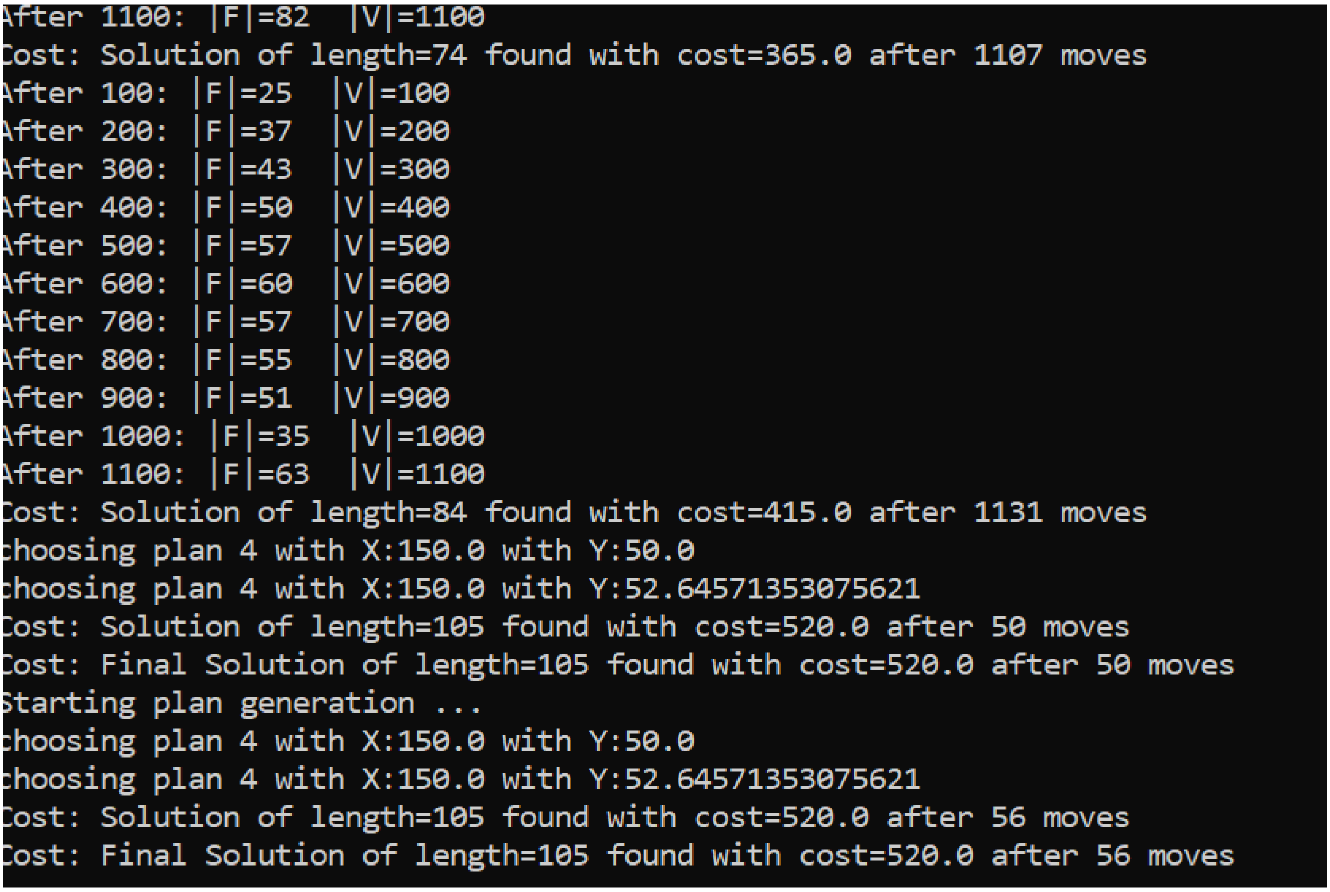
-
  ```
  javac CBPlannerAStarPre.java
  javac PlanningGUIRoger.java
  java PlanningGUIRoger
  ```
- You should see the GUI running by now
- 

Planning complete

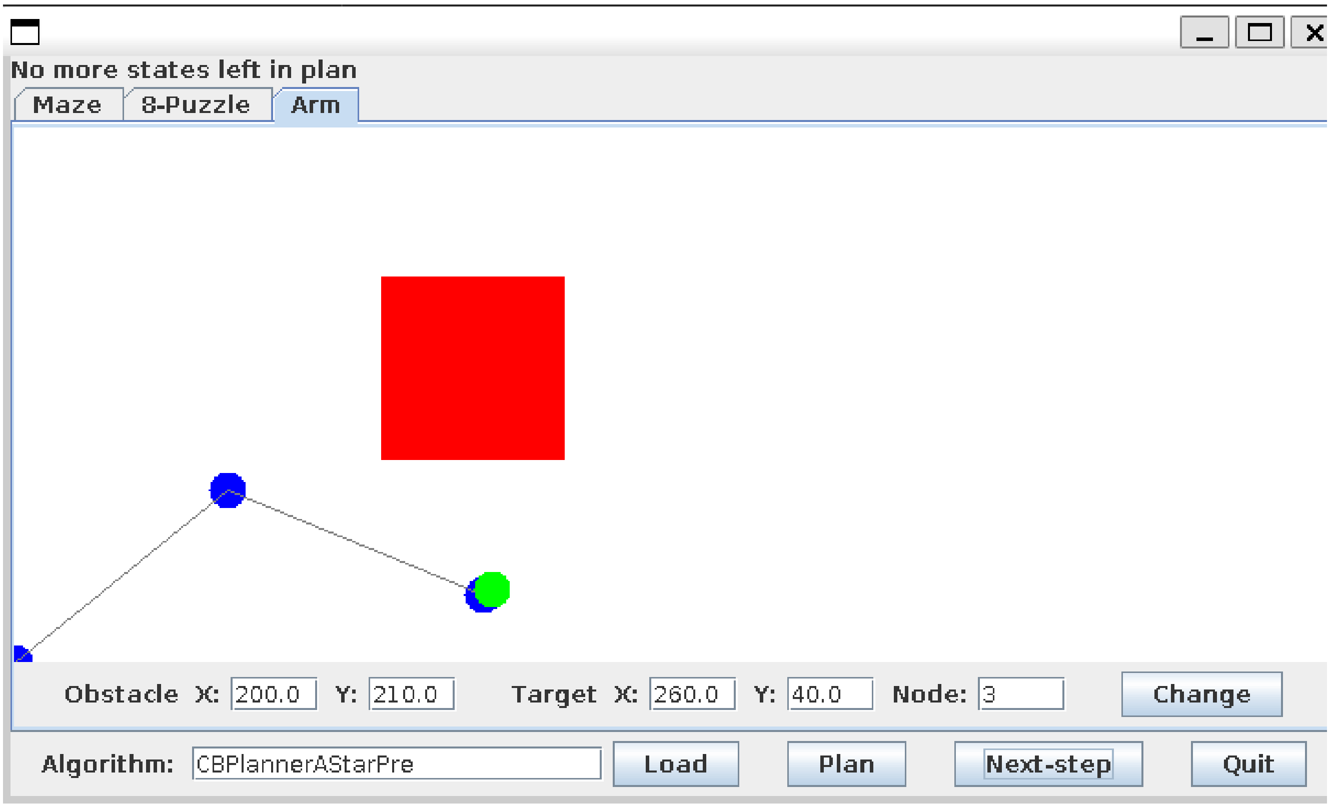
Obstacle X: 200.0 Y: 200.0 Target X: 30 Y: 200.0 Node: 3

Algorithm: CBPlannerAStarPre

tic
Maze
8-Puzzle
Arm
tio
1
2
3
4
Change
Load
Plan
Next-step
Quit
e, we are given a start configuration (left) and a goal (in
e right. This means we know how to get to that configu

- Change to tab `Arm`, and enter `CBPlannerAStarPre` in the Algorithm then hit the `Load` button.
- Once the GUI shows load complete, hit the `Plan` Button.
- You can change the Target X,Y and hit `Change` Button. Then hit `Plan` button again to see performance on different points.
- If you have changed the location of obstacles, please allow more processing time for the pre-calculations will be regenerated.
- Sample result
- 

```
After 1100:  |F|=82   |V|=1100
Cost: Solution of length=74 found with cost=365.0 after 1107 moves
After 100:  |F|=25   |V|=100
After 200:  |F|=37   |V|=200
After 300:  |F|=43   |V|=300
After 400:  |F|=50   |V|=400
After 500:  |F|=57   |V|=500
After 600:  |F|=60   |V|=600
After 700:  |F|=57   |V|=700
After 800:  |F|=55   |V|=800
After 900:  |F|=51   |V|=900
After 1000:  |F|=35   |V|=1000
After 1100:  |F|=63   |V|=1100
Cost: Solution of length=84 found with cost=415.0 after 1131 moves
Choosing plan 4 with X:150.0 with Y:50.0
Choosing plan 4 with X:150.0 with Y:52.64571353075621
Cost: Solution of length=105 found with cost=520.0 after 50 moves
Cost: Final Solution of length=105 found with cost=520.0 after 50 moves
Starting plan generation ...
Choosing plan 4 with X:150.0 with Y:50.0
Choosing plan 4 with X:150.0 with Y:52.64571353075621
Cost: Solution of length=105 found with cost=520.0 after 56 moves
Cost: Final Solution of length=105 found with cost=520.0 after 56 moves
```

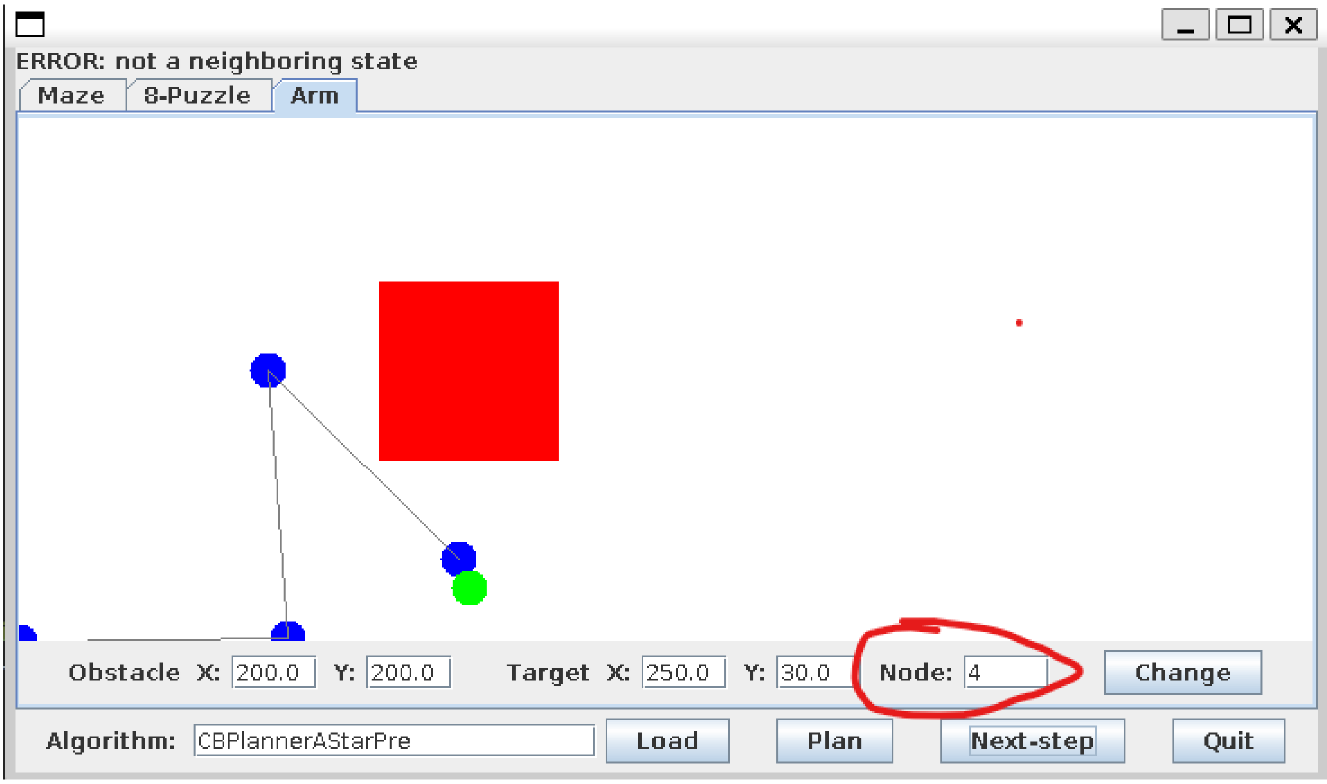
- 

No more states left in plan

Obstacle X: 200.0 Y: 210.0 Target X: 260.0 Y: 40.0 Node: 3

Algorithm: CBPlannerAStarPre

- You can also change the node from 3 to 4 and hit the Change Button to see how this program works on 4 node.

- 

ERROR: not a neighboring state

Obstacle X: 200.0 Y: 200.0 Target X: 250.0 Y: 30.0 Node: 4

Algorithm: CBPlannerAStarPre

3 Answers

- Then select a few new targets and compare regular A* with your new algorithm, which we'll call pre-A. *How will you choose which pre-stored plan to use? Alternatively, you could run all 5 of them (by stepping through each in turn). How often does pre-A* outperform A*?
  - intuitively, I chooses the plan which has the least distance between the plan's ending point and the goal.
  - In 10 out of 10 tests the pre-A outperforms A*, pre-A often find solutions just with less than 100 moves from pre-defined routes but A* need more than 1000 steps from beginning.
- [Optional for undergrads] Experiment with *k* and implement a parallel search, in which you treat each pre-stored plan as a separate search from that starting point, stepping through each in turn. At what values of *k* does the parallel-search become worse than the single run of A*? To make a fair comparison, add up the total time for a number of different goal states.
  - With the increase of K, if we are to include the time used for pre-calculating K-routes, When K is significantly larger than the count of different goal states. The pre-A will become worse than A*
- [Optional for undergrads] Use an arm with 4 links instead of 3. How does this change your findings? You can change the number of links by setting `numLinks=4` in `ArmProblem.java`.
  - I have made a customization in the GUI panel so you can enter 4 in the node blank and hit `Change` button to set the arm to 4 nodes.
  - When Arm is using 4 nodes, the calculation of A* becomes significantly harder. A typical solution will need more than 20k steps to achieve. And using pre-A doesn't help to reduce the time needed in this process.