Foundation of Artificial Intelligence

Lab – 1 (Write up)

Ravikiran Jois Yedur Prabhakar (ry4287@rit.edu)

- Speed:
    - The main assumption is the unit of speed which is meter/minute
    - For each different terrain, the speed increases or decreases based on the difficulty to travel in that particular terrain
- Calculating distance:
    - As given by in the question, the latitudinal distance (horizontal) is 7.55 and the longitudinal distance(vertical) is 10.29
    - The diagonal distance is calculated using the Pythagoras Theorem for hypotenuse
- Distance:
    - The time to pass from one pixel to another, the distance from the start node is halved
    - This is because, the assumption is that the distance is from the centre of the pixel to the centre of the next pixel that has to be travelled to
    - These halved distances are divided by the speed of the source and speed of the destination respectively and add them to get the time, which is the cost between the two points
- Slope:
    - To calculate the slope, the treadmill gradient is used which is: (elevation_difference/distance) * 100
    - The total cost between two pixels is the product of the slope and distance
    - Reference: https://www.topendsports.com/fitness/treadmill-gradient.htm
- Checking the neighbours:
    - The neighbours of the pixels are calculated by adding or subtracting -1 or 1 to the pixel coordinate value
- A* search:
    - The priority queue has been made use of so that the minimum cost is always taken
    - For the Heuristic value, the straight-line distance is calculated between the pixels using the Euclidian distance between the goal node and the next node to be visited
    - Reference: https://www.redblobgames.com/pathfinding/a-star/implementation.html
- For different seasons:
    - Winter: The original terrain image is edited to draw the snow/ice on the edges of water
    - Spring: The original terrain image is edited to draw the mud around the edges of water
    - The speed for these pixels is decreased significantly if the season parameter shows winter or spring
    - The BFS is used to find out if the next pixel is water
    - If so, that pixel is changed to another color which has a lower speed parameter assigned to it
    - When A* search is done, their cost is calculated
    - As their speed is reduced the time required to pass through these pixels increases
    - Fall: As told in the problem statement, the speed across the easy movement forest is decreased
- The Output Image:
    - Each node that is mentioned in the input file is highlighted as advised in the problem statement
    - The A* search is used to traverse through these nodes (pixels)
    - The predecessor path for each node is kept track of and the pixels in the path is colored red and written on the output image
- Correctness:
    - For correctness of the algorithms, please refer the output image
    - It has the path travelled by the A* search
- The total distance of the path in meters is calculated and written on the console
- The total time required for the code to run is also calculated and written on the console