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PROJECT 1 REPORT

Running the code:

$make
$./Project1 filename startx starty endx endy

Important Design Decisions:

The project consists of the following files:
main.cpp — handles command line arguments.
queue.h - defines the circular queue.
func.h - defines all the functions to read the array, calculate neighbors, and calculating the distance and coordinates.
1. I have implemented a circular queue in order to do the push and pull operations.

2. In order to create a 2D matrix to calculate the neighbors of each and every element, I have implemented the following algorithm:

1. Push the start element on to the queue.
2. In a while loop,
    a. pop the first element
    b. check to see the top, bottom, left and right of the element is equal to 1. If it is, then increment the value of the top, bottom, left and right element and push those on to the queue.
    c. pop the first element
    b. continue this process until the queue is not empty.

3. In order to calculate the shortest path. I worked backwards. I started with the end element and implemented the following algorithm:

1. Push the last element on to the queue.
2. In a while loop,
    a. pop the last element.
    b assign the maximum value to the element popped.
    c . check if the top, bottom, left and right elements are one less than the value of the popped element.
    d. if yes, then store that into another queue to hold the coordinates and push the same structure to the temporary queue that you need to keep iterating through.
    e. I had to put this in a if-else if control statement so that only one of the neighbors are taken into consideration.
    f. Run the while loop as long as the temporary queue is not empty.

4. In order to print the coordinates of the array, I iterated through each of elements of the queue, then added each of the row values into an array and each of the column values into another array. Then traversed the array in reverse order and printed the list.

5. The final distance was calculated by subtracting the target value by 10.