New York City College of Technology

DEPARTMENT OF MECHANICAL ENGINEERING TECHNOLOGY

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Final Project: City Flooding and Evacuation

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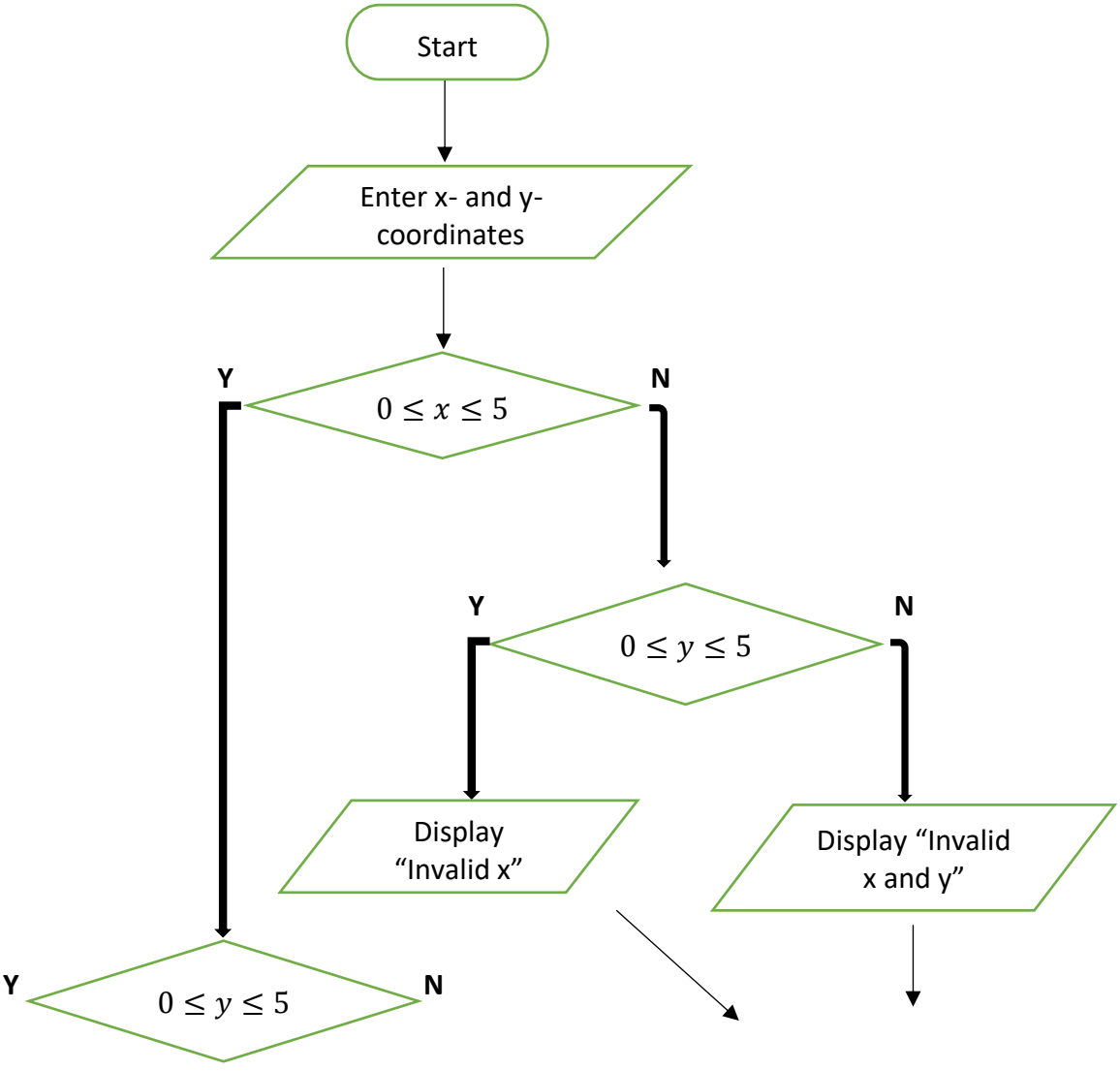
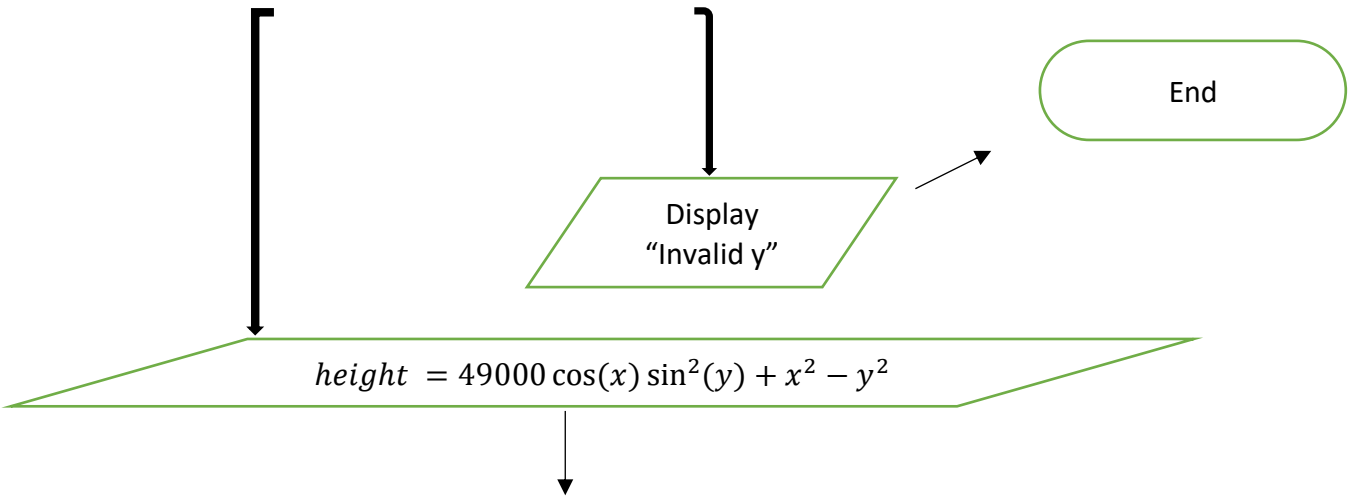
Introduction

I wrote this code to take x- and y- inputs within a given rectangular area and outputs the height of a surface above sea level in meters. A tidal wave is on course to hit this area of land and any area with a height below sea level will be flooded. This program calculates the average time it will take (in hours) to reach the locations that are below sea level on foot. If the time it takes is greater than or equal to 2 hours, then a fast vehicle like a helicopter must be sent to help evacuate. If the time is takes is less than 2 hours, we can balance our resources and send out slower moving vehicles likes busses to reach those areas. The idea is that there are limited helicopters available to use so resources must be used wisely.


Start
Enter x- and y-coordinates
$0 \leq x \leq 5$
Y
N
$0 \leq y \leq 5$
Y
N
Display "Invalid x"
Display "Invalid x and y"
$0 \leq y \leq 5$
Y
N



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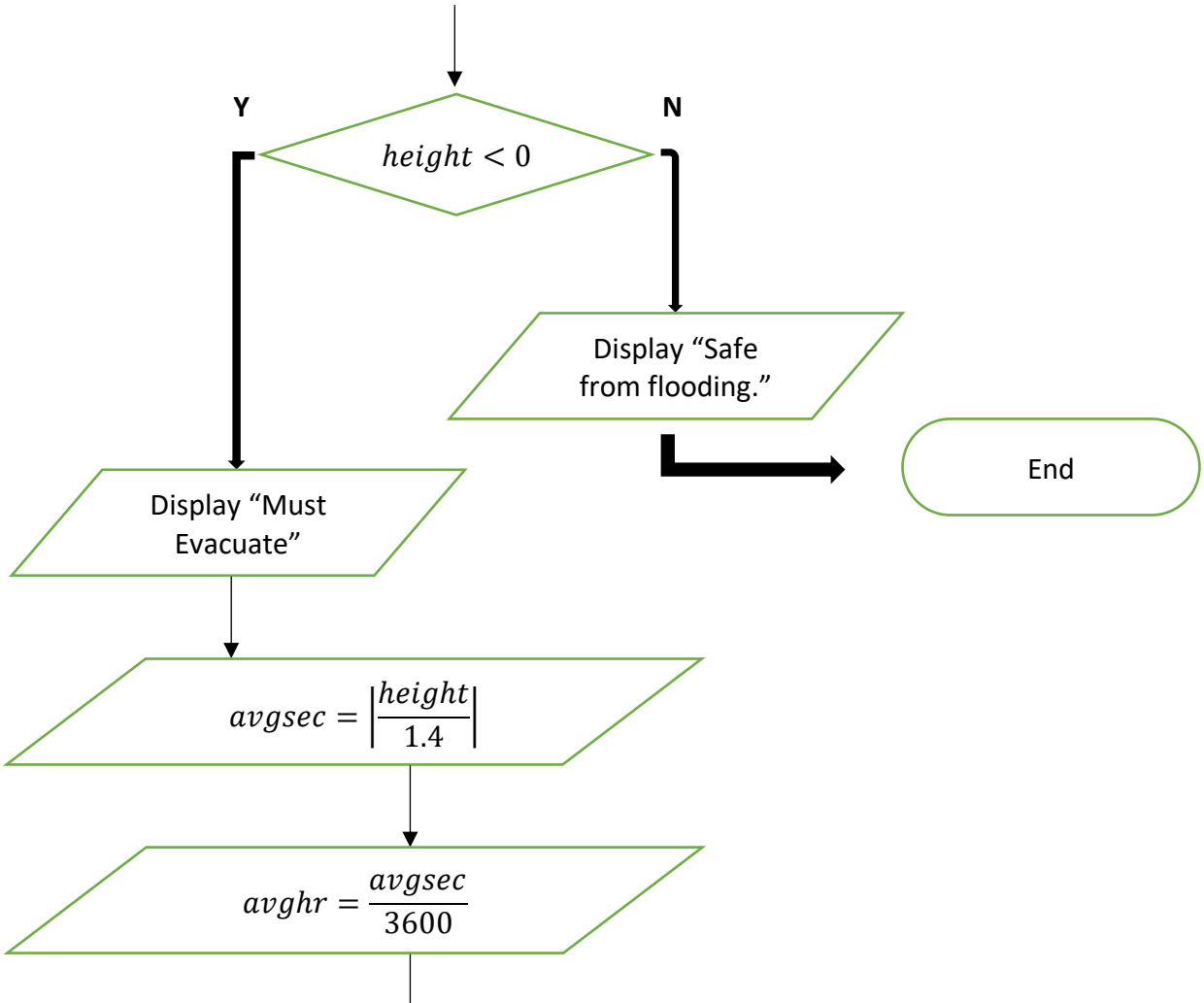

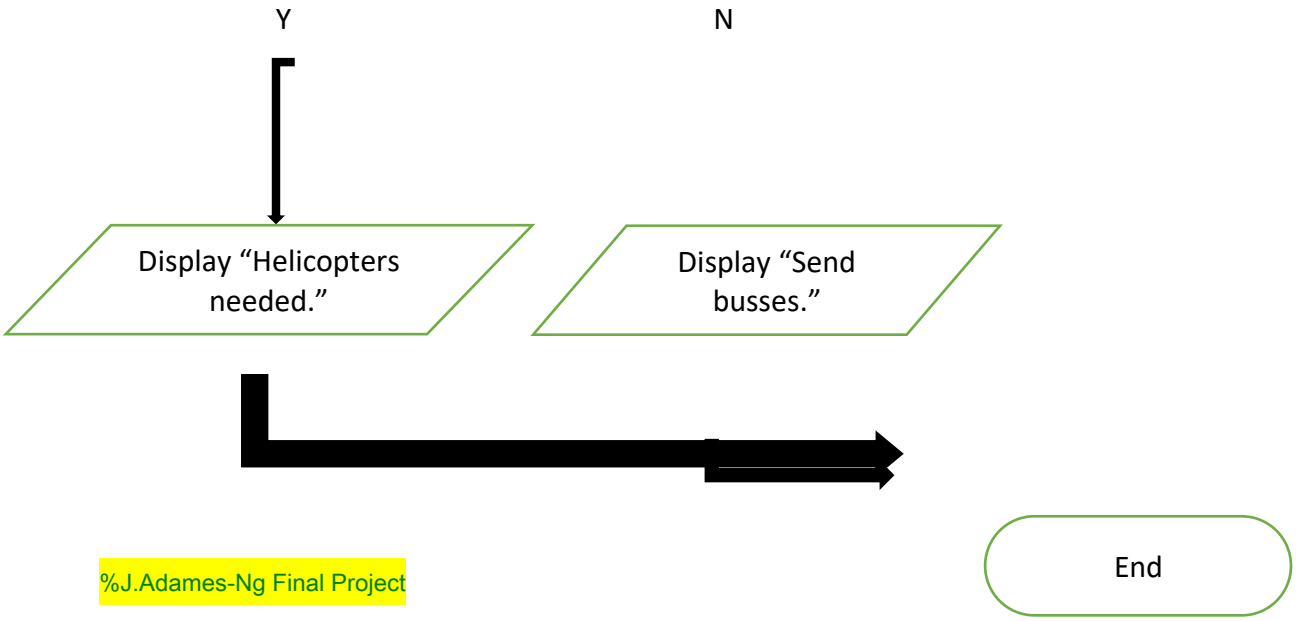


```
%J.Adames-Ng Final Project

%flooding below sea level, within a squared area of land of varying height.

%ask user to input x-coordinate of position in kilometers
x = input('Enter a value from 0-5 for the x-position: ');
%ask user to input y-coordinate of position in kilometers
y = input('Enter a value from 0-5 for the y-position: ');

%first condition is the x-position is between 0 and 5 kilometers
if 0 <= x && x <= 5
    %if the first condition holds, the second condition is that the
    %y-position is also between 0 and 5 kilometers
    if 0 <= y && y <= 5
        %if both conditions hold, we get the height in meters
```

```
        height = 49000.*cos(x).*sin(y).^2+x.^2-y.^2
        %if the height is below sea level, the location will flood
        if height < 0
            %locations that will flood must be evactuated
            disp('We must evacuate this location.')
            %average walking moving/walking speed of a human is 1.4 meters per second
            avgsec = abs(height/1.4);
            %average walking speed in meters per hour
            avghr = avgsec/3600;
            %display average time, in hours, to reach a safe location by walking
            disp('It will take an average of')
            disp(avghr)
            disp('hours to evacuate this location by foot.')
            %if it takes longer than 2 hours, send out air vehicles to
            %evacuate faster
            if avghr >= 2
                disp('We must send out helicopters to reach the people in time.')
            %if it takes less than 2 hours, slow vehicles can be
            %dispatched to help evacuate
            else
                disp('We can send busses to evacuate these locations.')
            end
        %if height is above sea level, then no evacuation is required
        else
            disp('This location will be safe from flooding.')
        end
    %if y is negative or greater than 5
    else
        disp('Invalid y-position.')
    end
%if x is negative or greater than 5
else
    %if y is between 0 and 5 including endpoints
    if y >= 0  && y <= 5
        disp('Invalid x-position.')
    %if y is also negative or greater than 5 while x is negative or greater than 5
    else
```

```
        disp('Invalid x- and y- position.')
    end
end
```

CONCLUSION

This project involved many logic gates that performed a given task depending on whether a specific condition was satisfied. When a particular condition was satisfied, depending on the user input, a series of instructions were followed by the program to continue through the lifetime of the program. The context of this project was to help save lives from flooding, but also to make use of the available resources by being most efficient. With this program, we were able to take x- and y- distances as location inputs for a multivariable function that gave us a height as the output for that given point. We based our decisions on the value of that height and the average time it takes to reach the location on foot. To maximize efficiency in this scenario, we only used helicopters in cases where it would take longer than 2 hours to walk from on foot. Anything taking under 2 hours to reach on foot would have busses sent to them to retrieve people that were affected.

CITATIONS

https://en.wikipedia.org/wiki/Walking
(for average human walking speed)

https://academo.org/demos/3d-surface-plotter/?expression=49000*cos(x)*sin(y)%5E2%2Bx%5E2-y%5E2&xRange=0%2C5&yRange=0%2C5&resolution=100
(to visualize my surface)