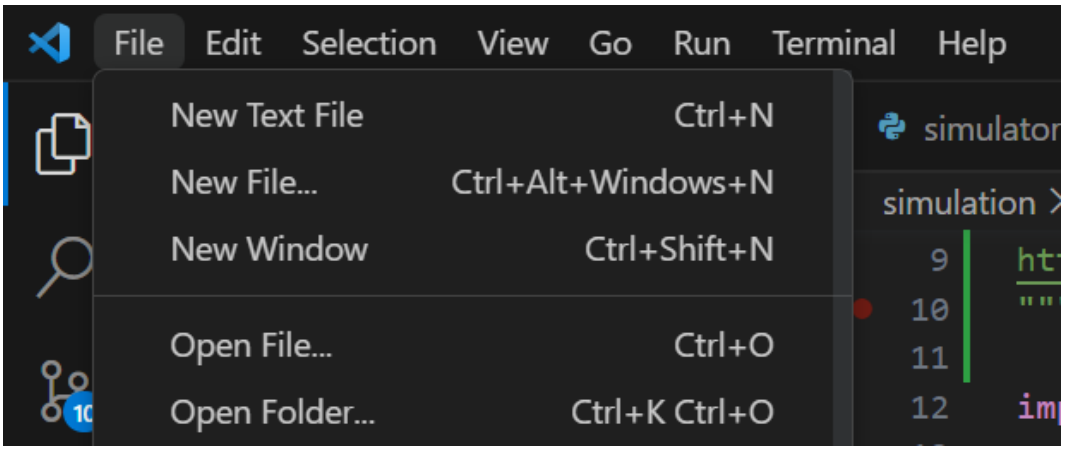
MapSimulation.py Manual

To run the map simulator

1. To run this code correctly, mapSimulation.py must be in the current directory, since I used a relative file path for cv.imread() and included libraries as packages. To change directory (may need to save your current files first), go to File/Open Folder and select the "simulation" folder.



2. The input images are stored in the simulation_img. These images made using MS paint, look at the examples in the folder.
3. In most cases, the ONLY part of MapSimulation.py you need to modify is main(), to set the initial position/coordinates of the car and number of cycles the code
    a. If you open the map in MS paint. Bottom left corner of MS paint gives you the coordinates and size of the map image:

4. To turn off the debug mode, change the constant/variable EACH_STEP to False in both MapSimulation.py AND simAlgorithm.py.
5. To turn on debug mode during the simulation, go to this line in the code:

```
for stepNum in range(5 if savedEACH_STEP else 180):
    if stepNum == -1: #switch to bebug mode. -1 to turn this off
        EACH_STEP = True
        simAlgorithm.set_EACH_STEP(True)
```

And change stepNum == -1 to for example stepNum == 5, if you want to start debugging on the 5th step/cycle of the simulation

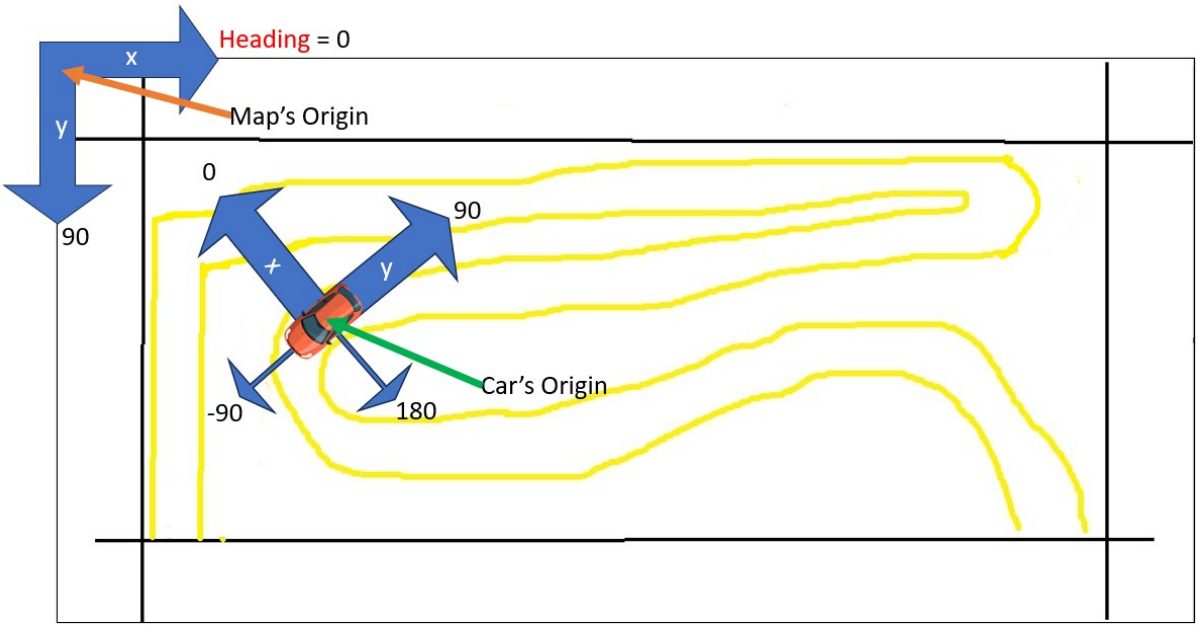
Assumptions

1. Perspective transform (which converts the camera view into bird's eye view) is correct

a. Zac said it is good

2. The car can turn/change direction instantaneous.
    a. Which it does not so we will account in the margin of error
    b. Reduce speed when turning helps

Frames and coordinate system

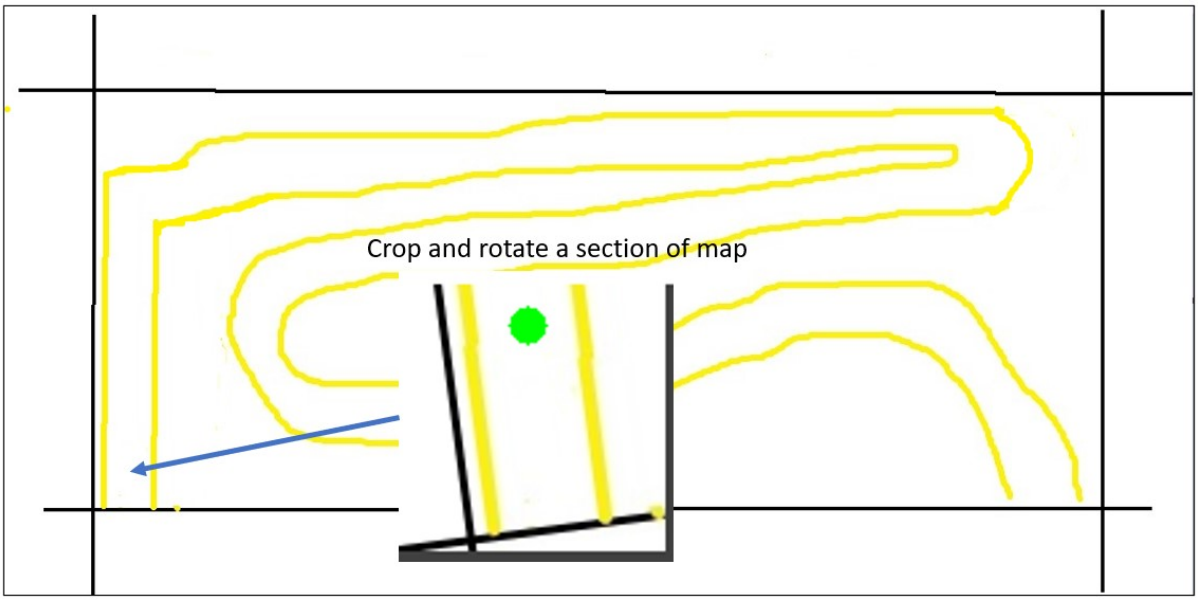


Due to nature how image data is stored. As you go UP an image, the y-value DEcreases (heading = -90 degrees). The heading values are shown in the diagram above. The front of the car points towards heading = -90 degrees or decreasing y value.

Flow chart

Just look at MapSimulation.py's main() and next_point() from MapSimulation class.

MapSimulation class's next_point() crops and rotates a section of the map:



The green dot above represents carX and carY coordinates. newX and newY are just carX and carY converted into the map frame coordinate system.