

# P1 Follow road practice

INDALECIO MARTÍNEZ CASTRO

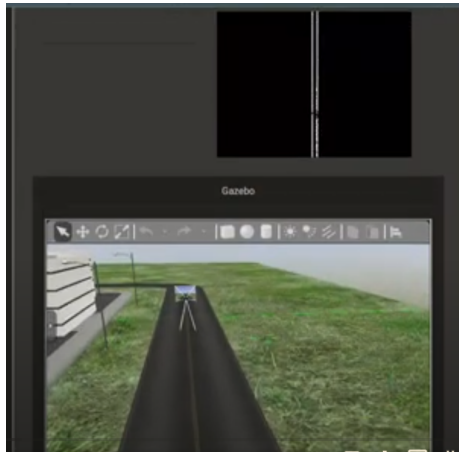
Friday 19<sup>th</sup> May, 2023

## 1 Practice goals

The drone must move along the road of the scenario

## 2 Algorithm

The problem is modeled as PID control one. The drone ventral camera images are used to detect the central line of the road by thresholding the road RGB image to a binary one. As the center line is thin an assumption is made to obtain a mathematical model of it without calculating centroids given all the pixels in the same row that form the line width. Taken this fact into account the line is just made form the first white pixels encountered at the bottom and top of the image. The next is an example of image detected by the drone and the drone situation in the simulator.



Once the 2 interest pixels of the line are selected 2 variables are obtained to form the error metrics. The first variable is the sin of the angle formed by the ratio of column difference of top and bottom pixels and the number of rows of

the image. This metric gives the system the ability to know the drone's heading relative to the road center line. When the drone is aligned with the road the sin of the angle will be 0 and so the error. The second metric used is just the ratio between the image bottom pixel column and the total number of columns of the image. When the bottom pixel is at the image center the ratio is 0.5 and the error value will be 0.

The 2 error metrics are used as the input of 2 PIDs controllers. One PID controls  $v_y$  to move the drone trying to locate at the center of the image the bottom pixel that form the detected line. The second PID uses the sin function error to try to keep the drone heading close to 0 so the it won't deviate from the center line.