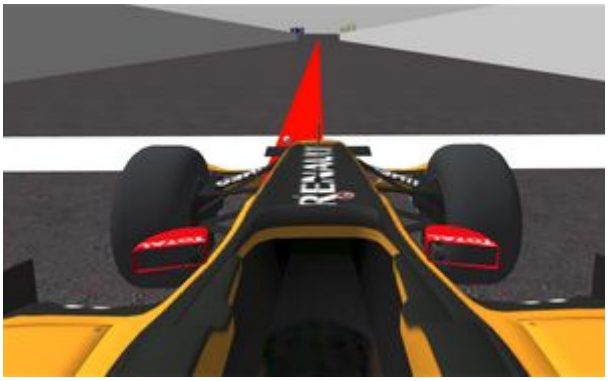
FOLLOW LINE



Introduction

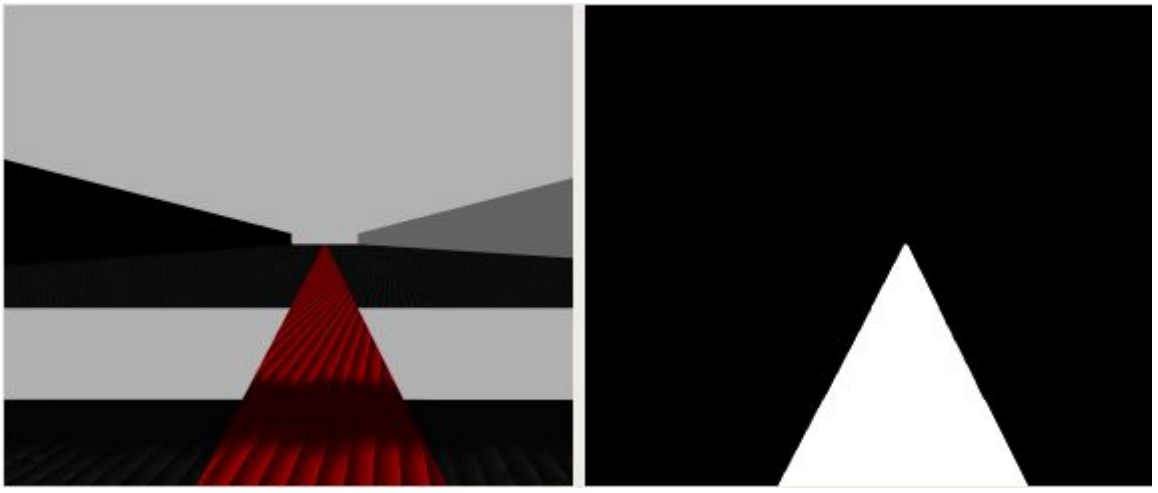
In this project we will program a race car to drive inside a circuit, following a red line as a guide.

The objective is to hit the fastest lap taking the information given by the camera sensor.

Steps

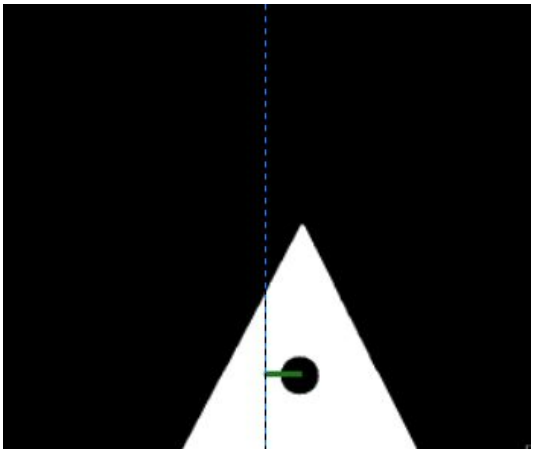
1. Our first goal is to adjust incoming images to be able to process them. So using the **openCV library**, we first convert our input into **HSV** format and we make a mask that filters everything except the line we will follow.

   We use HSV because it works more stable than RGB, against lighting changes.



2. The next step is to **get the centroid of the line** using the moments of the image. For that, we use again some functionalities provided by openCV.

   We also need to calculate some **offset** between the sensor and the middle of the image, that is because the camera position isn't exactly the center of the car.



3. Continuing with the task, the third step is to implement **control** to the system:

   P: We use proportional control to establish the pillars of vehicle movement. Taking linear velocity as a constant, we modulate the angular value using this.

   The problem is that when we increase the linear velocity, the system becomes more oscillating, to the point it becomes uncontrollable.

   D: To solve this, we add derivative control. This adds stability on the oscillations which allows to increase the velocity of the car.

**__I__ control is not used here because I don't really see a significant offset between the set point and the final output.*

Results

Best Lap (1.27.38) → FollowLine1.ogv (GITHUB)

V = 5
Kp = 0.575
Kd = 1.0