JRD301: Mini Project in Robotics (Second Semester 2019-20)
Progress Report

Videos Link -
https://drive.google.com/drive/folders/1S1BA1Ks1rAhZrcO9Aoi_0JC_yQZIClgI?usp=sharing

Video_1

1. The video is recorded at a speed of 1.5 m/s.

Video_1_longer

1. The video is recorded at a speed of 1.5 m/s for a longer path.

Video_3

1. The video is recorded at a speed of 3 m/s.

Video_5

1. The video is recorded at a speed of 5 m/s.

Work done

1. PID control was successfully implemented on the steering angle showing a good results on straight and curved roads.
2. The steer angle published becomes 0 when heading direction is within the bounding box and less than a threshold (0.1), so that the wobbling is minimised.

```
def pid(dif):
    global sum1
    global elapsed_time
    global diff
    global prev_err
    global kp
    global ki
    global kd
    global check
    #print(dif)
    #print("f",sum1)
    if(abs(dif)>0.1):
        if(check==True):
            deltaT=0.1
            check=False
        else:
            deltaT = (time.time()-elapsed_time)
        #print("dt",deltaT)
        #print("dif",dif)
        elapsed_time=time.time()
        sum1 = sum1 + dif * deltaT;
        diff = (dif - prev_err) / deltaT;
        #print("sum",sum1)
        #print("dif",dif)
        prev_err = dif
        output = (kp * dif + ki * sum1 + kd * diff);
        return output
    else:
        sum1=0
        check=True
        return 0
```

3. The PID parameters were calculated by the rerun of the car in the simulated world. It was the main time consuming step in PID integration.

```
kp=0.00000001
ki=0.05
kd=1
```

4. For curves, when other lines are detected and there is error in the target to be followed, the values having a sudden change more than threshold (10) were ignored.

```
if(abs(int(x)-prev)>10):
    x=prev
else:
    prev=x
```

Problems in simulation v/s real world

1. In the camera view, car's front was not visible, so our algorithm for using the centre of the car front as heading direction couldn't be used in Carla. As a result we were forced to change the camera frame as the width of road changes
2. This is a perfect world in Carla with no shadows and noises, as a result the algorithms that we used in real world control like averaging were creating problems in the simulated world. They are necessary for real world but not so much for simulated world.
3. The PID parameters found for the car movement in CARLA were different from the PID parameters that are found on the video of real world. As a result, for real world the parameters have to recalculated. We can get help from PID values of Carla in finding the real world values.
4. The camera frame coordinates in the zed camera are different from the values of the stereo camera of Carla. Also the resolution was different and as a result of which we had to use different crop values.
5. In real world, the car once given command to steer had a lag due to friction and inertia, which is not present in the Carla. As a result the values to be given for steering in Carla were half of the value observed in real world car.

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