1 Introduction

First project status of this year. 3 of us participated last year under name "Racetech Racing Team".

2 Planned activities

1. Review of last year code
2. Defining project architecture, time plan
3. Team members assignment and other formalities
4. Implement lane detection
5. Implement object detection
6. Implement 3D Camera
7. Install Simulator
8. Find potential sponsors

3 Status of planned activities

1. **Status: done**
   Description: We have implemented traffic sign detection, lane following, intersection and parking states and have used ROS2. Outcomes:
   - We will migrate to ROS1 and use code provided by Bosch with implemented IMU and v2x handlers.
   - We will train other object detection model (we have used yolov3, now look for better computation effectiveness) and will include both traffic sign and cars detection. We also must expand our dataset a lot.
   - We will use last year's lane detection program, but it must be optimized.

2. **Status: done.**
   We have defined project architecture and approximate time plan.

3. **Status: done.**

4. **Status: done.**
   We have left/right lane marking detection and stop line detection that work robust on our test track in approx. 20 fps on raspberry pi. (See images).

5. **Status: first try done, further work needed.**
   We have expanded our dataset and trained yolov8n model. It achieves only 70% accuracy for one-way road signs, 65% accuracy on cars detection and 20 % for highway exit signs. Other classes are detected good (> 90%). (See images for confusion matrix).

6. **Status: in progress, 50% done**
   We have a Robosense Zed2 stereocamera. We can get images from right and left camera. Next step is to get depth images.

7. **Status: done.**
   We installed the simulator on our workstation, and it works. There still are open question like changing spawning coordinates of objects etc.

8. **Status: in progress.**
   We have found an interested company and are preparing a presentation.

4 General status of the project

We have the big picture of our system, we have lane detection done and object detection that is applicable but needs to be improved. We are working on implementation of 3D Camera and we have a working simulator. We also are in contact with potential sponsor. Next steps would be installing software in the car, implementing localization and trajectory following.

5 Upcoming activities

1. Implement GNSS error in the simulator
2. Implement stop line mapping (i.e. given position of stop line on the image and on the map find exact ego position)
3. Install software in the car
4. Fuse localization data using Kalman filter (GNSS, IMU and data from lane mapping)
5. Train new object detection network
6. Implement trajectory following (given trajectory as set of coordinates in world system)