Boundary estimation and model predictive contouring control of an autonomous formula student race car

We are looking for two motivated master students Electronics and ICT Engineering Technology

Project description:

Formula Electric Belgium (**FEB**) is a team of highly motivated engineering students that build an electric formula student race car. Just like Formula 1 the team builds a brand new car each year to compete in multiple international competitions during the race season. Formula Student is the largest international engineering and design competition in the world. The competition is characterized by combustion vehicles, electric vehicles and since recent also autonomous vehicles. Formula Electric Belgium strives towards innovations and the raw performance of technologies. It is for this reason that the team will focus on the autonomous/electric race cars. Research and development applications will be made by postgraduate students in collaboration with thesis students from the KU Leuven and bachelor students from Thomas More.

Thesis description:

Once the surroundings are captured by LIDAR, mono and/or stereo camera, an algorithm has to drive the motor and steering actuator. To do this correctly, some operations still have to be done on the data. The data contains the locations of the cones, which indicate the race track. A first operation is *boundary estimation*, that captures the borders of the track based on the location of these cones. Next, *model predictive contouring control* has to calculate a racing line, as well as the speed at which the car will go through these corners. Here we must consider the grip pattern of the tires. You will have to consider a lot of dynamic aspects of the vehicle. This is knowledge that not all electronics-ICT students will have, so an introduction course will be provided to you. It is because of this that you will work closely with dynamics engineers.

Thesis target:

You will have to develop both boundary estimation and model predictive contouring control, simulate it, test it on smaller scale and eventually implement it on the autonomous car. The thesis is more than a research topic and will eventually be used to compete in the Formula Student competions. Ideally this thesis would be done by a postgraduate student within the FEB team. This is because the thesis is comprehensive for the autonomous race project. The writing of a good documentation and keep a version history is of utter most importance.

Profile:

- Knowledge of real-time operating systems and writing performant software.
- Knowledge of and interest in ROS, GIT, Automated testing systems etc…
- Managing a thigh time schedule and an accurate budget planning
- Driven team player who dares to take responsibility.

What do you gain?

- A unique engineering– and team experience where hard work and team atmosphere are central.
- Work with innovative technologies in a realistic environment/application.
- Create added value for your curriculum and the team

Are you interested? Please send your resume with accompanying motivation to:
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