Driverless Mechanical

Green Innovation meets performance

Our Project

Formula Electric Belgium is a team of engineering students who build a **Formula-Student racecar** to compete in international competitions. We design and build a brand-new car every year and compete with other teams in multiple worldwide competitions during the summer months. Formula Student is by far the biggest **engineering competition** in the world and continues to grow. From next year on, we will be competing in both the **electrical** and **driverless** competition. You can join the project during one or two years by applying for the '**Postgraduate in Innovation and Entrepreneurship in Engineering'.**

Tasks

As a driverless engineer you will work with onboard sensors to create a virtual environment of the track, in the aim to localize the race car, and then control its trajectory. An autonomous system is therefore composed of three main algorithms: **Track Landmarks Detection**, **Car Localization and Landmarks Mapping**, and **Car Control**.

The estimation of the cone position and their color detection are performed by the sensors fusion of a **LiDAR** and **cameras**. The LiDAR outputs raw cloud of points providing an accurate estimation of the surroundings 3D localization. The cameras provide raw images to an **Image Processing** algorithm (YOLO) which performs the cone filtering and the cone color detection.

To localize the race car and map the landmarks, the **Simultaneous Localization and Mapping** (SLAM) algorithm accumulates on the one hand data coming from the cone detection algorithms, and on the other hand velocity, heading and car position measurements from an **INS/GNSS sensor**. It is working simultaneously with a **Data Association** process stating whether a cone detected by the sensors is a newly detected cone, or a cone already mapped in the virtual environment.

The **Trajectory-Planning** algorithm computes a reference trajectory, the middle of track, based on the virtual environment built. The **Model Predictive Contouring Control** makes the tradeoff between maximizing the speed on the track and following the reference trajectory, based on a theoretical model of the race car. This algorithm provides the steering wheel, throttle and brake commands to the race car.

A **Wireless-Telemetry system** is implemented on the race car and provides a real time access to the sensor data and algorithm states to a remote laptop.

We are looking for two **software engineers**, one **hardware engineer** and one **mechanical engineer** to compose the next Driverless department.

Mechanical engineer will be responsible for every area related to the mechanics of the race car: the theoretical modelling of the race car dynamic behaviour (design and validation), the sensor mounting, the vehicle maintenance, the design/implementation of the mechanical systems (Braking system, Steering system, Emergency Braking system,...), and the development/implementation of advanced mechanical systems, such as Torque Vectoring, and Energy regeneration.

Profile

- Team Player
- Eager to learn new technologies
- Communicative

Returns

- A unique engineering experience
- Developing your hard– and soft-skills in a company-like environment
- Work with the newest technologies and innovative companies
- Work in a team with a network of well over 120 partners
- A summer season packed with competitions all over Europe
- An experience of a life-time!

Up for the challenge?

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