State Estimation for Vehicle Dynamics in Formula Student

OUR PROJECT

Formula Electric Belgium is a student-run electric race team which competes in Formula Student, the world's largest competition for engineering students. We aim to push the limits of performance, innovation and sustainability within electric racing every year, which is only possible with the help of our Thesis students. These pioneers are responsible for performance-defining innovations within the team, and we would love for you to join our team of highly ambitious and motivated engineers. As a Thesis student, you will research, design, prototype and test your innovations alongside the full-time members which make sure the team pushes itself and the car to new heights.

AIM AND OBJECTIVE

The aim of this master's thesis is to research, develop, and validate a state estimation framework for a Formula Student race car, with a focus on accurately estimating lateral velocity. The project investigates how noisy sensor data from an inertial navigation system can be fused with mathematical vehicle models to improve estimation accuracy and robustness.

Different state estimation techniques will be explored, with particular attention given to Kalman filter–based approaches using varying model complexities. Alternative estimation methods may be considered if they demonstrate sufficient accuracy and robustness for real-time vehicle applications. The estimator will combine data from multiple on-board sensors, including accelerometers and GPS signals from the INS, wheel speed sensors, suspension potentiometers, and other available measurements. The potential integration of LiDAR-based information will also be investigated to improve state observability.

The developed estimator will be validated using data from the team's Formula Student race car, allowing direct testing and evaluation under real driving conditions.

PROFILE

- Strong interest in vehicle dynamics and control
- Analytical and problem-solving mindset
- Motivated team player with strong communication skills
- Knowledge of estimation techniques and sensor fusion is a plus

RETURNS

- Unique experience within a Formula Student racing team
- Hands-on testing and validation on a real electric race car
- Exposure to advanced vehicle dynamics and state estimation methods

INTERESTED?

Send us your contact details and field of interest to

recruitment@formulaelectric.be