PhD : Estimation of physical parameters for connected and automated vehicle

Lab and company

A fully funded Ph.D. position is available at Michelin and the Laboratory for Computer Science and Automation Systems (LIAS), Poitiers University, France. The appointment will be for 3 years. This PhD project will be supervised both by academic and industrial partners.

Summary

To improve car performance, to optimize occupant comfort and, more importantly, to increase safety, future cars will more and more deliver connected functionalities to the drivers, and will be based on innovative control algorithms to ensure autonomous functions. This is one of the main reasons why Michelin currently works on solutions like the now well known "MICHELIN Track Connect" in order to develop new information and communication technologies tools to be operated in a fully autonomous mode as well as in a connected mode.

Even if the current off the shelf solutions have proven their efficiency in many practical cases, there is still room for improvement when accurate estimates of signals or parameters like the vehicle speed, the rolling radius or the slip ratio (and many other) are required by these smart information and communication technologies tools.

The main objective of this Ph.D. thesis is thus to develop new tools for estimating online the aforementioned paramount parameters and signals accurately under standard driving conditions. This project more precisely aims at providing new solutions to avoid the drawbacks of the existing approaches and develop new estimation-control algorithms for new connected functionalities and even Automated Driving Systems, leading to a better driving experience and an increased safety for the end users.

The target is the estimation of several physical quantities with the highest possible precision, like vehicle speed, tire slip ratio, rolling radius. The estimation of complementary quantities will be necessary to improve the precision of the first ones, like vehicle mass, aerodynamic drag, road grade, ...by using data available on the vehicle (through the vehicle communication network), like GPS, accelerations, torque, ... The use of algorithms like Kalman filter, particle filtering or learning method will be considered.

The developed estimation methods will be developed thanks to simulated data based on accurate vehicle and tire physical models available at Michelin. During the Ph.D., test plan will also be designed and performed at the test tracks of Michelin R&D center in Ladoux, France, in order to validate the developed approaches with real data.

Candidate requirements

Applicants should have a MsC degree from a good-quality university. They should possess a strong background and interest in mathematics and, ideally, in estimation theory, system identification, and advanced control. They should have excellent analytical and problem solving skills and, preferably, well-developed programming skills. Applicants should have a good knowledge of Matlab and Python. A good knowledge in mechanics and physics is also expected. The candidate should have excellent oral and written communication skills in English.

Application procedure

To apply for this Ph.D. position, send email to guillaume.mercere@univ-poitiers.fr and frederic.biesse@michelin.com with subject "Estimation of physical parameters and signals for automated driving", attaching an academic CV, a cover letter, a pdf of your diplomas and transcript of course work and grades, a certificate of proficiency in English, and any other document deemed necessary by the candidate which can enrich the application.