PhD position at IFP Energies nouvelles (IFPEN)

in *Electrical Engineering, specialization in Automation*

Dynamic traffic optimization in large urban road networks

The International Energy Agency affirms that over 50% of the world oil consumption is for transportation, and three-quarters of the energy used in the transportation sector is consumed on the roads. From an environmental sustainability perspective, the European Environment Agency claims that transportation accounts for close to a quarter of total greenhouse gas emissions. Most cities have taken or plan to take actions to address these problems in order to comply with the European Union climate and energy package. Much can be done at research level to significantly reduce the energetic and environmental footprint of transportation just by regulating traffic behavior without modifying the road infrastructure. Furthermore, the rapid diffusion of connected and automated agents in traffic networks will ease the practical implementation of the research solutions.

The objective of this thesis is to define a macroscopic traffic model, based on variables such as vehicles flow and density, which can be measured or estimated, that is able to depict the main phenomena having an impact on energy consumption and pollutant emissions. In particular the model should be able to track the evolution of congestion and queues within the road network, and represent the different traffic states with their respective speed. Such a model will be particularly suited for estimating traffic energy consumption and emissions, and for optimizing them in real time at a large scale by acting on standard actuators such as speed limits and traffic lights. To achieve real-time capabilities, the proposed modeling and control strategy are required to be computationally light and fast without sacrificing accuracy. The modeling solution developed during the thesis will be validated and compared against well-established macroscopic traffic models in order to assess its precision. The optimization techniques will be evaluated in a microscopic traffic simulator, a tool largely used by traffic engineers to verify control strategies before deployment.

Keywords: traffic modeling, energy consumption estimation, traffic optimization

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PhD location	Inria Rhône-Alpes, Grenoble, France and IFP Energies nouvelles, Solaize, France
Duration and start date	3 years, starting preferably on October 1st, 2018
Employer	IFP Energies nouvelles, Solaize, France
Academic requirements	University Master degree in Electrical Engineering, Automation Engineering
Language requirements	Fluency in English, fluency in French or willingness to learn French is a plus
Other requirements	Good programming skills, Matlab/Python

For more information or to submit an application, see theses.ifpen.fr or contact the IFPEN supervisor.

About IFP Energies nouvelles

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IFPEN offers a stimulating research environment, with access to first in class laboratory infrastructures and computing facilities. IFPEN offers competitive salary and benefits packages. All PhD students have access to dedicated seminars and training sessions.