Université de Technologie de Compiègne – Thesis proposal

Thesis proposal title	**Distributed algorithms for cooperative perception**
PhD grant	Labex MS2T Grant
Research laboratory	Heudiasyc laboratory, UMR CNRS-UTC 7253, research team: ASER and RO teams web site: https://www.hds.utc.fr/ labex MS2T www.utc.fr/labexms2t
Thesis supervisor(s)	Véronique Cherfaoui, associate Professor, (HDR) Bertrand Ducourthial, Professor
Scientific domain(s)	Computer science and information technologies Science and technology
Research work	Since several years, the laboratory is specialized in data fusion to merge data coming from several sources, reliable or not, contradictory or not. It also studies distributed algorithms for dynamic networks. All this research are applied to the fleet of intelligent vehicles of the laboratory, with the help of the engineer team. This is a challenge because sources may send erroneous data either voluntary (eg. attack) or involuntary (eg. unreliable sensor), communication may fail (messages losses...) and the convergence of the distributed algorithms may be delayed due to the network dynamic. Recently a robust distributed algorithm has been proposed to fuse distributed data and some experiments have been done on the road. Depending of the candidate profile, several directions are possible for this thesis. One of them is to deepen the existent technique and to propose new solutions. The candidate could propose and experiment data fusion operators for augmented perception and well adapted to dynamic environment. The proposed solutions have to deal with data imperfections (uncertainty, inaccuracy, lack of data, latency,…) due to the vehicular context. Different distributed strategies will be studied regarding the vehicular applications. Another direction is related to the improvement of the distributed data management by means of new and robust networking protocols, that could rely themselves on distributed data fusion algorithms. New standards are also to be studied and experimented (IEEE 802.11p, OSI CAM and DENM...). Moreover, preliminary studies proved the interest of distributed data fusion for taking into account malicious behaviors either by attenuating their impact or by detecting attackers. Theoretical and/or practical studies are expected, using road tests and network emulation thanks to the tools (hardware and software) designed previously in the lab.
Key words	cooperative perception, vehicular networks, data fusion, distributed algorithms, data sharing, uncertainties modeling and management, dynamic networks, selfstabilizing algorithms, robustness
Requirements	The candidate must demonstrate (through her/his formation, previous projects, recommendations, grades) excellent skills in mathematics and computer science. We are seeking candidate mastering either in networking and distributed algorithms or in sensors, embedded systems, perception and decision. A taste for the development and experimentation will be a plus.
Starting time	October 2016
Location	Université de Technologie de Compiègne