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Unité de Recherche : Laboratoire Heudiasyc, Labex MS2T

soutiendra sa thèse de Doctorat sur le sujet :

An overview on Systems of Systems Control: General discussions and application to multiple autonomous vehicles

A l'université de technologie de Compiègne
Le lundi 21 Janvier 2019 à 14h00
Salle GI 042 – Bâtiment Blaise Pascal - UTC

Devant le jury composé de :

- **M. Dominique Luzeaux**, directeur adjoint, ministère des armées, Le Kremlin-Bicêtre
- **M. Éric Bonjour**, professeur des universités, université de Lorraine
- **M^{me} Isabelle Fantoni**, directrice de recherche, école centrale de Nantes, UMR CNRS 6004
- **M. Robert Plana**, professeur des universités, société Assystem, Issy-les-Moulineaux
- **M. Bernard Dubuisson**, professeur des universités émérite, université de technologie de Compiègne, Heudiasyc, UMR CNRS 7253
- **M. Ali Charara**, professeur des universités, université de technologie de Compiègne, Heudiasyc, UMR CNRS 7253
- **M^{me} Reine Talj-Kfoury**, chargée de recherche, université de technologie de Compiègne, Heudiasyc, UMR CNRS 7253

Abstract :

This thesis focuses on System of Systems (SoS) control, and how to build daptable and reliable SoS. This work is part of the Labex MS2T laboratory of excellence on technological SoS development. SoS are complex systems that consist of multiple independent systems that work together to achieve a common goal. SoS Engineering is an approach that focuses on how to build and design reliable SoS that can adapt to the dynamic environment in which they operate. Given the importance of controlling constituent systems (CS) in order to achieve SoS objectives, the first part of this thesis involved a literature study about the subject of SoS control. Some control methods exist for large-scale systems and multi-agent systems, namely, hierarchical, distributed, and decentralized control might be useful and are used to control SoS. These methods are not suitable for controlling SoS in its whole, because of the independence of their CS; whereas, multi-views frameworks are more suitable for this objective. A general framework approach is proposed to model and manage the interactions between CS in a SoS.

The second part of our work consisted of contributing to Intelligent Transportation Systems. For this purpose, we have proposed the Cooperative Maneuvers Manager for Autonomous Vehicles (CMMAV), a framework that guides the development of cooperative applications in autonomous vehicles. To validate the CMMAV, we have developed the Cooperative Lateral Maneuvers Manager (CLMM), an application on the autonomous vehicles that enables equipped vehicles to exchange requests in order to cooperate during overtaking maneuvers on highways. It was validated by formal scenarios, computer simulations, and tested on the autonomous vehicles of the Equipex Robotex in Heudiasyc laboratory.