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SOUTENANCE DE THÈSE D'AMENI CHTOUROU

Ameni CHTOUROU soutiendra sa thèse intitulée "Context-Aware Communication for Intelligent Transportation Systems", le lundi 13 décembre à 10h à VEDECOM

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Titre : Context-Aware Communication for Intelligent Transportation Systems

Résumé
An important role of C-ITS is to extend perception of individual road users so that traffic accidents are avoided. Such an extended perception is built by information exchange among vehicles, pedestrians, and infrastructure using different types of messages including cooperative awareness message (CAM) and Collective Perception Message (CPM). While data carried by these messages are critical, they are resource-consuming. Currently, CAMs and CPMs are broadcasted periodically with a minimum frequency of 1Hz. In addition, their frequencies can be adapted based on vehicle dynamics (speed,

acceleration,...) and further with wireless channel condition when a distributed congestion control (DCC) functionality is enabled. However, it might be vital for a vehicle to transmit its beacons at a high rate in critical areas, such as intersections, even if this may result in higher channel busy ratio (CBR). On the contrary, vehicles with a low risk of collision may reduce their transmission frequency to avoid unnecessary load on the channel. Hence, dissemination of such messages must be made in an efficient way so that road safety application requirement is ensured and resource utilization is optimized.

This requires the communication be context-aware, being able to control communication parameters by taking into account application requirements, availability of communication technologies and radio resources as well as environmental condition (road layout, traffic density, presence of roadside infrastructure, and etc.). Hence, establishing contexts that characterize environmental and non-environmental collected information is a key challenge for context-aware communication.

The thesis targets at studying and developing context aware communication for road safety applications. The main goal is to design algorithms that are able to optimize V2X communication based on a recognition of the contexts particularly radio resource availability, environmental condition and application requirements. The work consists of two phases. In the first phase, we present context aware communication architecture and study/model contexts in terms of application requirement (context1) and environmental context (context2). The first context aims to define application requirement and evaluate performances of different Cooperative Awareness Service strategies against requirements. Environmental context consists on infrastructure availability allowing I2V communication that may replace V2V communication in that local area resulting in improved collective perception and reduced channel load thanks to its larger communication coverage and sensor field of view. The second phase intends to design and develop algorithms that control message data contents taking into account contexts previously modelled while ensuring a high level of collective perception/awareness.