



Dottorato di Ricerca in Ingegneria dell'Informazione PhD Program in Information Engineering

Vehicular Networks and Cooperative Driving

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Abstract: Mass media call them Autonomous Cars, meaning that they do not need a human driver; however, vehicles in traffic are never autonomous, they need to interact and cooperate with all the other vehicles and road users to drive you to destination and avoid crashes and accidents. The easiest way to cooperate is to communicate, so networking and communications are essential for the success of this extremely promising technology, that has been recently hampered by the first fatalities ... all of them due to the lack of simple communication technology that would have prevented the tragic misjudgment of the situation by the driving algorithm.

This PhD course of 20 hours aims to present the more promising communication technologies for V2X (Vehicle to Anything) networking, from the 802.11p standard, to 5G-New Radio and network slicing, to Visible Light Communications, as well as the key functions needed to achieve cooperative driving and smart traffic management, including both safety related applications and traffic management.



Program

- **Monday 22, 13.00-17.00:** Introduction
 - Data (on accidents, casualties, responsibility, ...) from DoT and other public bodies.
 - The vision and the big picture
 - Economic value and potential (reduction of resource waste, opportunities to be opened)
 - Accidents reduction: saving lives and money
 - Improved road infrastructure usage
- **Tuesday 23, 9.00-13.00:** Direct Short Range Communications
 - WAVE, ETSI G5, 802.11p, other proposals
- **Wednesday 24, 9.00-13.00:** Cellular-based proposals
 - In-coverage and out-of-coverage schemes
 - LTE-V2X
 - 5G C-V2X
- **Thursday 25, 9.00-13.00:** Other Communication Technologies and Integration
 - Visible Light Communications
 - Potential for Modulated Radars
 - Technology Integration
 - The application and middleware layer
- **Friday 26, 9.00-13.00:** Challenges & Opportunities
 - Safety Related
 - Platooning, Collision avoidance, Cooperative maneuvering, ...
 - Non safety-related applications
 - (Public) Car-to-the-Home Sharing
 - Traffic coordination
 - Vulnerable Road Users
 - Bikes, Pedestrian, ...

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