Ph.D. in Information Technology: Thesis Defenses

February 14th, 2020

Room Conferenze "E. Gatti" – 10.00 am

Dario Nava – XXXII Cycle

"Sensing and Dynamics Control For Assisted and Automated Drive in Motorcycles"

Advisor: Prof. **Giulio Panzani**

Abstract:

Autonomous driving represents the biggest challenge for the future of the automotive industry. On the long run, the benefits possibly deriving from the introduction of such paradigm are numerous and relevant: from the improvement of vehicle's safety – resulting in a significant reduction of road accidents related casualties – to the enhancement of users comfort – cancelling downtime and stress associated with driving. Even though we are still distant from reaching the goal of full automation, the advantages related to the extensive research along these lines are already noticeable and substantial. In such sense, it is worth mentioning Advanced Driver Assistance Systems (ADAS) – electronic systems designed to help the driver when facing many challenging driving situations – as a first step in the introduction of on-board automation. What has just been stated is true in general regarding four-wheeled vehicles. Considering the motorcycle field instead, the development of such technologies is still at an embryonic stage, despite the possible benefits that could derive from their large-scale adoption. In fact, even if an autonomous two-wheeled vehicle could be hardly conceived to carry any passenger, its intrinsic agility and inclination to avoid remaining stuck in traffic would make it suitable to be employed in deliveries and similar applications. Moreover, as for the four-wheeled vehicle case, the research in such direction could speed up the development of rider assistance systems, enhancing the safety of a vulnerable road users category, subject to a high risk of serious injuries in the event of a crash. For these reasons, my Doctoral Research deals with the design and implementation of sensing and control algorithms oriented towards autonomous and assisted drive of motorcycles and, more broadly speaking, single-track vehicles.

Luca Onesto – XXXII Cycle

"Advanced Driver Assistance Systems for Off-Highway Vehicles"

Advisor: Prof. **Matteo Corno**

Abstract:

Cars represent the primary means of passenger transport in the world and road accidents are one of the mainspring of premature human death. Although, a decrease in the number of road deaths is observed throughout the last years. Technology advances in vehicle dynamics control are considered one of the reasons for this trend: road vehicles are nowadays very complex systems, composed of several subsystem which are often interacting among each other.

Car manufacturers have been responding to this increasing need for safety by developing electronic systems called Advanced Driver Assistance Systems (ADAS), and increasingly deploying them on board of commercial vehicles. ADAS are systems designed for two and four-wheeled vehicles which have the goal of increasing comfort and safety during everyday driving; in some cases, such systems are only asked to report information or alert the driver in dangerous situations, while in other cases they directly intervene on the vehicle dynamics to avoid potential hazards.

The literature has mostly focused on the prevention of casualties for road vehicles, while only limited interest has been paid to off-highway vehicles. They are also interested by a less established legislation concerning licensing, safety education and minimum age.

Even though, the popularity and the diffusion of these vehicles is rising, the open scientific and technical literature is rather scarce on ADAS for this class of vehicles. This is due to several factors: a smaller market and the fact that in most cases, solutions developed for road vehicles are also applicable to this minor class.

The research studies of this Thesis propose innovative ADAS for different off-highway vehicles, dealing with a specific environment for each application. In particular, the following case studies are investigated: an Antilocking Braking System (ABS) for snowmobile, a road gradient estimator for an agricultural tractor, an obstacle detection system for a snow groomer, an automatic steering system for an agricultural tractor focused for the navigation in a vineyard. The proposed systems are tested and validated through experimental results.

PhD Committee:
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