Ph.D. in Information Technology: Theses Defenses

February 12th, 2019

Room Seminari – 9.30 am

Alessandro AMODIO – XXXI Cycle

"Automatic Systems for unsafe lane change detection and avoidance"

Advisor: Prof. **Sergio Savaresi**

Abstract:

Road Safety is currently recognized to be among a major societal issue, since road crashes are found to be among the major causes of death.

In the past recent years, car manufacturers have been responding to this increasing need for safety by developing, and increasingly deploying on board of commercial vehicles electronic systems called Advanced Driver Assistance Systems (ADAS).

This thesis proposes a composite and integrated system that helps the driver avoid safety hazards due to unsafe lane change maneuvers, which are recognized to be among the most frequent scenarios that involve vehicle crashes.

The system is designed to perform two precise tasks.

Prevention: The goal is to give alert signals to the driver to advise him about potentially dangerous situations that may lead to a lane change crash.

This is done by checking the drunkenness state of the driver before the drive start, and by monitoring the vehicle surroundings during the drive.

Intervention: The goal is to actively intervene to correct the vehicle trajectory in case a lane change maneuver is performed in unsafe condition.

The typical scenarios that are considered are two; the first is a vehicle drift towards the adjacent lane due to the driver losing control as a consequence of micro-sleep occurrence or drowsiness.

The second is an intentional lane change performed during inattentive driving, without the driver noticing a potential danger in the adjacent lane.

The system is composed by a Warning Module that performs the Prevention task and a Control module that handles the Intervention task, with a Supervisor that controls activation of the second module.

Finally, the system is shown to be effective in the considered scenarios.

Luca D'AVICO – XXXI Cycle

"Analysis and Design of Advanced Anti-Lock Braking Systems"

Advisor: Prof. **Sergio Savaresi**

Abstract:

Safety is one of the major concerns on vehicles and one of the most safety-critical situation is the braking manoeuvre. The focus of this work is the analysis, design and experimental validation of anti-lock braking systems on aircrafts and bicycles.

Since the early 1900s, anti-skids have been used on aircrafts based upon industrial practice and, up to now, with almost no variation of the control logic. A formal description of commercial anti-skids is provided in this thesis and the experimental comparison between the designed and the commercial one is reported as well. Innovative anti-skids have been proposed and proved to improve the performances of current solutions.

Safety devices are an important features of vehicles and more often part of the mandatory equipment. However there is a physiological gap in time between the formation of well established mobility trends and the introduction of safety regulations. Bicycles are increasing popularity in most of the urban areas but not all the cyclists are expert enough to avoid dangerous situations due to the lack of appropriate safety devices. For these reasons, an anti-lock braking system for bicycles has been designed, implemented and tested on different road conditions (asphalt, clay ground, gravel/sand) showing the improvement in terms of safety without compromising the braking performance.

Olga GALLUPPI – XXXI Cycle

"Innovative approaches to the lateral control problem in cars"

Advisor: Prof. **Sergio Savaresi**

Abstract:

The Ph.D. research is dedicated to the lateral control and estimation problems in 4-wheeled vehicles. Multiple layers and frameworks which compose the vehicle's lateral interactions are investigated.

PhD Committee:

Prof. **Simone Formentin,** DEIB

Prof**. Carlo Novara,** Politecnico di Torino

Prof**. Olivier Sename,** Grenoble Institute of Technology