Modeling, Simulating and validating Safe Machine to Man Control Transition in Autonomous Driving F/H

Presentation of the Establishment

Since January 1st 2020, Université Côte d’Azur is a new experimental university subsuming both the Nice Sophia Antipolis University created in 1965 and the Community of Universities and Establishments Université Côte d’Azur created in 2015. Université Côte d’Azur now brings together 17 major academic players around the historic university core to build one of the 10 major French universities that are intensive in research.

Winner of the Idex call for projects in 2016 (UCARÉDI - Joint Excellent and Dynamic Initiative), its ambition is to build a 21st century university whose excellence will allow " increase national and international visibility and attractiveness and ultimately be among the best universities in the world.

UCARÉDI is organized around five transdisciplinary academies of excellence (networks, information and digital society; complex systems; space, environment, risk and resilience; complexity and diversity of living things; people, ideas and environments) and three Centers of Reference which aims to ensure the effective connection and interactions between fundamental research and innovation around very high-level technological platforms in public-private partnership:
- Health, well-being and aging (Pasteur district)
- The intelligent territory, prevention and risk management (NiceEcovalée)
- Digital challenges (Sophia Antipolis)

The mission of the Reference Centers is to stimulate partnership research actions, provide engineering support for the collaborations developed, create initial and professional training, promote expertise and innovation in the service of economic development.

Context of the subject

Université Côte D’Azur, in connection with Inria Sophia Antipolis Méditerranée, is looking for a young researcher for post-doctoral research, on a collaborative regional funding supported by a PSPC
project, called “ADAVEC” bringing together industrial partners in the automotive sector, including the companies Avisto, EpicnPoc and Renault Software Labs. The ADAVEC project is a digital R&D project in the context of autonomous vehicles. Autonomous vehicles will circulate with conventional vehicles for a few years, a period during which the infrastructure will be equipped to be more and more communicative. The autonomy of vehicles will evolve to reach levels L3 and L4 (see SAE levels), resulting in different driver involvement. During this transition to high-level automation, the role of the driver during the same journey will be contextualized by the degree of autonomy of the vehicle at the given time. The objective of the project is to build a prototype allowing an autonomous vehicle to continuously adapt its level of autonomy according to traffic and safety conditions. This prototype must automatically define the optimum level of autonomy by communicating with the environment (V2X, ADAS, etc.), but also by analyzing the driver’s ability to take over the vehicle. The prototype will be validated in a digital simulation environment and eventually embedded in a real robotic vehicle with autonomous driving.

**Subject**

The main theme of the ADAVEC project is to study the modalities of transition between automated driving and taking over by the driver, in order to validate the safety / security of the methods deployed. In this context, the contribution of the academic partners UCA and Inria will be to propose an adaptation of formal models and methods, inspired by communicating hierarchical automatons for mode transitions, but also including original elements due to the perception of the respective states of the driver, and the intelligence of autopilot, as well as specific control transfer protocols. One of the attractive aspects of the project will be to combine these studies with the expertise of the industrial members of the project to ensure the realism of the approach (sensors, actuators, development environments dedicated to the field). A preliminary study of human behavior for modeling purposes, in conjunction with researchers from the Human and Social Sciences department of UCA, will feed into the modeling of mode changes between autonomous driving and manual driving.

The work will be carried out in the context of the project which plans to combine extensively co-modeling and abstract digital twins of the driver / autopilot pair on the one hand, with simulation steps at several levels, up to the real prototype vehicle. if the results allow it.

**Required Competences**

Holder of a PhD in the fields of digital sciences, interested candidates will have to show identifiable skills in formal modeling of real-time digital systems in interaction with humans, as well as in the implementation of these dynamic models by participating in the development of simulators for the verification of safety properties.

**Position open to people with disabilities.**
Workplace

The workplace is in Sophia Antipolis, in the premises of the "Digital Challenges" Reference Center located at the Inria Sophia Antipolis Méditerranée site. The engineer may occasionally be required to travel to the sites of UCA and its partners, and the companies with which UCA and its partners collaborate.

Procedure:

Applicants must send the following documents electronically, no later than 09/15/2020, to Amar.BOUALi@univ-cotedazur.fr with:

- Curriculum vitae, clearly specifying your skills
- Motivation lettre.