2018-00602 - Social Navigation of autonomous vehicles in shared spaces

**Contract type:** Public service fixed-term contract  
**Level of qualifications required:** Graduate degree or equivalent  
**Function:** PhD Position

### About the research centre or Inria department

Grenoble Rhône-Alpes Research Center groups together a few less than 800 people in 35 research teams and 9 research support departments.

Staff is localized on 5 campuses in Grenoble and Lyon, in close collaboration with labs, research and higher education institutions in Grenoble and Lyon, but also with the economic players in these areas.

Present in the fields of software, high-performance computing, Internet of things, image and data, but also simulation in oceanography and biology, it participates at the best level of international scientific achievements and collaborations in both Europe and the rest of the world.

### Context

**Within the framework of a partnership (you can choose between)**

- collaboration between 2 Inria teams: Chroma (Grenoble [https://team.inria.fr/chroma/en/]), Choral (Sophia antipolis)  
- public with French National Research Agency (ANR). In the scope of the Hianic project ([https://project.inria.fr/hianic/](https://project.inria.fr/hianic/))

The PhD student will be co-directed by Anne Spalanzani (Chroma team in Grenoble), and Philippe Martinet (Lagadic Team in Sophia Antipolis). He is expected to spend 18 months in both sites (to be negotiated).

Contacts: Anne.Spalanzani@inria.fr, Philippe.Martinet@inria.fr

### Assignment

Classical autonomous vehicles navigation relies on geometric and kinematics constraints. This is adapted to simple, structured and predictable environments. When encountering an obstacle, these vehicles either stop or a collision is avoided by handling control back to drivers. Outdoor mobile robot applications are becoming progressively more demanding. It is to focus on **safe and predictable interaction** between cybercars and other road users in complex and human populated urban environments. A **social and cognitive dimension** is required in the intelligent vehicles so that these latter will follow **socially adapted behaviors** that will be understood and predicted by passengers and pedestrians, will **communicate their intentions** to move or stop, will be safer. This must be understood that vehicles will not simply stop during uncertain situations but will be **proactive** and **negotiate** their paths and velocities, by **conveying** their course and direction of travel to surrounding road users.
The goal of the PhD is to propose social navigations functions which can be used to control an autonomous and intelligent car where vehicles and pedestrians are evolving in a shared space. The trajectories of the autonomous vehicle are expected to be safe and socially compliant and the decisions of the vehicle will be based on the estimated intentions of all agents of the scene. The idea is to associate a risk level to each intention by estimating its coherence with the traffic and social rules, but also with the passenger’s perception of their field of travel.

**Main activities**
- State of the art on social navigation, proactive behavior, risk-based navigation, sensor based navigation, leader following, navigation among crowds.
- Implementation of state-of-the art navigation strategies among people and tests of their limitation in simulation using ROS
- Development and evaluation of a social proactive behavior in indoor environment, tests on a wheeled robot (wheelchair, pepper, ...).
- Development and evaluation of a social proactive behavior in outdoor environment, tests on the zoe car.

**Skills**
Interested candidates must send to anne.spalanzani@inria.fr and Philippe.Martinet@inria.fr the following material:
- a motivation letter with any relevant information for proving a good match with the description of the activities and expected profile of the candidates
- a detailed CV
- name of at least two referees
- results in Master1 and Master2

**Benefits package**
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

**General Information**
- **Theme/Domain**: Robotics and Smart environments
  - Scientific computing (BAP E)
- **Town/city**: Montbonnot
- **Inria Center**: CRI Grenoble - Rhône-Alpes
- **Starting date**: 2018-09-01
- **Duration of contract**: 3 years
- **Deadline to apply**: 2018-08-15

**Contacts**
- **Inria Team**: CHROMA
- **Recruiter**:
  - Spalanzani Anne / anne.spalanzani@inria.fr

**The keys to success**
The ideal candidate has a strong background in planning, control and robotics. The candidate must be a proficient user of C/C++ and ROS. Scientific curiosity, large autonomy and ability to work independently are also expected.

**Conditions for application**

**Defence Security :**
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

**Recruitment Policy :**
As part of its diversity policy, all Inria positions are accessible to people with disabilities.

**Warning :** you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.