PhD position (M/F) – Thesis offer (M/F) in Wireless Communications

(Reference: SC_DS_PhD_HIGHTS_102017)

Research topics **Geopositioning by and for Vehicular Networks**

Department Communication Systems

Parution date October 2017

Start date ASAP

Duration Duration of the thesis

Description

This PhD thesis will start in the context of the EU H2020 project HIGHTS, "High precision Positioning for Cooperative-ITS", http://hights.eu/ .

HIGHTS is a research project supported by the European Union under the funding scheme "Horizon 2020". The theme is "Smart, Green and Integrated Transport" and the focus area is Cooperative ITS. The goal of the HIGHTS project is to achieve high precision positioning system with the accuracy of 25cm.

Background

Cooperative intelligent transport system (C-ITS) applications rely on knowledge of the geographical positions of vehicles. Unfortunately, satellite-based positioning systems (e.g., GPS and Galileo) are unable to provide sufficiently accurate position information for many important applications and in certain challenging but common environments (e.g., urban canyons and tunnels).

In addition, Safety is a huge challenge for today's road scenario and it will be even more challenging in the future, with the progressive introduction of Highly Automated Driving (HAD) applications such as Cooperative-ACC or Vulnerable Road Users (VRUs).

Objectives

This project addresses these problems by combining traditional satellite systems with an innovative use of on-board sensing and infrastructure-based wireless communication technologies (e.g., Wi-Fi, ITS-G5, UWB tracking, Zigbee, Bluetooth, LTE...) to produce advanced, highly-accurate positioning technologies for C-ITS.

HIGHTS platform will be a key enabler to C-ACC and Platooning. In particular C-ACC and Platooning will provide smoother driving conditions, optimization of traffic flows and high precision lane detection for more efficient guidance in urban and highway environments.

Our platform will increase the safety level of vulnerable road users (motorcycles, scooters, pedestrians) through bi- directional danger detection and by detecting slight deviations from driving courses, thus detecting danger before it occurs.

The results will be integrated into the facilities layer of ETSI C-ITS architecture and will thereby become available for all C-ITS applications, including those targeting the challenging use cases Traffic Safety of Vulnerable Users and Autonomous Driving/platooning. The project will therefore go beyond ego- and infra-structure-based positioning by incorporating them as building blocks to develop an enhanced European-wide positioning service platform based on enhanced Local Dynamic Maps and built on open European standards.

Research Topics of this PhD thesis

An initial series of topics to be explored in this thesis includes:

• Channel models for Vehicular-to-Vehicular (V2V), Vehicular-to-Infrastructure (V2I) (shadowing by own and other vehicles, Doppler shifts of scatterers, etc.).

• Multi-vehicule mobility models, correlation of vehicle mobility, correlation of position errors (GPS).

• The current version of WiFi for Vehicular (ieee 802.11p) includes the exchange of RSSi (Received Signal Strength indicator) information. The RSSi is a fairly sensitive and imprecise measurement of distance induced attenuation. We would like to pursue the separation of a channel response into multipath propagation components in order to e.g. extract more reliably the (amplitude of the) Line-of-Sight (LoS) direct path or single-bounce paths. To this end the channel needs to be explored in as many dimensions as possible, including delay spread, Doppler spread and possibly multiple antennas. Depending on the configuration, the array of antennas may be operating in the near field.

• In cooperative localization, the information exchanged between vehicles arrives with a certain delay. Hence it needs to be retimed which requires the local reconstruction at any vehicle of the mobility of its neighbors.

• Calibration issues (transmitter/receiver gains, synchronization,…).

• New compressed sensing inspired vehicle tracking methods beyond Kalman filters.

• The use of sensors (odometer readings,…)

• Location estimation with insufficient GPS satellite visibility, exploiting side information.

Requirements

We are looking for a highly motivated person with a master degree in electrical engineering with a strong background in applied mathematics and signal processing as well as excellent programming skills (Matlab). Previous experience in the area of statistical signal processing, possibly applied to wireless radio communications will also constitute a significant advantage. English language and general communication skills also constitute a plus.

Application

The application must include:

- CV,
- 2-3 letters of reference (especially by the Master's thesis/project/internship supervisor),
- Master's degree grades and any evidence of good academic performance (e.g. rank),
- a one page statement of research interests and motivations.

Applications should be submitted by e-mail to secretariat@eurecom.fr and dirk.slock@eurecom.fr with the reference: SC_DS_PhD_HIGHTS_102017

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