PhD proposition

Cooperation between V2V communication content and properties for an autonomous and safe driving.

MIPS (Modeling, Intelligence, Process and Systems) Lab, EA 2332
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General purpose information

Areas of expertise: Information technologies, Engineering sciences
Date of starting (potentially): October 2106
Funding: French Regional grant (50%), German Hochschule (50%)
Hosting teams: MIPS-MIAM / Hochschule Offenburg
Web: www.miam.mips.uha.fr
PhD supervisors: J.Ph LAUFENBURGER (HdR), A SIKORA (Pr. Dr. Ing.), B HILT (Mcf).

Subject

Autonomous vehicles which are regularly in the first pages of newspapers setup their autonomy by using a wide range of sensors (3D cameras, LiDARs, radars, …) that are often expensive. By using multi modal data fusion techniques, these sensors allow equipped vehicles to have a fine perception of their local environment that is used for autonomous driving.

Besides, the increasing onboard availability of multi technology wireless communication systems (Wifi, Bluetooth, cellular) in intelligent transportation systems (ITS) allows reaching an ubiquity of connectivity to numeric communication systems. However, the vehicular surrounding (urban or suburban areas, highway environment), as well as the generally high moving speed of the vehicles have a significant impact on the channel propagation conditions and also on the dissemination control of the carried information between vehicles (V2V – vehicle to vehicle) and between vehicle and infrastructure (V2I – vehicle to infrastructure).

In this PhD work, we will first work on the adaptation of aforementioned multi-technology communication systems to the vehicular environment by taking into account nodes density, range, geocasting, … This will provide a basis for the next step of this PhD.

The second step of this PhD aims to improve the reliability of embedded environment sensing solutions. To this end we plan to merge local sensed information with remotely sensed information available through V2V and/or V2I communication. We will specifically consider the properties of the remotely exchanged data by considering their uncertainty related to the distributed architecture of the sensing system, their non-deterministic and fully heterogeneous properties. The fusion of multimodal information coming for different sources that could be internal from the vehicle but also distributed and remotely exchanged into the near-field area of the vehicle, requires to precisely know their origin (location) and dating.

The applicant to this PhD will start his work by proposing a contribution in the domain of multi-technology routing and clustering. He will take into account the geographical range limitation for data dissemination in order to preserve the dissemination efficiency facing vehicles density (in typical urban situations). This first contribution/step will be extended in order to develop perception
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methods that take into account the uncertainty of data origin, their availability and their quality. In this work, security and reliability consideration will be taken into account with a special attention. This Phd work will be the principal vector of the collaboration between two teams of the MIPS Lab and the HS Offenburg.

Keywords: Data fusion, Ad hoc vehicular networks, navigation, autonomous vehicle, heterogeneous communication technologies, mobility, multi sensor distributed perception.

Profile and required skills
- Engineer/Master degree in signal processing, telecommunication, automatic control, embedded systems who has made a research internship.
- Skills in data fusion will be appreciated.
- Interest for development and experiencing.
- Motivated and creative.
- Good level in spoken and written English

Application
- Motivation letter expressing your interests for the proposed subject.
- Detailed curriculum vitae.
- Certified copies of degree certificates including a transcript of courses taken (with grades)
- Names and contact details of two referees
- A list and copies of recent publications if applicable

Send application information by email to the three PhD supervisors.

References