INTERNSHIP PROPOSAL 2020/2021

RESEARCH INSTITUTE :
Laboratory GEOLOC
Allée des ponts et chaussées
44344 Bouguenais Cedex
France (NANTES)
www.geoloc.ifsttar.fr

Supervisors : Ni ZHU, Valérie RENAUDIN

tél : (+33) 2 40 84 58 01 **Mail :** ni.zhu@univ-eiffel.fr valerie.renaudin@univ-eiffel.fr

TITLE :
Improvement of GNSS phase measurements quality for connected travelers positioning

PROBLEMATIC

With the continuous development of intelligent objects and in an increasingly "connected" world, new mobility solutions, from pedestrian navigation aids to autonomous vehicles, require precision in terms of location. Precise positioning information for devices in constrained environments, such as urban and indoor environments, has become a real challenge for many emerging applications.
Global Navigation Satellite System (GNSS) signals suffer disruption and degradation in constrained environments due to multipath and Non-Line-of-Sight (NLOS) reception. The accuracy of "standalone" GNSS is far from sufficient for some applications (such as autonomous vehicles) and for some users who require more precise positioning, especially in urban and "indoor" environments. However, under favorable conditions, GNSS measurements, especially phase measurements, can be an efficient way to improve the performance of the positioning system based on inertial units.

CONTEXT
In the research framework currently being developed by the GEOLOC laboratory, a patented algorithm based on the GNSS phase measurement time difference, i.e., TDCP (Time-Differenced Carrier Phase), has been developed. TDCP is capable of providing system speed information that can be used as an important correction strategy especially for positioning systems based on inertial units. This algorithm is tested and validated on several positioning platforms developed by the GEOLOC laboratory, such as PEdestrian Reference System (PERSY), ULISS (Ubiquitous Localization with Inertial Sensors and Satellites) and smartphones. But a qualification procedure for GNSS phase measurements is needed to ensure the integrity of the phase measurements for a more robust algorithm. The objective of this internship is to analyze the behavior of TDCP in different environments with different experimental platforms and then to add integrity monitoring procedures for GNSS phase measurements to detect cycle slips and other anomalies. Finally, phase measurement confidence indicators could be designed and calculated to describe the reliability of the phase measurement.

OBJECTIVES

1) Understanding the theory of TDCP and the existing codes developed by GEOLOC;
2) Analyzing and comparing the performance of TDCP with different equipments (foot-mounted, hand-hold, smart-phone-based) developed by GEOLOC laboratory in different environments (indoor, urban, open-sky…);
3) Implementation of integrity monitoring procedures for GNSS phase measurement to enhance the current TDCP algorithm;
4) Test and evaluate the performance of the enhanced TDCP in position calculation.

WORKING ENVIRONMENT / EXPERIMENTAL EQUIPEMENT

- Working on the Nantes site in the GEOLOC team of the University Gustave Eiffel ;
- PERSY, ULISS, smartphone application Xiaomi Mi 8 (more information can be found on the website https://geoloc.univ-gustave-eiffel.fr).

FINANCIAL SUPPORT / OPPORTUNITY

- Scholarship **550€** / month ;
- Publications in conference or journal

- **Please send your CV and note transcript to : ni.zhu@univ-eiffel.fr and valerie.renaudin@univ-eiffel.fr**