INTERNSHIP TOPIC PROPOSAL 2020/2021

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TITLE

Elaboration of an Artificial Intelligence based algorithm for detecting Quasi Static Field periods on a magnetometer

INTERNSHIP TOPIC

Nowadays, open access to GPS (Global Positioning System) based positioning tools achieve good accuracy in dynamic pedestrian positioning scenarios with different transport modes (vehicle, pedestrian, bicycle, etc...) in outdoor surroundings. Among these tools, the most used is Google Maps and the Fused Location API on smartphone. However, indoors, these technologies are very quickly limited in terms of performances. Often they are even unable to estimate the 3D positions. PERSY (Pedestrian Reference System) is a pedestrian geolocation tool developed in the GEOLOC laboratory that estimates 3D pedestrians tracks, irrespective of the movement type (walking, running, walking steps, ramp...), both indoors and outdoors, with a 0.3% accuracy over the traveled distance. The PERSY algorithm, based on an extended Kalman filter, includes three different types of updates that mitigate the trajectory drift induced by the low-cost nature of the embedded sensors. The first update, titled ZUPT (Zero Velocity Update) applies when the foot is flat on the ground. The second update QSA (Quasi Static Acceleration) uses the phases of zero acceleration, corresponding to the period when the acceleration field remains constant or varies very little. The last one, which is the subject of this internship, deals with magnetic field variations. Titled QSF (Quasi Static Field), the update applies when the local magnetic field is considered quasi-static. Several criteria are used to detect these instants. However, despite numerous tuning tests, several updates are still wrongly applied. The purpose of this work is to use artificial intelligence methods to train the algorithm for recognizing the instants where the QSF update must be applied without over or underestimation.

CONTEXT

GEOLOC is a research laboratory in indoor and outdoor geolocation at the Université Gustave Eiffel. This laboratory develops both algorithms and hardware solutions, such as PERSY (Pedestrian Reference System) and ULISS (Ubiquitous Localization with Inertial

Sensors and Satellites). The research on PERSY targets the improvement of positioning performance. Several projects are being conducted to reduce the positioning error, including the detection of ZUPT using Artificial Intelligence. GEOLOC is involved in the challenge MALIN (Maîtrise de la Localisation Indoor) for providing the French Army with a high-performance self-contained geolocation system working indoors. This project contributes to the objective of improving the positioning system using AI for automatically detecting the QSF phases of the magnetic field.

OBJECTIVES

1) Create a learning base for QSF
2) Create a QSF detection algorithm
3) Create a validation base for the resulting model
4) Implement this algorithm in real time
5) Validate this algorithm on the basis of validation

WORKING ENVIRONEMENT

- A user-friendly workspace in the campus of Nantes within a young dynamic team, passionate about navigation and artificial intelligence.
- Supervision provided by experts in navigation and a data scientist.
- Original PERSY test means.

SALARY

- Internship monthly fee about **550€**
- Possibility of reimbursement of up to 50% of the public transport pass
- A very low cost restaurant sponsored by the university
- The work may result in a high quality scientific paper presented at a conference or submitted to a journal.

To apply, send your CV and transcripts (Master or Engineer) to:
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