Post-doc position – 12 months

GNSS Integrity concept in railway environment

Topic:

GNSS Integrity is a measure of the trust that can be placed in the correctness of the information supplied by a navigation system and it includes the ability of the system to provide timely warnings to users when the system should not be used for navigation. One of the parameters of integrity quantification is the Protection Level (PL). This protection level is a statistical error bound computed so as to guarantee that the probability of the absolute position error exceeding said number is smaller than or equal to the target integrity risk. PL is typically computed with known equations in aeronautical applications, in a RAIM process (Receiver Autonomous Integrity Monitoring) and/or based on augmentation systems (like SBAS or LAAS). These solutions rely on the assumption of a single failure and the redundancy of the measurements.

In land transport applications, such as rail or road, the main source of positioning errors are caused by multipath and unavailability of signals received due to the surrounding buildings or vegetation. In these contexts, integrity data delivered by SBAS are not appropriate anymore, and classical RAIM assumptions neither. Thus new integrity monitoring solutions have to be developed.

The focus of the work will deal with the provision of a PL computation that will correctly bound real GNSS errors encountered in the railway environment. Several research axes can be discussed with the candidate, function of his/her proposals and background: EGNOS message use and its version for rail; how fault detection and exclusion techniques could help the computation of a correct HPL in these environments; towards an environment-dependent solution for HPL computation.

Context

The work of this post-doctoral topic will be performed in the rail context where safety is of main importance and in particular in the context of the European STARS project. In STARS, GNSS reception will be characterized by measurement campaign. Realistic error models shall be drawn.

The work will also be linked to the PhD work performed by Ni Zhu on this topic and will rely on previous experience and tools of the Leost lab.

Skills required: GNSS (PVT computation), Matlab, notions on integrity, RAIM, FDE

Contact: Work performed under the supervision of Juliette Marais, researcher. In collaboration with Ni Zhu, PhD student.
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