Characterization of the degradation modes of GNSS signals caused by the frame using data from LiDARHD

End-of-studies internship in the Engineering cycle

Syntony GNSS is a human-sized company with an international dimension, based in Toulouse and with the **FrenchTech label,** specializing in **Global Navigation Satellite Systems** (GNSS).

Our ambition: To provide our customers with relevant, innovative, reliable and robust solutions.

World leaders in radio navigation and embedded systems, we are present in fast-growing markets, such as aeronautics, space, road and rail transport, mining and IoT (Internet of Things). We have developed a range of products (simulators, receivers, indoor/outdoor location systems) that meet the growing needs of these industries.

Keysight, Airbus, Airbus Constellation, Hitachi Rail, Thales Alenia Space, Honeywell, Rockwell, MDA, or the Stockholm, New York and Toronto metros... So many partners who trust us and push us to always go further.

With passion, we constantly evolve our solutions to anticipate their needs and perfect our know-how.

At Syntony, we offer a pleasant and stimulating work environment, where the quality of life at work and the availability of our employees promote fulfillment and collaboration. Intellectual stimulation is omnipresent through innovative and varied projects.

We work on a variety of subjects, ranging from aeronautics to space, transport, mining and the environment.

Thus, Syntony vibrates around three fundamental values:

Benevolence:

Together, we cultivate listening, respect and empathy in our interactions, while also valuing the multiculturalism that enriches our exchanges.

We contribute to a positive environment where everyone feels valued and supported. We enrich each other by building strong relationships, both internally and externally.

Excellence:

Together, we strive for excellence in everything we do. Through our commitment, our high standards and our sense of responsibility, we guarantee quality, efficiency and performance. It is through our collective rigour that we meet challenges and provide sustainable solutions.

Adaptability:

Together, we are flexible in the face of the changes around us.

By combining creativity, collaboration and resilience, we find innovative solutions and move forward efficiently. Our agility allows us to evolve in line with our environment.

From students to professionals qualifié.es, help develop future navigation solutions in partnership with our team of experts. Evolve in a caring environment where your ideas take flight and your contributions strengthen the synergy of the company.

Internationally, we meet the challenges of today and tomorrow, supporting our customers throughout the entire process: from the initial vision to development, to delivery and the collection of their satisfaction.

The Context

Syntony GNSS is part of innovative railway projects such as ECOTRAIN or CLUG2, by offering its GNSS receiver as a navigation solution. The location of the train is a critical function, putting the safety of passengers at stake. The receiver must then prove its operational safety, i.e. its ability to perform its functions without the risk of dangerous failures.

Therefore, all the risks to which the positioning system is likely to be affected must be controlled. The contribution of this internship aims to study some of these risks, specifically those concerning the local environment of the receiver.

What you'll accomplish with Syntony GNSS

The GNSS receiver estimates its position by receiving and processing satellite signals. The local environment particularly influences the quality of the signals but also their visibility: nearby buildings act as masks and cause multi-path by reflecting signals on their surface.

The description of the elements of the environment is essential to characterize the risk that this induces in the quality of the positioning. We want to use the LIDARHD data to perform this characterization.

LIDARHD is a national project, provided by the IGN (HD LiDAR | Geoservices), which aims to provide France with a three-dimensional map of the territory, in the form of a cloud of classified points: soil, vegetation and buildings are identified. It is a decision-making tool that is particularly interesting for the public authorities, and we want to study its relevance to our problem.

Proposed activities

We propose two study activities:

1. The construction of a tool for assessing environmental masking
2. Estimation of the criticality of the environment with regard to multipath risks

The first activity will be devoted to the representation in a skyplot, for a given coordinate (x, y, z), of the areas hidden by the buildings, to identify any non-visible satellites.

The second activity will quantify the quality of positioning according to the elements of the environment, taking into account, for example, the footprint, height and distance of buildings according to a given position.

The technical skills we are looking for:

- Data analysis
- Signal processing
- Knowledge of Navigation, GNSS System (GNSS receiver, positioning, orbitography, ...) is a plus
- The handling and operation of LIDAR point clouds is appreciated
- Matlab / Octave / Python (optional)
- Fluency in technical English and good writing skills English / French
- A taste for experimentation and analysis of real data is a plus (critical thinking, autonomy, writing)

About you

Currently in engineering school or Master's degree, with a good foundation in mathematics and/or a specialization in space systems, GNSS, signal processing, etc., you are looking for a 6-month internship at the end of your studies. An appetite for scientific programming and theoretical studies with experimental application is also sought.

Your technical curiosity, your desire to learn and your team spirit will be the assets necessary for the success of your mission.

Ready to get on board with us? 🚀 ✨

Send us your Resumé under the reference ENG-655-EN: jobs@syntony.fr.