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CHALLENGES FACED BY GNSS TODAY : AN OVERVIEW

Abstract

The GNSS technology has reached high levels of maturity and diversity, its applications are limitless and embedded in the heart of a numerous range of domains, such as transport, logistics, surveys, wildlife preservation, farming, etc. Nonetheless, new stages in the development of the art bring along new challenges to face with more complex problems to solve.

This article presents an overview of those challenges that today compel industry as well as academy to move forward and spot solutions and paths to follow. With this article we aim to define the frontiers of the GNSS science, what will help assisting the GNSS community in its effort to widen the reach and applicability of the domain.

The main challenges encountered by GNSS systems can be classified in inter-technological, intra-technological and environmental challenges:

Intra-technological Challenges (Interoperability Challenges)

The coexistence of multiple working constellations in the present and near future raises questions such as which or how many systems to use for a given application. In addition, multiple signals may be able to work together in a single receiver whilst following different standards and formats. On this spirit, new ICD standards, and interoperability interfacing need to be identified and formalized (e.g. time offset to be transmitted in a message). Two major aspects of interoperability may be identified : multi constellation receiver and multi constellation SBAS.

Environmental Challenges

The ionosphere is one of the most dynamic layers of the atmosphere, depending on rapidly varying, unpredictable phenomena like solar activity. It is of foremost importance to GNSS Signal in Space because it induces error in the determination of pseudorange through multipath-like propagation. Even though means to palliate the effect of the ionosphere exist, the ionosphere is still one of the major contributors to the positioning error budget, influencing the performance of the GNSS system. Today, characteristics of the ionosphere such as the scintillation are yet to be accurately modeled.

Inter-technological Challenges The use of jammers for privacy can diminish the accuracy and integrity of augmentation systems in sensitive maneuvers such as landing. Furthermore, users are commonly deprived of GNSS service in shaded places like tunnels or the interior of buildings. Some solutions are pursued in the form of hybrid cooperative positioning, combining GNSS with UWB or RF signals to enhance the performance of the system and give service to otherwise inaccessible locations.