University of Rijeka, Faculty of Maritime studies

PROJECT ACRONYM AND TITLE: Research of environmental impact on the operation of satellite navigation system in maritime navigation

FUNDING PROGRAMME: University of Rijeka

PERSON RESPONSIBLE: David Brčić

FINANCIAL DATA

Project total cost	Overall funding assigned to PFRI
21.057,74 HRK/year	21.057,74 HRK/year

SUMMARY

Satellite navigation has become one of the pillars of modern society, and a crucial component of the national infrastructure, regardless of the ownership of the core satellite navigation system's (GNSS) infrastructure. Consequently, the sustained GNSS Positioning, Navigation, and Timing services quality has become the imperative in developing of sustainable society increasingly dependent on GNSS. This imperative may be realized through development of the GNSS resilient to both natural and artificial sources of GNSS PNT services degradation and deterioration. Introduction and proliferation of the Software-Defined GNSS receivers (SDR) has brought significant advantage in GNSS resilience development (maritime navigation). With the dominating market share, GNSS SDR-based receivers allow for development and targeted utilisation of tailored mathematical methods and statistical learning algorithms for classification and characterisation of individual and collective sources of GNSS PNT performance degradation. Utilisation of GNSS SDR receivers allows for: (1) adaptability of position estimation methods and algorithms to serve requirements of targeted GNSS applications (systems and services); (2) adaptability of error correction methods, position estimation methods and algorithms, and user GNSS equipment in general to recognise and answer the challenges of positioning environment conditions, both natural (space weather, geomagnetic, ionospheric conditions, multipath effects due to local topography and micro-environment), and artificial (GNSS spoofing, considered a cyber-attack, and GNSS jamming, in particular); (3) transparency in deployment of the latest scientific accomplishments, expressed in form of mathematical methods and models, for a fast commercialisation; (4) scalable GNSS receiver characteristics, suitable for a wide range of GNSS applications.

Proposed project aims at: (1) extension of the pool of relevant data sets required for a proper detection, recognition, and modelling of natural causes of GNSS positioning performance deterioration through integration of trusted internet-based sources of space weather, geomagnetic, ionospheric and GNSS data with own observations (GNSS SDR raw pseudoranges, Sudden Ionospheric Disturbances monitor (SID) data, magnetometer observations collected at sites in northern Croatia maintained and operated by project participants; (2) systematic data collection, aggregation and archiving, and statistical analysis and modelling of the observations, related to cases and scenarios of GNSS positioning performance deterioration; (3) development and validation of descriptive, correction, and forecasting models of GNSS positioning performance degradation due to related natural causes of interference (space weather, geomagnetic, ionospheric, and tropospheric disturbances, multipath

effects), as well as studying the impact on position estimation methodology through evaluation of various optimisation approaches; (4) enhancement and operational sustainability of Navigational GNSS Laboratory at Faculty of Maritime Studies, University of Rijeka, Croatia; (5) capacity development, knowledge transfer facilitation and fostering general understanding of GNSS resilience importance for technology and society through selection of challenging Master and PhD thesis topics, exchange of visiting researchers, students and professors, organisation of scientific events (Baška GNSS Conference in Baška, Krk Island, Croatia), presentation and publications of project's scientific accomplishments in scientific journals and respected international conferences, organisation of field work for students, post-docs and researchers, and organisation of selected acitivities aimed at facilitation of understanding of the need for GNSS resilience among the general public.

Start date	End date
07.03.2019.	07.02.2024.

PARTNERSHIP

Br.	Partner organization	Country	Role
1.	Faculty of Maritime Studies Rijeka	Croatia	Lead partner
2.	Faculty of Maritime Studies Split	Croatia	Partner
3.	University of Zadar, Maritime Department	Croatia	Partner
4.	IOLAP inc.	USA/Croatia	Partner
5.	Zagreb University of Applied Sciences	Croatia	Partner

WEBSITE: -

ADDITIONAL INFO:

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