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Information-Based and Cooperative Positioning of Multi-Sensor-Systems by Extended Kalman Particle Filter

Rozhin Moftizadeh[1], Wenchao Li[2], Hamza Alkhatib[1], and Allison Kealy[3]
[1]Geodätisches Institut Hannover, Leibniz Universität Hannover, Germany
[2]RMIT University Melbourne, Australia
[3]Department of Environment, Land, Water and Planning, Victoria State Government, Australia

Nowadays, in engineering geodesy, Multi-Sensor-Systems (MSSs) have gained a significant amount of interest in data acquisition. To make sense of the derived data and use it for multiple purposes, such systems need to be localized with respect to a global coordinate system. To do so, the most straightforward way is to use the Global Navigation Satellite System (GNSS) and Inertial Measurement Unit (IMU) data. However, such data are usually prone to errors, which should be overcome in the best way possible. One way to do so is to use beneficial information of the surrounding environment, which could be derived by other sensor types rather than the GNSS and IMU. An example of such sensors is a 3D scanner that could be used to capture the static information of a scene such as infrastructures. Moreover, the Ultra-Wide-Band (UWB) units could be used to establish a connection with the other nodes in the same environment and thus help to use potential dynamic information. Fusing various data derived from multiple sensors in a suitable filtering framework is another key to reach a reliable positioning solution. In this work, on the one hand we have explained our recent measurement campaign that was designed to cover the aforementioned aspects for capturing static and dynamic information. On the other hand, we have shown our proposed particle filtering methodology that could lead to reliable positioning solutions for MSSs that move in an inner-city area.