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Autonomous Distributed Multi Sensor Data Fusion for 3D Mapping

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ABSTRACT

Indoor and outdoor accurate localization and 3D mapping is a relevant resource for a diversity of applications. In this paper we present a real autonomous platform able to operate in unknown indoor and outdoor contexts. A set of Data Fusion processes is performed in real-time by on-board and/or off-board processing nodes. The platform sensing capabilities is composed by multiple laser scanners for 2D and 3D perception, IMU units (of different qualities), 3D cameras (indoor Kinect), standard cameras, GPS (for outdoor operation) and dead reckoning sensors. The acquired data is shared with multiple client processes that are in charge of different levels of perception and control. The resulting data, produced by the perception processes is also shared for being used by higher level processes such as the 3D mapping, generation of maps of diverse dense properties such as terrain quality, detection and classifications of obstacles and other application specific context features.

The information generated by the platform is shared through the communication resources of the platform allowing remote processing and remote decision making, such as path planning when operated in autonomous mode.

Even remote processes and users operating through the internet have been successfully tested, such as applications where distributed processing was performed between the platform operating in Australia and remote processing nodes operating in Europe.

In addition to the flexibility of the system for being applied to a diversity of perception and control applications, the data generated offer an excellent richness and quality for the research community. Typical datasets are to be offered as part of the presentation.

KEYWORDS: Real-time Distributed Sensor Data Fusion; Autonomous mapping. 3D mapping. SLAM