Preface: Workshop "IAMS - Intelligent Autonomous Mapping Systems"

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This IAMS (Intelligent Autonomous Mapping Systems) workshop has collected 11 relevant contributions that show the developments of autonomous mobile sensing (with specific regard to unmanned terrestrial and airborne platforms) for different novel Geospatial applications.

Besides more traditional uses of drone platforms (Mesbah et al., 2023), the collected papers present new algorithmic solutions embedded in autonomous platforms. These works aim to enable outdoor or indoor/confined explorations for the extraction of useful information about the 3D scene such as well as the detection and tracking of interesting objects. In (Karjalainen et al., 2023) a stereo camera is used to safely navigate a drone inside a confined boreal forest. This contribution also shows how simulations can be useful instruments to improve the algorithm performances before testing them in real environments. Indoor mapping is tackled by (Udugama et al., 2023) who use visual-inertial odometry solutions to build a 3D scene graph representation for indoor semantic mapping in real-time with edge processing units embedded in a drone.

Other papers present solutions to enable more automated infrastructure monitoring using drones. In (Cuypers et al., 2023) these platforms are used to define and track asset deviations reducing costs and time compared to traditional operations. On the other hand, (Tilon and Nex, 2023) adopt drones to track cars on highways, detect incidents and other anomalies on the lane and determine vehicles' speed in real-time, making the patrolling of these infrastructures faster and more reliable. Another interesting example of monitoring and inspection with drones is given by (Simões et al.,2023) who adopt a monoplotting strategy to detect and avoid obstacles in real-time, showing its potential for many real-time path planning tasks. An interesting, tethered drone solution is then presented in (Martinez-Sanchez et al., 2023) for road monitoring: this concept allows the continuous detection of incoming traffic and the prompt support of decision-makers in case of car traffic problems.

Besides the on-board navigation instruments (such as GNSS and IMU) different typologies of sensors have been considered in these contributions too. Some contributions show how cameras can be complemented or replaced by miniaturized LiDAR instruments and how these solutions can achieve better performances in specific use cases. As an example, in (Wu et al., 2023) new algorithms for GPS-constrained LiDAR odometry are presented to show how autonomous driving solutions can be supported by efficient and accurate localization and mapping solutions. The integration of visual and LiDAR odometry is then presented in (Park and Park, 2023) where these instruments are used to localize the drone platforms and map the position of trees. On a different note, (Yadav et al., 2023) propose a hybrid adjustment to accurately align drone LiDAR and image acquisitions for accurate 3D mapping and modelling. Autonomous solutions can be embedded in more complex and heterogeneous solutions too. In (Mohamed et al., 2023), a full pipeline is proposed for updating the HD map via crowdsourced data that are collected with low-cost smartphone sensors. Through postprocessing procedures, the data are uploaded automatically to the cloud server that is connected to a map database. Automated solutions for object detection, depth estimation, and matching algorithms are then triggered on the cloud server to keep up-to-date the map database.

The IAMS workshop gives a nice overview of developments in the field of autonomous mapping systems, showing the current solutions, the still existing challenges and limitations and triggering the development of new ideas and solutions.

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