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## Sensors integration for smartphone navigation: performances and future challenges

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**Abstract.** Nowadays the modern smartphones include several sensors which are usually adopted in geomatic application, as digital camera, GNSS (Global Navigation Satellite System) receivers, inertial platform, RFID and Wi-Fi systems.

In this paper the authors would like to testing the performances of internal sensors (Inertial Measurement Unit, IMU) of three modern smartphones (Samsung GalaxyS4, Samsung GalaxyS5 and iPhone4) compared to external mass-market IMU platform in order to verify their accuracy levels, in terms of positioning. Moreover, the Image Based Navigation (IBN) approach is also investigated: this approach can be very useful in hard-urban environment or for indoor positioning, as alternative to GNSS positioning.

IBN allows to obtain a sub-metrical accuracy, but a special database of georeferenced images (Image DataBase, IDB) is needed, moreover it is necessary to use dedicated algorithm to resizing the images which are collected by smartphone, in order to share it with the server where is stored the IDB. Moreover, it is necessary to characterize smartphone camera lens in terms of focal length and lens distortions.

The authors have developed an innovative method with respect to those available today, which has been tested in a covered area, adopting a special support where all sensors under testing have been installed. Geomatic instrument have been used to define the reference trajectory, with purpose to compare this one, with the path obtained with IBN solution. First results leads to have an horizontal and vertical accuracies better than 60 cm, respect to the reference trajectories. IBN method, sensors, test and result will be described in the paper.

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