

UBI-T: Smart Surveying Instrument Using Ubiquitous Computing Concept

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Key words: Education; Engineering survey; Land management; Positioning; Spatial planning; Young surveyor; Smartphone; Sensor; Ubi-T; Kalman Filter; Total Station; Location-Based Services

SUMMARY

Over time, surveying instruments have evolved to the current stage of total stations that can measure various geometric aspects of different surveying operations with desired accuracies. Nowadays, they can measure distances, horizontal and vertical angles, store data into the computer memory, and display results automatically or perform robotically. In parallel with these traditional usages, location-based and positioning applications also appear in smartphones using the sensor- and infrastructure-based positioning techniques. The comparison between smartphones and total stations shows that, a total station even with high weight or usage complexity must be used depend on the application. However, due to the low cost, weight and small size of the smartphones, affordable effort to train operators and the role of modern technologies in the development of today's phone, the term of Ubiquitous Total Station (Ubi-T) is presented. In this paper, the novel realization of Ubi-T is introduced and evaluated in different aspects to discuss, if there is a possibility to use smartphones instead of a total station. A survey has been conducted before developing the Ubi-T by asking surveyors if they prefer to use Ubi-T instead of a total station to collect spatial data or not. We found the Ubi-T a popular and interesting concept. Then, the system accuracy performance is compared with a total station during a field work experiment. While the accuracy of the laser ranging sensor reports from the data-sheet (± 1 mm for maximum precision), the mean error of 0.741° and 8.677° in vertical and horizontal angle measurements is realized respectively. For that, we have used a Kalman Filter model in placements such as free-hand and on-tripod. At the end, discussion shows that the smartphone sensors can provide a variety of location-based services and applications.

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FIG e-Working Week 2021

Smart Surveyors for Land and Water Management - Challenges in a New Reality

Virtually in the Netherlands, 21–25 June 2021