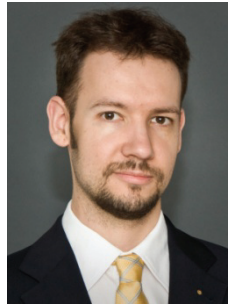


The Application of Smartphones in Bridge Inspection and Monitoring

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Summary

Smartphones and tablets have the potential to revolutionise the mobile collection of data. The inspection of infrastructures, specifically of bridges, is an important aspect of maintenance in relation to ensuring a long service life and hence improving the sustainability of the building stock.

Numerous technical features of modern smartphones make these very light and mobile devices perfectly suitable for recording, storing, transmitting and visualising data acquired “in the field”. Numerous built-in sensors can be utilised. This paper presents the main relevant features of such devices, the software implementation that has been developed and possible usage scenarios on actual structures.

Keywords: Smartphones, ASPIRE, Android, Infrastructure and bridge inspection, Sensors, GPS.

1. Introduction

A key component in the quest for a more sustainable built environment is the extension of the life time of existing structures. Civil infrastructure however witnesses a significant deterioration throughout the world. The management of this problem, i.e. the identification of structural deterioration and damage as well as the optimisation of remedial measures, presents a serious challenge.

More reliable information about the structural performance with higher resolution both spatially and temporally are required to facilitate such management. The data should be easily accessible, readily comprehensible and economical to acquire. Traditional monitoring systems present viable means to collect data at an arbitrarily high resolution, but are expensive to install because of the component cost as well as the tailor-made planning usually necessary [1]. Such systems cannot be easily modified should the scope of the monitoring change, they require significant maintenance and, last but not least, consume significant amounts of power.

As one trend in structural health monitoring the development of wireless sensor networks has emerged [2]. These systems deploy distributed systems of small, usually MEMS-based (MEMS-microelectromechanical systems), sensor nodes that communicate with/through gateways via radio transmission. The successful initial trials highlight the potential for the sensor technology applied.

Similar MEMS technology has recently been introduced in modern smartphones. These devices present an opportunity to simplify the mobile collection of information about existing infrastructure and to streamline the process of saving, transmitting and processing such data.

In Sections 3 and 4 of this paper trial implementations of smartphone and tablet software are presented which investigate the usefulness of such devices for applications in assessing civil infrastructure.