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EDITORIAL

Foreword

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Tunnels, embankments, retaining walls and earth dams are only few examples representing the framework of geo-infrastructure systems. Recent surge in frequency of extreme climatic occurrences, and natural disasters, such as floods, hurricanes, and earthquakes has resulted in landslides, collapse of tunnels and breach of levees and dams. Prevention and mitigation of potential disasters requires development of innovative monitoring systems and condition assessment methodologies for geo-infrastructures. A number of monitoring techniques and sensing technologies have been developed for geo-monitoring. Distributed sensing based on optical fibers and related optoelectronic based approaches for transduction of parameters of importance have played a major role in condition assessment of geo-infrastructures. These methods include distributed fiber optic sensors such as BOTDR/A and ROTDR, Fiber Bragg Grating (FBG) sensors, and digital image correlation techniques, have played an increasingly important role in monitoring and early warning of geo-hazards. Due to their apparent advantages, the development and application of these technologies have become a worldwide research effort. Therefore, this special issue is dedicated to articles pertaining to the monitoring of geo-infrastructures.

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The compendium of eight articles in this special issue is expected to provide critical insights into the development and applications of advanced sensing technologies in geo-infrastructures. The articles by Cheng et al. and Xu et al. correspond to the laboratory and field applications of distributed strain-sensing technologies in monitoring rock strata deformations induced by coal mining operations. Results of their studies indicated the effectiveness of distributed fiber optic sensing in differentiating the uneven displacements within the rock layers. In the work presented by Gue et al., an existing cast iron tunnel in London was monitored by a distributed fiber optic sensor system. Detailed design of the sensing system in their project provided valuable information for the kinds of technical issues involved in monitoring of tunnels, including sensor placement planning, measurements, and evaluation of the field data. Wu et al. carried out a preliminary study based on Brillouin Optical Time Domain Reflectometry (BOTDR) for monitoring of land subsidence due to the diminishing groundwater levels. Brillouin scattering based sensing proved to be an effective approach in capturing the compression and deformation characteristics of the soil layers. In the article by Huang et al., particle image velocimetry (PIV) technique was employed in the centrifuge model tests of buried pipelines. The static and dynamic uplift mechanisms of pipes in sand were investigated based on accurate determination of strains and displacements. Feng et al. describes the use of digital image correlation (DIC) technique for monitoring the deflections and displacements of temporary structures, such as scaffoldings and excavation supports. Their work involved evaluation of the feature and pixel-based methods for the measurement of deflections. In the article described by Li et al., feasibility of simultaneous measurements with FBG and Brillouin Optical Time Domain Analysis (BOTDA)

techniques were investigated. The article by Wang et al. (2015) describes development of an FBG-based inclinometer and successful installation of the same at a site prone to landslides for long-term monitoring of slope stability.

In closing the special issue editors would like to express their sincere gratitude to all the authors and anonymous reviewers who generously contributed their times and efforts for the production of this special issue.