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Editorial

Special Issue on Green Construction, Maintenance, Structural Health Monitoring and Non-Destructive Testing in Complex Structures and Infrastructures

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1. Introduction

It is widely acknowledged that structural design, new construction technology, maintenance, monitoring and testing remain core aspects of civil engineering. These aspects can be achieved by various means and technologies, including the use of modern automation and the information technologies of planning, organizing, construction, and maintenance processes. Societal and ecological conditions are rapidly changing, increasing the impact of climate changes, including natural and anthropogenic disasters such as flooding, earthquake, drought, erosion, landslides, heatwaves, and air pollution. In this context, green construction is considered one of the most effective ways to address sustainability issues. Moreover, environmentally induced deterioration, improper maintenance, and the increasing occurrence of natural or human-made disasters intimately affect civil structures and infrastructures, including bridges, building structures, tunnels, etc. It is essential that we test the performance of civil structures at regular intervals and monitor them in real time in order to improve their operational efficiency. With the development of advanced sensing, signal processing, and damage detection methods, structural health monitoring (SHM) technology and non-destructive testing (NDT) technology have been widely implemented in practical civil structures, which are used to assist decision making for the maintenance, rehabilitation, and retrofit of existing civil structures. This Special Issue seeks to gather a series of manuscripts that advance the frontiers of construction, maintenance, SHM and NDT in civil structures.

2. Highlights in the Present Issue

A total of nine research papers are presented in this Special Issue, covering both the construction and maintenance stages of infrastructure structures and materials using structural health monitoring and non-destructive testing technologies. Deng et al. [1] proposed a tower deviation correction method applied for the construction stage of a long-span concrete-filled steel tube arch bridge based on the active control system and theory, which has been used to monitor tower deviation as well as its regulation and control during the cable hoisting process. Wang et al. [2] proposed a prefabricated bridge substructure, named "Pile Column Integration", which is an important method for achieving green and low-carbon goals in the construction stage of transportation infrastructure, and they also used a series of mechanical tests to verify the performance and feasibility of this kind of prefabricated structure. Wang et al. [3] evaluated the performance of a long-span cable-stayed bridge after construction based on a series of nondestructive testing technologies on stress, strain and cable force, etc., which were verified using a finite element simulation method. The detection, monitoring and component performance of civil structures are vital to ensure their durability and sustainable development in the management and maintenance stages. Fang et al. [4] reported a new damage characterization index of

Citation: Wang, W.; Tan, G.; Yang, T.; Wu, C.; He, X. Special Issue on Green Construction, Maintenance, Structural Health Monitoring and Non-Destructive Testing in Complex Structures and Infrastructures. *Appl. Sci.* **2022**, *12*, 10189. https://doi.org/10.3390/app121910189

Received: 8 October 2022
Accepted: 9 October 2022
Published: 10 October 2022

cable force for cable-stayed bridges based on the residual force and non-zero vector under arbitrary static loading, which can successfully and accurately identify, locate and quantify cable force damage. Xiao et al. [5] reported a structural damage identification method for connecting rods based on structural characterization parameter of measured displacement, which can accurately identify the cross-sectional area damage or key node damage of a rigid frame. He et al. [6] proposed a reliability evaluation with time-varying features of lateral load distribution for simply supported beams, considering environmental influences such as corrosion. Liu et al. [7] studied a technology to monitor data recovery based on EMD and BiGRU joint technology, which is helpful for the stability and reliability of SHM. As for maintenance, rehabilitation, and the retrofit of structures, Wang et al. [8] put forward a calculation method for bridge deck displacement in the process of suspender replacement for suspender arch bridges based on the equivalent model, which can be used to guide actual retrofit engineering. Chen et al. [9] reported the damage mechanism and pozzolanic reaction repair effect of cement-based materials for infrastructure through acoustic emission nondestructive testing technology.

3. Conclusions

The Special Issue focuses on complex structures and infrastructures, collating many research findings from the life cycle of design, construction, maintenance and monitoring in civil engineering, and more in-depth and significant research continues to meet the challenges of green, durability, non-destructive and intelligent engineering.

Author Contributions: Conceptualization, W.W., G.T. and T.Y.; formal analysis, C.W.; writing—original draft preparation, W.W.; writing—review and editing, X.H.; project administration, W.W.; funding acquisition, W.W. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Scientific and Technological Project of Science and Technology Department of Jilin Province (grant number: 20210508028RQ), National Natural Science Foundation of China (grant number: 52208438), Scientific Research Project of Department of Education of Jilin Province (grant number: JJKH20221019KJ), Key Project of Department of Transportation of Heilongjiang Province (grant number: 2022-1, 2022-2).

Acknowledgments: Thanks to all the authors and peer reviewers for their valuable contributions to this Special Issue 'Green Construction, Maintenance, Structural Health Monitoring and Non-destructive Testing in Complex Structures and Infrastructures'. I would also like to express my gratitude to all the staff and people involved in this Special Issue.

Conflicts of Interest: The authors declare no conflict of interest.

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