

Special issue on “ICT Bridge Technology for Life-span Extension and Carbon Emission Mitigation”

Preface

The work reported in this special issue of *Smart Structures and Systems* represents the forefront research related restoration, renewal, monitoring and life-span extension of bridge structures along with mitigation of carbon emission. As the number of aging infrastructure increases and the issue of global climate change can no longer be ignored, life extension of our infrastructure systems and mitigation of carbon emission throughout the construction, maintenance, repair and replacement of the infrastructure are becoming critical challenges that not a single nation but our entire world face urgently. To cope with these challenges, the Korean government initiated 5-year project entitled “ICT (Information and Communication Technology) based partial replacement and low-carbon technologies for bridge structures (2013-2018)” under the auspices of Ministry of Land, Infrastructure and Transport (MOLIT) of Korean government and Korea Agency for Infrastructure Technology Advancement (KAIA). Eight papers presented in this special issue are mainly the outcomes resulted from this project and represent the latest and best efforts of leading researchers on the aforementioned challenges.

In the first paper, an enhanced design concept for prefabricated bridge piers is validated experimentally and numerically. The second paper is intended to improve the workability of a precast bridge deck system, which has ribbed loop joints between decks eliminating internal tendons. The third paper evaluates experimentally the transfer length of 2400MPa seven-wire 15.2mm steel strands in high-strength pretensioned prestressed concrete beam. In the fourth paper, glass fiber-reinforced polymer hybrid bar is developed for stronger durability of concrete structures. The fifth paper presents a new approach for surrogate modeling of time-consuming finite element analysis. In the sixth paper, a magnetic resonance is proposed for wirelessly transferring power to an embedded wireless sensor. In the seventh paper, dynamic displacement is estimated by combining acceleration and displacement measurements using multi-rate two-stage Kalman estimator. The last paper describes a data management infrastructure for bridge monitoring applications based on NoSQL database systems.

We hope the readers would find the special issue useful along the way conducting research in relevant fields. The guest editors thank and acknowledge the significant contributions provided by the authors and the technical reviewers of this special issue. Furthermore, the guest editors are grateful to Prof. Chung Bang Yun, one of the Editors-in-Chief of *Smart Structures and Systems*, for his guidance in the development of this special issue.

Guest Editors:

Hoon Sohn, Ph.D.
Professor, Department of Civil and Environmental Engineering,
KAIST, Republic of Korea (e-mail: hoonsohn@kaist.ac.kr)

Taek-Ryong Seong, Ph.D.
Group Leader, Steel Structure Research Group,
POSCO, Republic of Korea (e-mail: t.seong@posco.com)

In-Gyu Kim, Ph.D.
Team Manager, Civil Engineering Research Team,
DAEWOO E&C, Republic of Korea (e-mail: ingyu.kim@daewooenc.com)

The third paper evaluates experimentally the transfer length of 2400MPa seven-wire 15.2 mm steel strands in high-strength pretensioned prestressed concrete beam.

The third paper evaluates experimentally the transfer length of steel strands in pretensioned prestressed concrete beam.