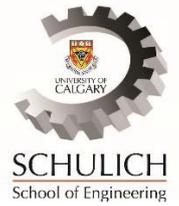
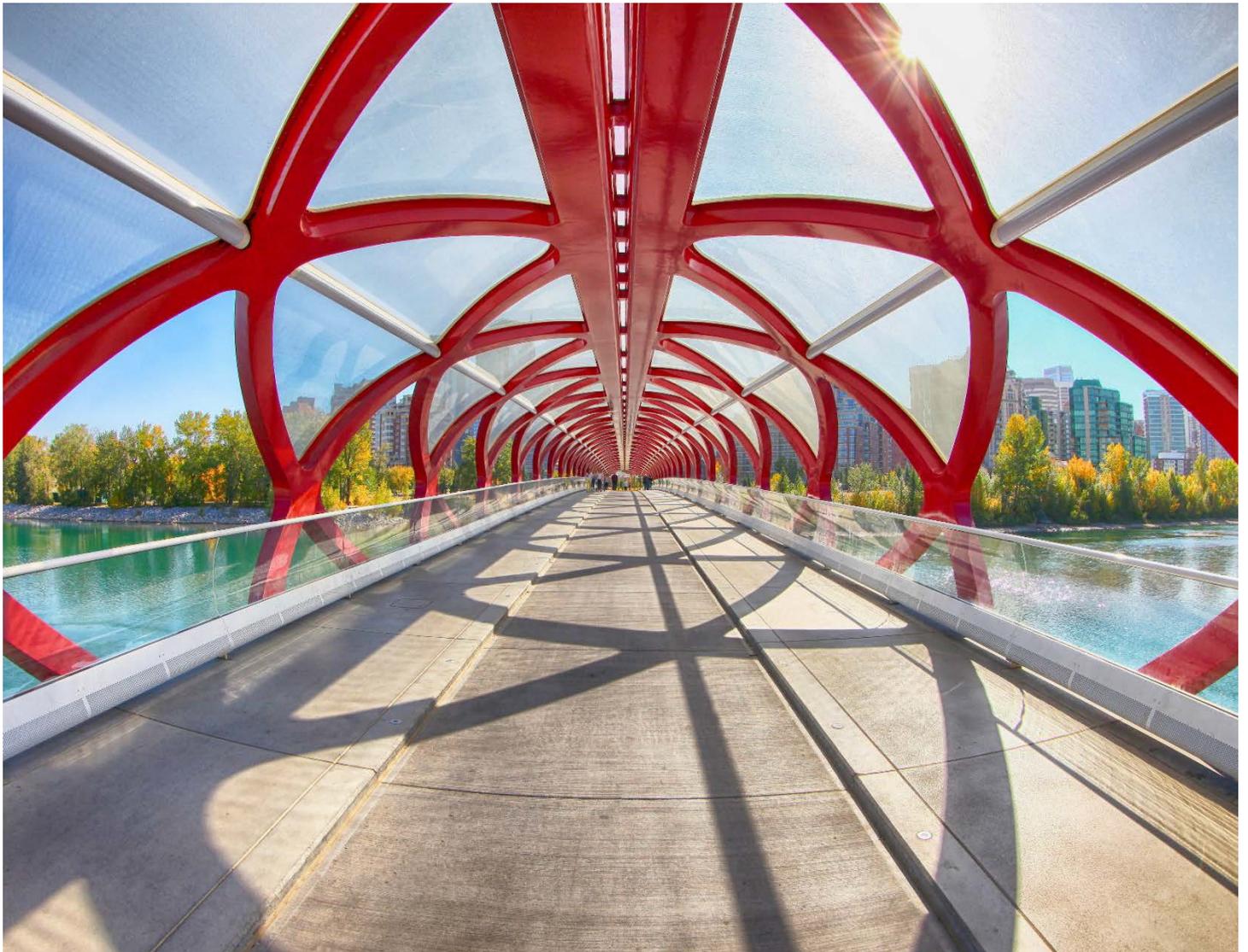


Robert Brennan, Kristina Edström,
Ron Hugo, Janne Roslöf, Robert
Songer & Daniel Spooner (eds.)



The 13th International CDIO Conference

Proceedings – Full Papers



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Cover photo: Peace Bridge, Downtown Calgary

Research Reports From
University of Calgary
Calgary 2017

ISBN (pdf) 978-0-88953-399-8
ISSN (electronic) 1796-9964

Distribution: <https://prism.ucalgary.ca/handle/1880/52093>

CDIO Initiative
Proceedings of the International CDIO Conference
ISSN 2002-1593

Editorial

The CDIO approach is an innovative educational framework for producing the next generation of engineers. The aim is an education that supports students in the acquisition of strong technical fundamentals while simultaneously developing the necessary professional skills required of a practicing engineer. This is done by providing students with dual-impact learning experiences that are based upon the lifecycle of an engineering project, the Conceiving – Designing – Implementing – Operating (CDIO) of real-world products, processes, and systems. Throughout the world, more than 135 institutions have adopted CDIO as the framework of their curriculum development.

The Annual International Conference is the main meeting of the CDIO Initiative and it includes presentations of papers as well as special seminars, workshops, roundtables, events and activities. The 13th International CDIO Conference takes place in Calgary, Canada, June 18–22, 2017, hosted by the Schulich School of Engineering at the University of Calgary. The organizers together with the City of Calgary welcome you to the event!

The main theme of this year is *Engineering Education in the Digital Age*. It is visible in the keynote presentations, paper presentations, roundtables and workshops. The rich topical program will facilitate lively discussion and contribute to further advancement of engineering education.

The conference includes two types of contributions, Full Papers and Projects in Progress. The Full Papers fall into three tracks: Advances in CDIO, CDIO Implementation, and Engineering Education Research. All Full Papers have undergone a full single-blind review process to meet scholarly standards. The CDIO Projects in Progress contributions describe current activities and initial developments, and were selected by the program committee co-chairs based on the submitted abstracts.

Originally, 170 abstracts were submitted to the conference. The authors of the accepted Full Paper abstracts submitted 108 Full Paper manuscripts to the peer review process. During the review, 310 review reports were filed by 91 members of the 2017 International Program Committee. Acceptance decisions were made based on these reviews. The reviewers' constructive remarks served as valuable support to the authors of the accepted full papers when they prepared the final versions of their contributions. We want to address our warmest thanks to those who participated in the rigorous review process.

This publication contains the 102 accepted full papers that will be presented at the conference, of which 5 are Advances in CDIO; 48 CDIO Implementation; and 11

Engineering Education Research. These papers have been written by 173 different authors representing 30 countries. This book is available as an electronic publication only. In addition to the Full Papers, 32 CDIO Project in Progress contributions will be presented at the conference and are not included in this publication.

We hope that you find these contributions valuable in developing your own research, curriculum development, and teaching practice, ultimately furthering the engineering profession. We also hope that you benefit through the truly unique community of practice that exists within the CDIO Initiative. A total of 80 universities from 35 countries, representing six continents, will be present during the conference. Seize the opportunity to discuss and share with colleagues, as global awareness and partnerships are of major importance in the education of the next generation of engineers.

Wishing all of you a wonderful CDIO 2017 experience!

Calgary, June 15, 2017

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