DCEE4

The 4th International Workshop on
Design in Civil and Environmental Engineering

Taipei, Taiwan

October 30-31, 2015

Conference Chairman

Shang-Hsien (Patrick) Hsieh

Shih-Chung (Jessy) Kang

Organizer

National Taiwan University

Supporting Organization

Ministry of Science and Technology

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Shih-Chung “Jessy” Kang	National Taiwan University

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Welcome Message

Dear Colleagues,

On behalf of the Organizing Committee, I would like to welcome you with great pleasure to the 4th International Workshop on design in Civil and Environmental Engineering (DCEE 2015) in Taipei City, Taiwan.

DCEE 2015 is organized by the Department of Civil Engineering, National Taiwan University, and with help of Graduate Institute of Futures Studies, Tamkang University for the pre-conference workshop. In order to give all participants a most worthy experience of conference, the organizing committee has arranged the event in careful contemplation and detailed consideration. We have planned a pre-conference workshop: "Sustainable City – A Hundred Years from Now", facilitated by Professor Pirjo Haikola (Finland) and Professor Mei-Mei Song (Taiwan), in hope to bring on the discussion one step further to the future. I would like to thank Professor Haikola and Professor Song for their great efforts.

This year's workshop features 3 keynote speeches and 13 technical presentations by researchers from Japan, U.S.A., Denmark, Italy and Taiwan. The presentations span a wide range of studies related to Design in Civil and Environmental Engineering, from environmental design, structural design, to engineering design education. These arrangements are aimed to provide the participants a most abundant journey of "design". I would like to thank all of the presenters, particularly the three excellent keynote speakers – Professor Hideyuki Horii from Japan (Designing Innovation Workshop: i.School UTokyo), Professor Eduardo Miranda from USA (Performance Based Design), Mr. Ying-Chih Chang from Taiwan (Structural design for best integration with Architecture).

Last but not the least, the organizing committee also planned a technical tour to Songshan Cultural and Creative Park, to see how the old architecture from the Japanese colonial period has been re-used and transformed into modern exhibition venues and creative studios for young artists.

I am looking forward to a delightful and enjoyable meeting with you. Thank you very much for coming all the way to join us here in Taipei. I wish you all a pleasant stay in Taipei and a successful meeting of the DCEE 2015.

Sincerely Yours,

Shang-Hsien (Patrick) Hsieh
Chairman, DCEE 2015 Organizing Committee
Professor, Department of Civil Engineering, National Taiwan University

Pre-Conference Workshop

Sustainable City – A Hundred Years from Now

What is a city and how do we live a hundred years from now?

The buildings and infrastructure we build stays with us for decades, even hundreds of years – are we able to imagine the cultures and citizens who will inhabit those environments? Are we equipped to design for them?

How did it evolve? What kinds of citizens will inhabit it? What kinds of new cultures and behaviors has it fostered? What will be the relationship between humans, animals, plants and the built environment?

The workshop intends to inspire, and provide tools, for long-term creative thinking – allowing us to imagine futures we want, and don´t want. With a selection of Futures Studies and Design methods, the workshop aims to provide the participants an introduction to some from the wide range of tools, to create and build better futures.

Workshop Facilitators:

Pirjo Haikola,
Assistant Professor, IADE Creative University Lisbon
Sessional Lecturer, School of Arts, Design and Architecture, Aalto University Helsinki
Researcher, Centre for Spatial and Organizational Dynamics, University of Algarve Faro

Mei-Mei Song,
Assistant Professor, Graduate Institute of Futures Studies
Director, Center for Futures Intelligence and Research, Tamkang University

October 29th, 2015 (Thursday)

Room 405, Civil Engineering Research Building

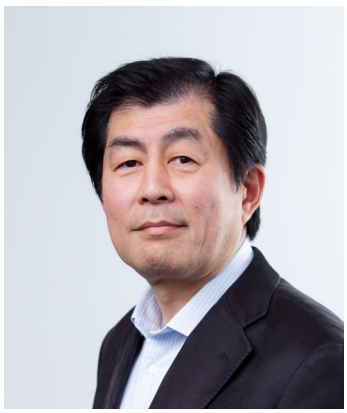
09:00 – 09:10	Opening Remarks
09:10 – 09:30	Thinking for the Future
09:30 – 10:00	Imagining and Impacting Futures – Practicality of the Fantastic
10:00 – 10:30	Coffee Break
10:30 – 10:45	Futures Tables and Assignment
10:45 – 12:00	Participants Work in Groups on the Assignment
12:00 – 13:00	Lunch
13:00 – 13:10	Intro on How to Brainstorm, Organize the Thoughts
13:10 – 14:00	Groups Brainstorm to Create Tables
14:00 – 14:10	Intro on Scenarios and the Next Task
14:10 – 15:30	Groups Work on the Scenario and Design Task
15:30 – 16:00	Coffee Break
16:00 – 17:30	Presentation of the Outcomes by Groups
17:30 – 17:45	Closing Remarks

Program Overview

October 30th, 2015 (Friday)	
09:00 – 09:20	Opening / Opening Address
09:20 – 10:00	Keynote I / Hideyuki Horii
10:00 – 10:20	Coffee Break
10:20 – 11:00	Keynote II / Eduardo Miranda
11:00 – 12:20	Paper Session I
12:20 – 13:20	Lunch Break
13:20 – 15:00	Paper Session II
15:00 – 18:30	Technical Tour
18:30 – 21:00	Banquet
October 31th, 2015 (Saturday)	
09:00 – 09:40	Keynote III / Ying-Chih Chang
09:40 – 10:00	Coffee Break
10:00 – 11:00	NTU Campus Tour
11:00 – 12:20	Paper Session III
12:20 – 13:20	Lunch Break
13:20 – 14:40	Mini Workshop : Futures of DCEE I
14:40 – 14:50	Coffee Break
14:50 – 16:10	Mini Workshop : Futures of DCEE II
16:10 – 16:30	Closing Ceremony
16:35 – 17:30	DCEE Committee Meeting

Keynote Speech I

Designing Innovation Workshop : i.school UTokyo



Prof. Hideyuki Horii

Professor, Department of Civil Engineering,
Executive Director, i.school
Director, Center for Knowledge Structuring,
The University of Tokyo, Japan

Bio: Graduated from Department of Civil Eng., The University of Tokyo in 1980. M.S. in 1981, Ph.D. in 1983 from Northwestern University in the field of Civil Engineering. Assistant Professor in 1985, Associate Professor in 1986 and Professor since 1996 in the Department of Civil Eng., The University of Tokyo. Published a number of papers in international journals on applied mechanics, rock mechanics, socio-technology and books including “Socio-technology: Design of problem-solving”, University of Tokyo Press, 2012.

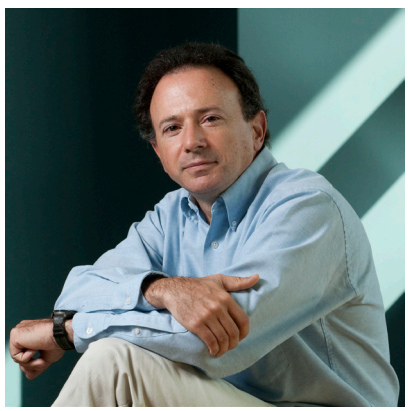
Professor Hideyuki Horii has been running an innovation education, named i.school to develop the ability to create innovative ideas of products, services, business models and social systems based on human-centered innovation. The i.school's educational program is composed of workshops for 20-30 participants. Each workshop has a different theme and method, but common to each is a focus on group work in four or five groups. Students of the University of Tokyo can apply from all sectors. The goals for i.school students are 1) when presented with a task requiring creativity, to learn how to design the most appropriate workshop process, and 2) to build up successful experience of creating innovative ideas leading to self-confidence.

Professor Hideyuki Horii has been also leading “International Project Course” in the Department of Civil Eng., The University of Tokyo since 2004. The course is one of the most popular in the University of Tokyo. The objective of the course is to foster those who work actively in the international society.

He initiated studies on socio-technology which is the technology to solve social problems. Science and technology and social systems are combined to form the socio-technology. The methodology developed in the studies on socio-technology is utilized to handle international projects. He served as the director of social system investigation team in investigation committee on the accident at the Fukushima nuclear power stations of Tokyo Electric Power Company based on his knowledge on socio-technology.

Keynote Speech II

Performance Based Design



Prof. Eduardo Miranda

Associate Professor,
Department of Civil and Environmental Engineering,
Stanford University, USA

Bio: Eduardo Miranda obtained his Civil Engineer degree from the National Autonomous University of Mexico, UNAM. He obtained his MSc and PhD degrees in Structural Engineering at the University of California at Berkeley. From 1993 to 1999 he was a Professor at the Graduate School of Engineering at UNAM. He has been a faculty member at the Department of Civil and Environmental Engineering at Stanford University since 2000 where he is currently an associate professor. He is the author of more than 250 publications and recipient of several awards two of which are the Moisseff award from the American Society of Civil Engineering and “top 25 Newsmaker” from Engineering News Record. His research focuses on Earthquake Engineering with emphasis on Performance-Based Design.

Keynote Speech III

Structural Design for Best Integration with Architecture

Mr. Ying-Chih Chang

Founder and Chief Engineer,
Envision Engineering Consultants (EEC), Taiwan

Bio: Founder and Chief Engineer of Envision Engineering Consultants (EEC), Mr. Kevin Chang co-works with major developer and world-famous Architects, provides best suitable structural solution and new concept for each individual project to achieve the most “harmonic" end-results and performance for the entire project.

To ensure every project be completed in time and budget-controlled, all projects by EEC are designed (1) built-able by considering construction details and sequence in advance, and (2) cost-efficient by value engineering.

Mr. Kevin Chang has designed many high-profile projects in Taiwan; ex. Tau yuan international airport Terminal one expansion, and Kaohsiung Library, a total suspended structure.

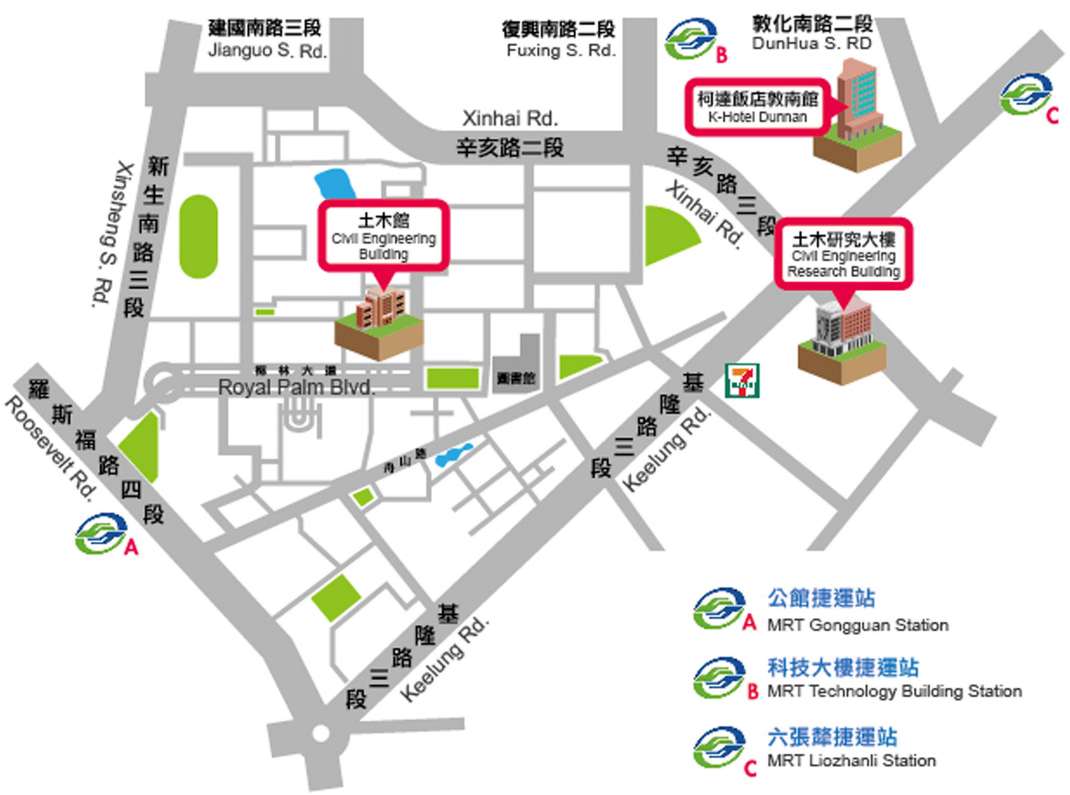
Conference Information

Date

October 30-31, 2015

Venue

Oct 30		Civil Engineering Building Room 224, 2F, No. 1, Sec. 4, Roosevelt Rd., Taipei [Google Map]
Oct 31	before 11:00	Civil Engineering Building Room 224, 2F, No. 1, Sec. 4, Roosevelt Rd., Taipei [Google Map]
	after 11:00	Civil Engineering Research Building Room 405, 4F, No.188, Sec. 3, Xinhai Rd., Daan Dist., Taipei [Google Map]



Please click on the following link to view a detailed map
http://goo.gl/FEkzsA

Conference Special Events

Banquet

18:30-21:00, October 30th (Fri.), Tuan Yuan Restaurant,
B2 of Eslite Spectrum Songyan,No.88 YanChang Rd., Taipei.
(高記小團圓 台灣台北市信義區菸廠路 88 號 B2)

Technical Tour

Oct. 30th 15:00-18:30

- Songshan Cultural and Creative Park Guided Tour
- Talk - about Social Design

Internet Access

Account: To be announced.

Technical Program

Keynote I **9:20-10:00, Oct 30th** Room 224, Civil Engineering Building	
Hideyuki Horii	Designing Innovation Workshop : i.School UTokyo
Keynote II **10:20-11:00, Oct 30th** Room 224, Civil Engineering Building	
Eduardo Miranda	Performance Based Design
Paper Session 1 **11:00-12:20, Oct 30th** Room 224, Civil Engineering Building	**Chair:Dr. Konstantinos Gkoumas**
Konstantinos Gkoumas, Francesco Petrini, Franco Bontempi	Design for Robustness, Resilience and Anti-fragility in the Built and Urban Environment: Considerations from a Civil Engineering Point of View (p.11)
Julia Ratajczak, Giada Malacarne, Daniel Krause, Dominik T. Matt	The BIM Approach and Stakeholders Integration in the AEC Sector – Benefits and Obstacles in South Tyrolean Context (p.12)
Meidi Chen, Shih-Yao Lai, Mei-Mei Song, Shang-Hsien Hsieh	Development of an Interdisciplinary Participatory Design Course with Futures Thinking for Engineering Students (p.13)
Zito Tseng, Shih-Chung Kang	How to Educate Future Engineers? A Case Study of an Engineering Design Course(p.14)
Paper Session 2 **13:20 – 15:00, Oct 30** Room 224, Civil Engineering Building	**Chair:Dr. Lotte Marianne Bjerregaard Jensen**
Gabriele Pasetti Monizza, Dominik T. Matt, Cristina Benedetti	Parametric and Generative Design Techniques for Process Efficiency in Building Industry: The Case Study of Glued Laminated Timber Industry (p.15)
Patrick Dallasega, Elisa Marengo, Werner Nutt, Luka Rescic, Dominik T. Matt	Design of a Framework for Supporting the Execution-Management of Small and Medium Sized Projects in the AEC-industry (p.16)
Lotte Marianne Bjerregaard Jensen	Learning from the Masters – Architectural History and History of Technology and Architectural Engineering in Relation to Structural Design Education (p.17)
Hervé Capart, Tsung-Hsuan, Chung-Che Chou	Cooperative Design and Construction of Wood Bridges by Students of Architecture and Civil Engineering (p.18)
Giuseppe Longhi, Linda Comerlati	An Urban Regeneration Consistent with EU Principles: The Case of Northeast Italy Region (p.19)

Keynote III 9:00 – 9:40, Oct 31 Room 224, Civil Engineering Building	
Ying-Chih Chang	Structural Design for Best Integration with Architecture
Paper Session 3 **11:00 – 12:20, Oct 31** Room 405, Civil Engineering Research Building	**Chair: Prof. Shih-Chung Kang**
Franco Bontempi, Konstantinos Gkoumas, Stefania Arangio, Francesco Petrini, Chiara Crosti	The Long Way Towards a Sound Framework for Structural Design: 10 Tears of Experience in Rome (p.20)
Hervé Capart, Masatoshi Tomita, Min-Jay Chung, Ming-Jer Tsai, Yu-Chou Chiang, Wei-Jay Ni, Wei-Shun Wang	Student Capstone Design of Timber Bridge with Input from Professional Structural Designers, Decision Makers, and the Public (p.21)
Yi-Fen Li, Ci-Jyun Liang, Shih-Chung Kang	Experience and Reflections on a Global Collaborative Course, Sky Classroom – Global Project Team Course, from National Taiwan University (p.22)
HsuYu-Lien Chang, Ching-Mei Tseng, Shih-Chung Kang	The Development and Validation of Self-Efficacy Scale in Learning of MOOCs :An Example from the Engineering Graphics Course (p.23)

Abstract

Design for Robustness, Resilience and Anti-fragility in the Built and Urban Environment: Considerations from a Civil Engineering Point of View.

Konstantinos Gkoumas[1], Francesco Petrini[1,2], and Franco Bontempi[2]

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[2]Department of Structural and Geotechnical Engineering, Sapienza University of Rome, Italy

Abstract: In the recent years, natural disasters are recognized to be the cause of considerable human and socioeconomic losses, particularly in modern, infrastructure-dependent societies. For example, the 2011 earthquake and tsunami in Japan have been one of the most devastating disasters of the past decades. Likewise, the Katrina hurricane in the US east coast in 2005. In this context, the concepts of "structural robustness" and "resilience of urban areas" and "resilient community", have gathered the attention of researchers. On top of that, more recently, antifragile design came as an evolution of design for resilience (intended as the capacity to recover), or for robustness (a main dimension of resilience, intended as the ability of a structure to withstand events without being damaged to an extent disproportionate to the original cause). This study focuses on a modern approach in disaster resilience - including antifragile design and structural robustness - providing insight and a preliminary framework on important modelling aspects.

Keywords: resilience, robustness, antifragility, structural engineering, structural design, urban design.

The BIM Approach and Stakeholders Integration in the AEC Sector – Benefits and Obstacles in South Tyrolean Context

Julia Ratajczak*[1], Giada Malacarne[1], and Daniel Krause[1], Dominik T. Matt[1,2]

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[1] Fraunhofer Italia Research, Italy

[2] Faculty of Science and Technology, Free University of Bozen, Italy

Abstract: For more than ten years Building Information Modelling (BIM) has been one of the most important innovation trends in the Architecture, Engineering and Construction (AEC) sectors to approach building design holistically, to enhance communication and collaboration among key stakeholders, to increase productivity, and to improve the overall quality of the final product (building). Nowadays, BIM and related standards are already mandatory for projects founded by public bodies in some EU countries, but most of them have to still adopt. Italy is not a leading country in BIM adoption. National reports regarding status of BIM use and its business value are missing. This paper aims at defining the first status quo on BIM implementation and stakeholders' integration in the AEC sector in the South Tyrolean region. A survey was carried out using a questionnaire among the most important firms in the territory. This paper provides a qualitative study and key findings regarding: a) awareness and status of BIM use; b) benefits of BIM; c) barriers and issues to BIM adoption; d) stakeholders' involvement.

Keywords: Building Information Modelling, BIM advantages, BIM disadvantages, integrated approach in the AEC sector.

Development of an Interdisciplinary Participatory Design Course with Futures Thinking for Engineering Students

Mei-Di Chen [1], Shih-Yao Lai [2], Mei-Mei Song[3], and Shang-Hsien Hsieh [1]

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[1] Department of Civil Engineering, National Taiwan University, Taipei, Taiwan

[2] Graduate Institute of Building and Planning, National Taiwan University, Taipei, Taiwan

[3]Graduate Institute of Futures Studies, Tamkang University, New Taipei City, Taiwan

Abstract: In the future, engineers are expected to have innovative thinking and abilities of interdisciplinary and integration. Therefore, we combined three courses from Department of Civil Engineering, Graduate Institute of Building and Planning and Department of Mechanical Engineering at National Taiwan University (NTU). The courseware was designed and developed jointly by instructors from fields of Civil Engineering, Architecture, Mechanical Engineering, and Futures Studies. In this study, students were asked to develop an environment-improving proposal for an old community in Taipei city. The reflection from teachers as well as the feedbacks from students on teaching and learning were collected and analyzed. The material can be served as references to curriculum development and improvement for future work. After courses, we provided commands of interdisciplinary and courses design. Students did demonstrate abilities of interdisciplinary thinking, long-term planning, team work, and innovative design. Interdisciplinary communication and peer learning were the biggest gain of courses.

Keywords: Interdisciplinary course development, Participatory design, Engineering Education.

How to Educate Future Engineers? A Case Study of an Engineering Design Course

Zito Tseng and Shih-Chung Kang*

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Department of Civil Engineering, National Taiwan University, Taiwan

Abstract: Design thinking has been employed in engineering education globally in the past ten years. However, there is not much documentation of implementing engineering design thinking education in countries other than the United States. In 2014, a Stanford-originated project-based engineering design thinking course, ME310, was introduced into Taiwan. Here we document the contents of the course, including the course structure, design process, and teaching methods. We further discuss the importance of detouring and ambiguity in project-based learning. Moreover, we propose that a one-year course is not long enough to develop students' empathy. The documentation of the course content and the experience learned through executing the course could serve as the basis of future engineering education in Taiwan.

Keywords: Engineering education, Design Thinking, Project-based learning, ME310.

Parametric and Generative Design Techniques for Process Efficiency in Building Industry: The Case Study of Glued Laminated Timber Industry

Gabriele Pasetti Monizza[1], Dominik Matt[1,2], and Cristina Benedetti[2]

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[1] Faculty of Science and Technology, Free University of Bozen, Italy

[2] Fraunhofer Innovation Engineering Center, Fraunhofer Italia, Italy

Abstract: Building industry is one of the less efficient industries today, and the productivity gap with other industries is growing faster. In the last years, several improvements in process efficiency have been made focusing on production and installation processes only. In order to improve the efficiency of design and engineering processes as well, the scientific community agrees that the most fruitful strategy should be Front-End Design (FED). Nevertheless, effective techniques and tools are missing. As soon as innovative automated manufacturing processes (such as 3D concrete printing, advanced CNC machinery, etc.) will be widely available, may the Parametric and the Generative Design techniques facilitate FED? May these techniques increase the efficiency of design and engineering processes with effective results on the entire supply-chain system?
This paper will point out the first results of a research that investigates benefits and criticisms of these techniques by a case study analysis in the glued-laminated-timber industry. Starting from an analysis of ordinary engineering and production processes in the glued-laminated-timber industry, a possible solution through freeform-parametric-generative algorithms will be introduced Finally, the results will be discussed focusing on effective facilitations of FED strategy, on benefits and criticisms for manufacturers and potential clients.

Keywords: Building engineering, timber engineering, design methods, parametric design tools, process management.

Design of a Framework for Supporting the Execution-Management of Small and Medium Sized Projects in the AEC-industry

Patrick Dallasega[*1,2], Elisa Marengo[1], Werner Nutt[1], Luka Rescic[2], Dominik T. Matt[1,2], Erwin Rauch[1]

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[1]Free University of Bozen-Bolzano, Bolzano, Italy

[2]Fraunhofer Italia Research, Bolzano, Italy

Abstract: The paper describes a framework for efficiently organizing and managing construction projects, aimed at reducing time and cost overruns. The approach provides concepts and tools to constantly monitor the actual progress of a project, so as to identify problems early on and to take corrective action by replanning and rescheduling.

The framework combines three correlated modules: (1) Process Modeling, where high-level information about the structure of the building, the tasks to be performed and their interdependencies, the qualifications of the workforce needed, and the expected performance is collected; (2) Scheduling, where the daily or weekly work assignment to the crews is determined, based on the modeling information and the actual progress; (3) Actualization, where the actual work performed on site is recorded, using the concepts of the process model.

We show how the framework can be translated into the architecture of an IT system to support the approach and report on a prototype that is currently under development.

Keywords: AEC, SME, Process Modeling, Scheduling, Building Execution Process

Learning from the Masters – Architectural History and History of Technology and Architectural Engineering in Relation to Structural Design Education.

Lotte Bjerregaard Jensen*

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DTU Civil Engineering,

Technical University of Denmark

Abstract: There are many ideas of what it implies to perform structural design. However the majority of teaching in structural design is focused on an analytical approach where the bits and pieces of mechanics behind structural behavior are taught. The textbooks, lectures, examples and exercises are often framed as partial studies of a structure. The standards, developed to make everyday design of structures more efficient, also have the same narrowly framed perspective, centered on small structural systems that can then be applied in an additive process. However there exists a strong opposition to the above described notion of structural design. In this structures are conceived as the synthesis between geometry, material and a structural concept is the starting point. There is a large reservoir of knowledge of how to perform structural design in this sense present in the oeuvre of important engineer designers and architects, discussed in Architectural History and history of technology and architectural engineering.

In this paper, the ideas behind a design engineering program at the Technical University of Denmark is presented, with special emphasis on structural concepts and historical cases viewed as a reservoir of design strategies.

Keywords: Structural system design, architectural history, history of technology, history of architectural engineering, Design Education in Civil Engineering, Design Method.

Cooperative Design and Construction of Wood Bridges by Students of Architecture and Civil Engineering

Tsung-Hsuan Hsu[1], Chung-Che Chou[2], and Hervé Capart[2]
[1] Department of Architecture Design, Shih Chien University
[2] Department of Civil Engineering, National Taiwan University

Abstract: Since 2012, yearly workshops held by the Department of Architecture Design of Shih Chien University (SCU) and the Department of Civil Engineering of National Taiwan University (NTU) have let students of architecture and civil engineering work together on the design and construction of wood bridges. Targeted at second year undergraduates, the workshops feature an intense period of collaboration, concentrated over the first 5 weeks of the Spring semester, during which large mixed teams of 12 to 14 SCU and NTU students must design and construct functional, full-scale bridges of spans between 5 and 7 meters. Over the last four years, 22 such bridges have been completed by student teams, each providing a case study in design, construction, and collaboration between future architects and engineers. In this contribution, we will look back on how the activity and student designs have evolved over the years. Although students can identify and resolve many issues using drawings, scale models, and structural calculations, they find out that many more pitfalls and opportunities arise when constructing a full-scale prototype. Lessons learned, often the hard way, include the importance of designing for stiffness as well as strength, the key role of bracing, and the need to manage internal conflicts and respond to evolving circumstances. For many groups, another difficulty is to sustain everyone's energy beyond the rush of completing the first on-site assembly. When successfully navigated, these challenges lead to interesting solutions allying elegant forms, sensitivity to site conditions, structural stability, and expressive construction details, combined into a structural and architectural poem unburdened by the conventions of established practice.

Keywords: Cooperative design.

An Urban Regeneration Consistent with EU Principles: The Case of Northeast Italy Region

Giuseppe Longhi, Linda Comerlati*

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Advanced course in sustainable design, IUAV University of Venice, Italy

Abstract: Today the design practice is evolving because the ability to manipulate physical goods ('atoms') is linked to the ability to manipulate large flows of intangible knowledge (' bits'), as noted in "Innovation and design processes: towards a model of social responsibility" (G. Longhi, L. Comerlati, Copenhagen, 2014). This paradigm is a generator of an urban planning methodology, based on the “open innovation” concept, promoted by EU and characterized by:

- an operative organization of multidisciplinary platforms, to manage innovation as a collective process;
- a strategy for the development of knowledge at different scales, supported by new infrastructures such as networks and large data centers;
- the development of economic activities related to the "key enabling technologies" proposed by the European Union, especially the bio-nano technologies and the upgrading of the education sector.

These principles are the basis for the regeneration design of the metropolitan area of North East of Italy, the second Italian industrial basin. The paper proposes a platform for open innovation, built on the model of the Moebius strip, through an agenda of shared actions. The design goals are symmetrical with the International Environmental Agreements and the European Union Directives, namely:

- capability and innovation growth, through the development of open structures for long life learning;
- environmental restoration and enhancement of biodiversity, according to the principles of urban metabolism, which guarantees a "closed loop" network of physical and natural flows;
- dematerialization of design, thanks to new potential of hyper connectivity and biotechnologies;
- solutions for resilience and socio environmental responsibility growth.

The result is an urban regeneration methodology, and the testing of innovative physical solutions: the new 'basic' urban industry (data centers), the attractors and exchangers of knowledge (knowledge parks), the generators of new knowledge (schools).

Keywords: Urban Regeneration, Innovation, Key Enabling Technologies, Knowledge Generator

The Long Way Towards a Sound Framework for Structural Design: 10 Years of Experience in Rome

Franco Bontempi[*1,2], Konstantinos Gkoumas[1], Stefania Arangio[1,2], Francesco Petrini[1,2], Chiara Crosti[1]

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Abstract: This paper focuses on the different conceptual frameworks that govern the structural problem and provides an insight on the results obtained from structural analysis, towards a sound framework for the structural design. The interdisciplinary of many aspects is highlighted, considering the developments on the sustainable development and the architectonic design, and the availability of modern technologies that nowadays are integrated in the structural forms. The paper provides significant concepts and case studies (long span bridges, offshore wind turbines, high-rise buildings etc.), studied thoroughly in the last 10 years in the Sapienza University of Rome by the research group on structural analysis and design www.francobontempi.org.

Keywords: Structural Engineering, Analysis, Design, Knowledge.

Student capstone design of a timber bridge with input from professional structural designers, decision makers, and the public

Hervé Capart[*1], Masatoshi Tomita[2], Min-Jay Chung[3], Ming-Jer Tsai[3]

Yu-Chou Chiang[1], Wei-Jay Ni[1], and Wei-Shun Wang[1]

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Abstract: As part of a capstone design course, seven undergraduate students from the Department of Civil Engineering of National Taiwan University (NTU-CE) devoted one year to the design of a new timber footbridge to be constructed across a mountain torrent in the Xitou Nature Education Area of the NTU Experimental Forest (EXFO). The design process started with case studies of constructed bridges, the development of individual structural system proposals, and their embodiment in 1:50 foam board scale models. After field investigation, students then worked in teams to propose three sited bridge alternatives. Upon selection of one of these alternatives by the EXFO Director, students further developed two variants of the chosen design, including assemblies and simple structural calculations. Students tested the two variants by fabricating 1:25 scale models from curved glulam members and soldered copper joints, and conducting load tests in the structural laboratory. Students then used renderings and storytelling to submit their designs to public consultation and identify the option preferred by future users. To work out the preferred option, finally, students learned to perform detailed structural calculations in 2D and 3D, with the end goal of producing a set of construction drawings for possible implementation. Throughout the process, addressing the challenging requirements of the client, professionals, and users provided a strong source of motivation for the students, leading them to perform at a high level in spite of their lack of experience. In addition to describing the course and the resulting student designs, we will seek to draw lessons on how to involve students, instructors, professionals, users, and decision makers in a collaborative learning process.

Keywords: capstone, design.

Experience and Reflections on a Global Collaborative Course, Sky Classroom – Global Project Team Course, from National Taiwan University

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Abstract: Rapid changes in technology have made communication easier and more instantaneous in the twenty-first century. The ubiquity of Internet access has eliminated the barriers of region and time, thereby creating various opportunities for globalization. In the current study, the authors attempted to cultivate students in advance to make them competitive for the future. In 2014 and 2015, the authors participated in a global project-based course involving seven universities in five countries. This paper aims to document the experiences and reflections of students at National Taiwan University. The authors summarize the results in terms of five common phenomena, note five main problems with goals, technical issues, timing, skills, and team building, and report suggestions on communication, project process, tools, and techniques. Given the great amount of global cooperation in academia and business today, it is hoped that the findings of this report can assist people in global teamwork.

Keywords: Global Collaboration Experience, Virtual Network, BIM, Global Team Suggestion.

The Development and Validation of Self-Efficacy Scale in Learning of MOOCs: An Example from the Engineering Graphics Course

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Abstract: MOOCs learning have spread rapidly throughout higher education, typically integrating conventional and web-based courses to provide supportive instructional staff from conventional academic programs and offer the combination as blended courses. Enrollments in these courses have ranged from thousands to hundreds of thousands, typically from all around the world. Higher education focuses on the learning of professional courses in each subject manner. 'Self-efficacy' is a subjective measurement in assessing students' proficiency during their learning process. The purpose of the current study is to share the elements of successful experiences from a course practice, encourage the confidence in online teaching strategy and enhance students learning motivation to complete the self-directed learning.

The "College Students Self-Efficacy Scale in Learning Engineering Graphics" used in the this study based on Bandura's (1977) concept of self-efficacy and the related measurement tools. After validity and reliability examination, the current version includes two subscale on "positive affirmation" and "negative self awareness" with a total of 15 items. We aim to utlize this questionnaire as a measurement tool for the future relevant studies, for learners to increase the recognition on self-efficacy in learning, and for teachers to improve their teaching.

Keywords: Self-Directed Learning, Self-Efficacy, Online Learning Self-Efficacy