AFGS 2021
13th Asian Forum on Graphic Science

CONFERENCE PROGRAMME

6 (Mon) - 7 (Tue) Dec 2021

The Hong Kong Polytechnic Univesity

Hong Kong (Webinar)

The Organizer

DEPARTMENT OF
BUILDING & REAL ESTATE
建築及房地產學系
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Table of Contents

Conference Website: https://afgs2021.com

WELCOME MESSAGE

Welcome message from the AFGS2021 Conference Chair and Co-Chairs

We are very pleased to hold the 2021 Asian Forum on Graphic Science (AFGS) and hereby sincerely welcome you to attend the exciting online event. The AFGS is an international conference on graphics participated mainly by Asian countries, but not confined to the Asian region. It is held in odd-numbered years every two years. It evolved from its predecessor Japan–China Joint Conference on Graphics Education. After the 8th conference, it changed its name to AFGS, and expanded its scope to include topics regarding graphics education, and participating countries mainly from Asia and not restricted to Japan and China. This year, it comes to the 13th conference, which is hosted by The Hong Kong Polytechnic University - The Department of Building & Real Estate.

The AFGS 2021 aims to provide a platform for experts and scholars to exchange and discuss in the fields of geometry and graphics, computer graphics, industrial applications and research, graphics education and other related fields. 8 renowned scholars from Serbia, Poland, Japan, South Korea, China, and UK are invited to give lecture and 41 technical paper presentations will be delivered at this 2-day conference. Again, welcome experts and scholars from all over the world to attend the conference. AFGS2021 would not be possible without the diligent efforts of our volunteers. The conference chairs would like to express our sincere and deepest gratitude and thanks to the scientific committee members and organising committee members. In addition, we would also like to thank all session chairs and contributing authors.

We hope you will enjoy attending the conference as much as we have enjoyed organising it.

Prof. Heng LI

AFGS2021 conference chair

Chair Professor of Construction Informatics

Department of Building and Real estate,
Faculty of Construction and Environment,
The Hong Kong Polytechnic University

Dr. Hsi-Hsien WEI

AFGS2021 conference co-chair

Assistant Professor

Department of Building and Real estate,
Faculty of Construction and Environment,
The Hong Kong Polytechnic University

Dr. Hung-Lin CHI

AFGS2021 conference co-chair

Assistant Professor

Department of Building and Real estate,
Faculty of Construction and Environment,
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AFGS2021 Committees

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Scientific Committee Members

(in alphabetical order by last names)

Prof. Yuki AKIZUKI, University of Toyama, Japan

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Prof. Ayako KITA, Setsunan University, Japan

Prof. Kunio KONDO, Tokyo University of Technology, Japan

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Dr. Haiyan YU, Donghua University, China

PROGRAM OVERVIEW

Time GMT+8	Day 1, Monday, December 6			Day 2, Tuesday, December 7	
	Morning sessions				
09:00 - 09:30	**Opening Ceremony** **Room A (Zoom)**				
09:30 - 10:00	**KS1 Keynote Speech 1** **Room A (Zoom)** Bio – Feel – Geometry (Biophilia – Biodesign) Prof. Biljana Jović			**KS5 Keynote Speech 5** **Room A (Zoom)** BIM-based Delivery Management Platform for Underground Rail Transit Projects: the Taiyuan Metro Line 2 Case Prof. Guangbin Wang	
10:00 - 10:10	10-min Q&A session			10-min Q&A session	
10:10 - 10:15	Break			Break	
10:15 - 10:45	**KS2 Keynote Speech 2** **Room A (Zoom)** Content Production Technology Research and Education for CG animation and Game Prof. Kunio Kondo			**KS6 Keynote Speech 6** **Room A (Zoom)** (TBA) Prof. Inhan Kim	
10:45 - 10:55	10-min Q&A session			10-min Q&A session	
10:55 - 11:00	Break			Break	
11:00 - 12:30	**FS1 Full Paper Session 1** **Room A (Zoom)** Application of Geometry in Arts and Architectures	**FS2 Full Paper Session 2** **Room B (Zoom)** Applied Graphics and Geometry for Image processing (1)	**GL1 GAMELAB session 1** **Room C (Zoom)** Game Lab Challenge Workshop & Virtual Gallery	**FS5 Full Paper Session 5** **Room A (Zoom)** Applied Graphics and Geometry in Building Engineering	**FS6 Full Paper Session 6** **Room B (Zoom)** Applied Graphics and Geometry for Image processing (2)
12:30 - 14:00	Lunch Break				

Time GMT+8	Day 1, Monday, December 6			Day 2, Tuesday, December 7	
	Afternoon Sessions				
14:00 - 14:30	**KS3 Keynote Speech 3** **Room A (Zoom)** Development of 3D As-Is BIM Models from Digital Images for Digital Twins and Smart Cities Prof. Nobuyoshi Yabuki			**KS7 Keynote Speech 7** **Room A (Zoom)** Establishment of the Graphics Literacy Education and Research Center in the School of Engineering, Kobe University Prof. Hirotaka Suzuki	
14:30 - 14:40	10-min Q&A session			10-min Q&A session	
14:40 - 14:45	Break			Break	
14:45 - 15:15	**KS4 Keynote Speech 4** **Room A (Zoom)** GAME LAB project Prof. Małgorzata Łuszczak			**KS8 Keynote Speech 8** **Room A (Zoom)** Facilitating the standardisation of lifecycle carbon assessment for construction infrastructure through a BIM-based assessment framework Prof. Nashwan Dawood	
15:15 - 15:25	10-min Q&A session			10-min Q&A session	
15:25 - 15:30	Break			Break	
15:30 - 17:00	**FS3 Full Paper Session 3** **Room A (Zoom)** Computer Aided Design and Drafting	**FS4 Full Paper Session 4** **Room B (Zoom)** Mixed reality and visualization	**GL2 GAMELAB session 2** **Room C (Zoom)** Game Lab Challenge Workshop & Virtual Gallery	**FS7 Full Paper Session 7** **Room A (Zoom)** Computer Graphics	**FS8 Full Paper Session 8** **Room B (Zoom)** Graphics Education
17:00 - 17:30				**Closing Ceremony** **Room A (Zoom)** Best paper awards Message from the next AFGS conference	

*A email will be send to participants for instructions and acess links for rooms. If no receive until 2 Dec 2021, please contact secretariat@afgs2021.com.

Biljana Jović (Serbia)

Associate professor, University of Belgrade

Bio – Feel – Geometry (Biophilia – Biodesign)

Abstract: From 2012. Creative platform "Workshop Geometry" is designed for students of Landscape Architecture and Horticulture, all levels of studies. On this creative platform students have opportunity to express their creative inclinations trough the exploration of geometry, compositions and forms, visual communications. They have opportunity to present their work in a group exhibition at the Faculty of Forestry. We participated on international manifestation Belgrade Photo Month BPM 2017. BPM 2018. and BPM 2019. Student Cultural Center exhibition 2017. "Beyond Geometry" with bilingual reviewed Catalog. University Library "Svetozar Marković" workshops and exhibition. Expanded media art triennial – international exhibition in artistic pavilion "Cvjeta Zuzorić" 2016, and in Student Cultural Center 2019 organized by The Association of Fine Artists of Serbia (ULUS). Art and science overlapping and intertwining results will be presented and discussed. Multimedia DVD "Geometrical education using principles and tools of the 3D animation" will be presented, published by Faculty of Architecture, University of Belgrade, 2013. Digital visualization in landscape architecture by 3D modeling process of landscape architectural objects for urban open spaces. Bio inspiration by bio-digital means and methods as well as different approaches will be shown. All with purpose to find a way for sustainable living with nature-based solutions so peace with nature will be in focus. Educational computer graphics software in use, with focus on open-source Blender will be discussed, with advantages and limitations by comparing results on 3D bio-designed models done by talented students. Bio-geometry workshop results in India 2019 lectures, workshops, and exhibition will be presented.

Dr. Biljana Jović, docent was born in Belgrade, Serbia, graduated engineer of forestry – landscape architecture, with postgraduate studies – master of science degree and doctoral dissertation at the Faculty of Architecture, University of Belgrade in the scientific field descriptive geometry and geometry of architectural form which has a dual character: scientific and artistic. PhD thesis entitled: "Geometrical education in domain of visualization and experimental design using virtual technology", obtained in 2012. Founder of creative platform "Workshop Geometry" at the Faculty of Forestry. Focus of her research interest is geometry, graphics, new technologies and interventions in space. In her work combines the approach of landscape architects as well as engineers and artistic approach to geometric principles finds beauty and expression. A member of the International Society for Geometry and Graphics (ISGG). Finalist on Asian Digital Modeling Contest, Tokyo Japan ADMC 2017. Technical Session Chair on AFGS 2017 and Member of Committee Board of AFGS 2019, Kunming, China. Cumulus + Grantee 2019. Rovaniemi, Finland. International Reviewer Board member on this Cumulus creative linking Conference. Program Committee member BALTGRAF 2013, Riga, Latvia; ISGG 2014 Innsbruck, Austria; ICGG 2016 Beijing, China; ICGG 2018 Milano, Italy and ICGG 2020 Sao Paolo, Brazil. Member of Scientific Board of APLIMAT 2019 and APLIMAT 2020, Bratislava, Slovakia. Invited lecturer at TU Vienna, Austria; TU Dresden, Germany; Arch College for Design and Business, Jaipur, India. Currently on position Head of Master Studies at the Department for Landscape Architecture and Horticulture. Worth project EU ambassador: https://www.worthproject.eu/biljana-jovic-2/.

Kunio Kondo (Japan)

Emeritus Professor School of Media Science, President of Asia Digital Art and Design

Tokyo University of Technology

Content Production Technology Research and Education for CG animation and Game

Abstract: Contents such as animation and games play a part in Japanese culture and are highly competitive internationally, attracting attention from many countries. By advancing research on content production and reconstructing and systematizing engineering knowledge, we have established content production technologies that have attracted attention from the industry. Scenario writing, character making, and directing techniques are three essential areas in visual content production. In this talk, the speaker will introduce our research in these three areas. (1) We developed the writing support system created based on the scenario production workflow. Concerning scenarios, which are the foundation of video content, we aim to support the entire production of video content by streamlining information among producers. (2) The purpose of this research is to support character design. By analyzing existing characters, we have developed a method to make the "tacit knowledge" of designers into "Explicit knowledge" that can be used in design by anyone. We described our research on analysis and classification of character setting information, design draft production support using character scrapbooks, and character design draft production using three-dimensional models. (3) We have developed a system to support the direction. We developed on lighting simulation system, which are the most critical aspects of production, and a library for camerawork simulation. The content production education is based on production experience using the same environment and getting the development skills to make the production technology even more advanced.

Kunio KONDO was born in 1954 in Aichi, Japan. He is an Emeritus Professor at the Tokyo University of Technology. He got a doctoral degree in the University of Tokyo in 1988 and his Bachelor from Nagoya Institute of Technology in 1978. He was Associate professor of Department of Information and Computer Sciences, Saitama University, Lecturer of Tokyo Polytechnic University and Technical staff of Nagoya University, a part-time lecturer of The University of Tokyo, Aichi Prefectural University of Fine arts and Music, Kyushu Institute of Design, Visiting professor of Toho University. In 2021, he is a visiting professor at Kobe Design University, Kanagawa Institute of Technology, and the University of Silesia in Katowice. His research interests are computer graphics, content production technology for animation, games, and interactive modeling. He received the IPSJ the Anniversary Best Paper Award in 1985, JSGS Research Award in 1985, and JSGS Best Paper Award in 2011,   The Yayasan MSU-ADADA Award of the Lifetime Achievement in Digital Art and Design in 2019. He is a Fellow of IPSJ and a Fellow of IIEEJ. He is the president of ADADA International and ADADA Japan. He was former President of The Institute of Image Electronics Engineers of Japan, former President of The Society for Art and Science, former Vice President of Japan Society of Graphic Science, and Chair of SIG on Computer Graphics and CAD of Information Processing Society of Japan, Committee member of ICGG and AFGS. or more information visit https://kondolab.org/.

Nobuyoshi Yabuki (Japan)

Professor, Osaka University

Development of 3D As-Is BIM Models from Digital Images for Digital Twins and Smart Cities

Abstract: Thanks to the photogrammetry-based Structure from Motion (SfM) technology, 3D point cloud data can be generated for the object of interest such as buildings, bridges, etc., from many digital pictures taken from various directions. Furthermore, a 3D polygon model of the object with textures can be generated by Multi-View Stereo (MVS) technology. However, the generated objects represent only their surface geometry so that they are not intelligent enough to be identified as members such as beams, columns, walls, windows, doors, etc. And holes exist where no pictures are taken or where feature points are not identified. Since even smooth plane or cylindrical surfaces are represented with many triangulated polygons, they are not only rough but also it takes much time to render their computer graphics images. As per engineering plants of which members are mostly standardized products such as pipes, there are some software packages for transforming the 3D point cloud data of plants to Building Information Modeling (BIM) models. However, such software is not seen in the domain of buildings and infrastructures. Therefore, we have been conducting research on the development of a system that can classify the 3D point cloud data of buildings and infrastructures as individual members by using deep learning-based semantic or instance segmentation and that can transform the points into geometrical surfaces such as planes, cylinders, spheres, etc., automatically generating BIM models with semantics. This keynote speech will explain the methodologies and samples for verification and will show the directions to develop digital twins and smart cities by fusing sensing technologies with BIM models.

Prof. Nobuyoshi Yabuki was born in Tokyo, Japan, and received his bachelor's degree in civil engineering at the University of Tokyo in 1982. Then, he worked at the Electric Power Development Co., Ltd., as a civil engineer. He obtained his M.S. and Ph.D. in civil engineering at Stanford University in 1989 and 1992, respectively. He became Associate Professor, Department of Civil Engineering and Architecture, Muroran Institute of Technology in 1999 and has been Professor, Division of Sustainable Energy and Environmental Engineering, Osaka University since 2008. His research area is civil engineering informatics, which is the applications of advanced Information and Communication Technology (ICT) including AI, Internet of Things (IoT), Building Information Modeling (BIM), VR/AR/MR, Structure from Motion (SfM), laser scanning to civil and building engineering. He has been involved in the research and application of Computer Graphics (CG) and 3D CAD since 1983. He has published over 300 journal and international conference papers and has received awards many times. He is Chair of the Committee on BIM/CIM Promotion, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan, Vice President of International Society for Computing in Civil and Building Engineering (ISCCBE), Founder/President of Asian Group for Civil Engineering Informatics (AGCEI), Vice Chairman of buildingSMART Japan (bSJ), Past Chair, Committee of Civil Engineering Informatics, Japan Society of Civil Engineers (JSCE), etc. He is a Fellow Member of JSCE, a member of ASCE, IEEE, ACM, IPSJ, VRSJ, JSAI, etc.

KEYNOTE SPEECH 4

Session chair: Dr. Hung-Lin CHI

Małgorzata Łuszczak (Poland)

Professor, University of Silesia in Katowice

GAME LAB project

Abstract: The main purpose of GAME LAB project is to develop an innovative and permanent international cooperation based on the exchange of experiences, common research and creative activity of the academic centres in the European Union, Asia and North America. The core of the project is the International Game Lab Challenge, an eight-month workshop connected with game design for students of art, design and IT. Current workshops are conducted by 16 mentors who collaborate with scientists and representatives of creative industry. Each of the centres proposed an authorial program of workshops. Seven teams were created this way and currently 42 students from all over the world work in them. The goal is not just to create an interesting project, but also to acquire competencies valuable on the labour market, such as the ability of communication and working in an international team, being able to use advanced tools of project and team management, meeting specifications and keeping deadlines. We invited artists representing diverse fields of art (new media, video, animation, traditional graphics) to implement the part related to art. Find more information about the project at http://www.gamelab.us.edu.pl/.

Małgorzata Łuszczak was born in 1956 in Żywiec, Poland. She has been connected with the University of Silesia in Katowice for 40 years. She has worked as the director of the Institute of Art, Dean of the Faculty of Art and a member of the Senate. She has been a director of the International Laboratory for Game Studies and Design GAME LAB since 2020. In 2007-2018, she worked at the University in Trnava, Slovakia. In 1995-1999 she worked as an art director in a German company TopWare, which produced video games. She is an author of a few projects in the field of art education, popularising digital media and their use in art education in Poland and other countries, including Festival of Art and Independent Games carried out as part of Creative Europe for Culture programme in 2015-2019. She is an author of several articles and an editor of 23 monographs about contemporary art published in Poland and around the world. Her artistic work includes: drawing, graphics, animation and digital media. The artist connects traditional media with digital print and augmented reality. She uses digital media to create pictures inspired by landscape diversity. Her works have been presented at 30 individual and over 600 collective exhibitions in Poland and abroad, including Belgium, France, Russia, Germany, Spain, Portugal, the USA, Mexico, Canada, India and Vietnam. Małgorzata Łuszczak has received numerous awards and honourable mentions for her artisitic and organisational activity, innovative didactics, international cooperation and popularisation of culture and art in Silesia. For more information visit http://www.malgorzataluszczak.com/.

Guangbin Wang (China)

Professor, Tongji University

BIM-based Delivery Management Platform for Underground Rail Transit Projects: the Taiyuan Metro Line 2 Case

Abstract: Underground rail transit projects are inherently complicated and have relatively high requirements for effective lifecycle information and process integration. Building Information Modelling (BIM) can be beneficial for such practice due to its virtual representation and information integration characteristics. However, existing research suggested that BIM utilization for operation and maintenance (O&M) lags behind BIM implementation in the design and construction phases due to ineffective, inconsistent, and inaccurate delivery management. Besides, while the research on BIM for transportation infrastructure has increased, BIM applications for rail transit systems are still limited. As such, this lecture presents a case study on the BIM-based digital delivery management platform for an underground rail transit project in China. It first identify several organizational, process-related, and mindset-related BIM implementation challenges, and then proposes corresponding solutions to facilitate successful delivery process integration. Moreover, the Taiyuan Metro Line 2 case as a pilot project with the proposed implementation strategies is presented to illustrate how a BIM-based digital delivery management platform is established and successfully implemented with the aim of integrating project lifecycle information and delivery processes for effective O&M. The study contributes to the knowledge body by mitigating BIM implementation challenges and provides one of the first few exploratory BIM implementations for digital delivery management in underground rail transit projects.

Prof. Dr. Guangbin Wang is Professor and head of the Department of Construction Management and Real Estate at Tongji University, China. He is also the Director of the Center of Innovation and Development in Construction (CIDC) at Tongji as well as the head of the Integrated Management System Lab at the National Engineering Technology Research Center for Prefabrication Construction in Civil Engineering. Professor Wang holds a B.S. in Construction Management and Economics from Chongqing University, and a M.S. and Ph.D. in Construction Engineering and Management from Tongji University in China. His research interests focus on building information modeling (BIM) and construction project management. Currently, he is undertaking several research projects on BIM and construction project management funded by the National Natural Science Foundation of China (NSFC) and the Ministry of Housing and Urban-Rural Development of China. Professor Wang has a deep and wide collaboration with the industry and has participated as a consultant in dozens of complex construction projects in China during the past 30 years. He currently also serves as the vice director of the Academic Committee of BIM in the Architectural Society of China (ASC), the deputy chairman of the BIM Committee in the China Graphics Society (CGS), and the deputy chairman of the China Association of Construction Education (CACE). He was a visiting scholar in the Center for Integrated Facility Engineering (CIFE) at Stanford University as well as in the School of Building Construction at Georgia Institute of Technology.

KEYNOTE SPEECH 6

Session chair: Dr. Hsi-Hsien WEI

Inhan Kim (Korea)

Professor, Kyung Hee University

Efforts on BIM based design automation for Modular integrated Construction

Currently, the construction industry has problems such as declining productivity, aging workforce, and the 3D industry. These problems need to be solved through the transformation of the construction industry into manufacturing.In this presentation, I would like to highlight various efforts to develop BIM design automation technology through Design for Manufacture and Assembly (DfMA) in Korea. DfMA is a design approach which focuses on ease of manufacture and efficiency of assembly. The aims are to develop BIM-based automatic design creation technology, modularization and combination technology for DfMA implementation, and DfMA integrated construction Platform.

Three main aspects of design automation technology have been highlighted. Firstly, development of DfMA and BIM-based automated architectural design creation technology by applying specialized space and design methodology for users and building types using artificial intelligence (AI) and machine learning algorithms. Second, we develop a modular technology that integrates the design, manufacturing, installation and dismantling steps for DfMA implementation to achieve just-in-time design, cost-effectiveness, high quality and improved productivity. Finally, integration for the construction industry as an end-to-end through the development of a DfMA integrated platform that provides user-specific services and decision support technology, strengthens communication of participants at each stage, and induces participation of various users We provide solutions.

A DfMA based prototypical system is developed in the end which will facilitate the process of DfMA based building construction from the early design phase to the final construction and maintenance phase. This presentation will increase the understanding and implementation of the process of DfMA based construction. Further, this research can help in providing the future roadmap for the DfMA based Research. We will see how the fourth industrial revolution will impact every aspect of people's lives in a good way.

Inhan Kim is professor of the department of architecture at Kyung Hee University in Korea. He has more than 25 years of architectural design and project management experience in Korea. He is widely recognized for his research and teaching expertise in the project management and BIM areas. He is government initiated BIM, Construction IT participation as a project leader.
He had served vice chairman of buildingSMART Korea since 2010 and he was as chairman of Society for Computational Design and Engineering in 2020. He also elected to Fellow of buildingSMART International on March 2019.

Hirotaka Suzuki (Japan)

Associate Professor, Kobe University

Establishment of the Graphics Literacy Education and Research Center in the School of Engineering, Kobe University

Abstract: The Graphics Literacy Education and Research Center was established in April 2020 in the graduate school of Engineering, Kobe University. The center focuses on advanced education and research encompassing multiscale engineering design literacy for urban and architectural planning, industrial design and energy flow design, including a wide variety of disciplines from large to microscopic scale. The center also conducts education and research activities related to basic studies for design such as aesthetics and graphics sciences. We defined that the elemental technologies that students belonging to faculty of engineering should have in common are 'Drawing,' 'Manufacturing,' and 'Measuring'. And we thought that the knowledge, software, and hardware are significant to realize advanced education of graphics literacy. Knowledge are corresponding to 'Projection' and related skills, Software is including tools of 'Computer Aided Design' and 'Computer Graphics', and Hardware is including '3D Printer', '3D Scanner', and 'Quad Copter'. The activities of the center in the year 2020 are classified into 2, practical activities and educational activities. As practical activities, web page of the center was established and information about graphic literacy was disseminated from the page, a series of open seminars of visualization was organized, and the open competition of space design and technical proposal under the environment of COVID-19 pandemic was organized as well. And, as educational activities, reorganization of syllabus of descriptive geometry into that of graphics literacy based on the concept of the center was discussed. The detail of the activities will be explained in the lecture.

Hirotaka SUZUKI was born in 1968 in Tokyo, Japan. He got a bachelor's degree in Architecture, a master's degree in Information Engineering, and a doctoral degree in Architecture from School of Engineering, the University of Tokyo. From 1996 to 1999, he worked at Fac. of Environmental Information, Keio University as a research associate. From 1998 to 2000, he worked at Asian Disaster Reduction Center as a senior researcher. From 2000 to 2012, he worked at School of Engineering as a lecturer and an associate professor, and at Global Exchange Office as a staff and a vice director in Osaka City University. And, from 2012 to 2021, he worked at Dept. of Architecture as an associate professor and at Graphics Literacy Education Center as the director in School of Engineering, Kobe University. He stayed Aarhus University in Denmark in 2015 for cooperative research in the field of paper folding lampshade design, and he stayed Vilnius Gediminas Technical University in Lithuania in the year 2016 and 2019 based on Erasmus+ staff exchange program. He is an author of several books in the field of Computer Graphics, Architectural Light Environment, and Descriptive Geometry. He was the chair of the executive committee of International Conference on Geometry and Graphics 2010 held in Kyoto, Japan, the vice chair of the Asia Lighting Conference 2018 held in Kobe, Japan. And he was a board member from 2010 to 2016 and the treasurer from 2017 to 2020 at the International Society for Geometry and Graphics.

Nashwan Dawood (UK)

Professor, Teesside University

Facilitating the standardisation of lifecycle carbon assessment for construction infrastructure through a BIM-based assessment framework

Abstract: Making deep carbon emission cuts to national GHG emissions contribution by UK construction infrastructure requires an in-depth understanding of the industry's carbon footprint. An empirical analysis of UK infrastructure industry carbon specialists' perspectives on the key issues of importance linked to carbon assessments are presented. Thematic analysis of fourteen semi-structured interview responses produced twelve causalities linked to the pertinent overarching themes related to carbon assessments. Important findings include: (1) current carbon assessment regulations are insufficient to drive sustained carbon reduction in UK construction infrastructure due to their non-prescriptiveness; (2) use of disparate Greenhouse gas (GHG) assessment methodologies need to be urgently standardised in order to provide consistent reliable baseline for measuring reductions in its CO_2e emission contributions; (3) Innovative data standardisation approaches should be adopted to minimise the impacts of specialisation and organisational complexity in the rail industry. This leads to the conclusion that current carbon assessment techniques are outdated and the findings add to the growing need to use standardised carbon datasets. The study recommended digital underpinning using BIM to facilitate experimentation and assessment of carbon footprint.

Prof. Nashwan Dawood is a member of the executive management team at School of Computing, Engineering and Digital Technologies and Professor of Digital Construction since 2000. He have been recognised in the UK's best breakthrough list for the pioneering research into the development of BIL technologies and integrated 5D modelling – 3D modelling that includes time efficiency and cost management dimensions. His research is focused on innovative digital construction processes and technologies to underpin project construction management processes, Building Information Modelling, Virtual/Augmented Reality, Sustainable Built Environment, Energy Reductions in Buildings and Off Site manufacturing. He have extensive experience of leading internationally recognised industry facing research activities and successfully generated peer reviewed funded projects in the tune of £6 million from the Engineering and Physical Sciences Research Council, construction companies, the Technology Strategy Board, EU H2020 and innovate UK. He have published over 300 research papers, and sit on the editorial board of a number of journals and conferences. The impact of my research has been far-reaching, with 5D principals and smart systems being used across the UK, South Korea and Malaysia. It has also been employed in the ground breaking 'Virtual Construction Site' development, which enabled project managers to visualise detailed information prior to commencing construction. For more information, please visit Prof. Dawood's website.

DETAILED PROGRAMME

Opening Ceremony | 09:00 – 09:30, December 06, Monday

Time (HKT)	Sessions
09:00 – 09:05	**Welcoming messages from the Conference Chair** Prof. Heng Li
09:05 – 09:10	**Welcoming messages from the host, Department of Building and Real Estate** Prof. Michael C. H. Yam
09:10- 09:15	**Welcoming message from ISGG** Dr. Luigi Cocchiarella
09:15- 09:20	**Welcoming message from CGS** Prof. Baoling Han
09:20- 09:25	**Welcoming message from JSGS** Prof. Kazuki Takenouchi
09:25 – 09:30	**Welcoming message from Organizing Committees**

Parallel Sessions | 11:00 – 12:30, December 06, Monday

Time (HKT)	FS1 Parallel Fullpaper Session 1 Room A (Zoom) Application Of Geometry In Arts And Architectures	FS2 Parallel Fullpaper Session 2 Room B (Zoom) Applied Graphics And Geometry For Image Processing (1)	GL1 Parallel Session – GAMELAB Room C (Zoom) Gamelab (1)
Session Chairs	**Dr. Biljana Jovic** University of Belgrade	**Dr. Peeraya Sripian | Prof. Yasushi Yamaguchi** Shibaura Institute of Technology | The University of Tokyo	**Prof. Kunio Kondo | Prof. Małgorzata Łuszczak | Dr. Kensuke Yasufuku** Tokyo University of Technology | University of Silesia in Katowice | Osaka University
11:00 - 11:15	[AFGS2021 #25] BIODESIGN INSPIRED BY THE LEAF AND FLOWER OF DANDELION (LEONTODON TARAXACUM L.)	[AFGS2021 #18] BINOCULARS' ILLUSION - LINEAR PERSPECTIVE PERCEPTION IN BINOCULARS ON GROUND	[AFGS2021 #46] CYPHERS, LANGUAGE, AND TEXTURES IN GAME DEVELOPMENT
	Biljana Jovic, Dragica Obratov Petkovic, Aleksandar Cucakovic and Olga Gajanic	Peeraya Sripian, Takashi Ijiri and Yasushi Yamaguchi	Amanda Vanvalkenburg and Aleksandra Giza
11:15 - 11:30	[AFGS2021 #41] GRID ON THE CUBE OF NEW SAN CATALDO CEMETERY	[AFGS2021 #36] ANALYSIS OF NOSTALGIC ILLUSTRATIONS BASED ON PHOTOGRAPHY TECHNIQUES	[AFGS2021 #48] ETHIC FOR GRAPHICS: FACING THE CREATIVE CRISIS THOROUGH ETHICAL DILEMMAS
	Yuji Katagiri	Ryuta Motegi and Kunio Kondo	Julio Broca
11:30 - 11:45	[AFGS2021 #59] A STUDY ON THE EVALUATION OF STUDENTS' IMPRESSIONS OF THEIR LEARNING SPACES USING KANSEI ENGINEERING	[AFGS2021 #24] RESEARCH OF GEMETRICAL PATTERN ON RECTANGULAR PARALLELEPIPED SURFACE	[AFGS2021 #50] DESIGN AND IMPLEMENTATION OF AN INTERNATIONAL GAME DEVELOPMENT PROJECT UTILIZING TACIT AND FORMAL KNOWLEDGE IN JAPAN
	Manar Hosni, Kensuke Yasufuku, Akira Takahashi and Hirokazu Abe	Shin Tsuchiya	Koji Mikam, Kunio Kondo, Hirokazu Yasuhara, Akinori Ito and Motonobu Kawashima
11:45 - 12:00	-	[AFGS2021 #57] TRIPLY AMBIGUOUS OBJECTS	[AFGS2021 #54] IMMERSION IN THE VIRTUAL WORLD – THE INFINITE EXHIBITION POSSIBILITIES THAT 3D VIRTUAL GALLERIES OFFER – AND THEIR IMPACT ON THE VIEWERS
	-	Kokichi Sugihara	Kaja Renkas
12:00 - 12:30	Q&A for all papers in this session	Q&A for all papers in this session	Q&A for all papers in this session

Parallel Sessions | 15:30 – 17:00, December 06, Monday

| Time (HKT)	**FS3 Parallel Fullpaper Session 3** **Room A (Zoom)** **Computer Aided Design and Drafting**	**FS4 Parallel Fullpaper Session 4** **Room B (Zoom)** **Mixed reality and visualization**	**GL2 Parallel Session – GAMELAB** **Room C (Zoom)** **Gamelab (2)**
Session Chair	**Prof. Sande Gao** Meisei University	**Dr. Joonoh Seo** The Hong Kong Polytechnic University	**Prof. Kunio Kondo | Prof. Małgorzata Łuszczak | Dr. Kensuke Yasufuku** Tokyo University of Technology | University of Silesia in Katowice | Osaka University
15:30 - 15:45	[AFGS2021 #4] IMPROVEMENT OF THE CAMERA OF "DONBURI DE PLANETARIUM" WITH 3D-CAD	[AFGS2021 #12] THE COMPOSITION OF THE CITYSCAPE REPRESENTED BY VR	[AFGS2021 #52] DESCRIPTION OF THE METHODS USED TO IMPLEMENT THE GAME PROJECT IN THE POLISH LABORATORY AS PART OF THE INTERNATIONAL GAMELAB CHALLANGE WORKSHOP IN THE NAWA PROJECT
	Kazuhiro Yamashima, Yuki Akizuki and Hidekazu Tsujiai	Xiangjun Xu and Naomi Ando	Marcin Goldyszewicz
15:45 - 16:00	[AFGS2021 #43] CREATING 3D MODELS FROM THE SEM PHOTOGRAPHS OF FINE PROTRUSIONS FORMED BY SPUTTER-ETCHING OF STAINLESS STEEL	[AFGS2021 #49] SEARCHING FOR HUMAN VARIABLES IN THE DISCUSSION ABOUT THE DEVELOPMENT OF VIRTUALLY ENHANCED SPACES	[AFGS2021 #47] RETHINKING INFORMATION DELIVERY IN CG GAME DESIGN CLASSES USING SELF-DIRECTED TEACHING METHOD AND DIGITAL NETWORKED TECHNOLOGIES
	Sande Gao	Matteo Cavaglià, Veronica Fazzina and Simone Porro	Veronika Romhány, Steven Malliet, Carina Erdmann, Rozan Van Klaveren, Agata Jankowiak, Julia Cieślik, Wiktoria Gawlik, Zofia Gmur and Gavin Brandt
16:00 - 16:15	[AFGS2021 #56] MICRO-/NANO-TEXTURE SURFACE DECORATION OF METALS VIA LASER PRINTING AND PRECISE IMPRINTING	[AFGS2021 #23] 3 DIMENSIONAL ZOETROPE IN VIRTUAL 6 DOF ENVIRONMENT AS AN ART INSTALLATION AS WELL AS OBSERVING TOOL FOR WHAT ENHANCES PLAYERS' PSYCHOLOGICAL ENGAGEMENT	[AFGS2021 #39] DEVELOPMENT OF 2D PLATFORM GAME BY INTERNATIONAL TEAM OF STUDENTS WITHIN GAME LAB PROJECT
	Tatsuhiko Aizawa, Tomoaki Yoshino, Yohei Suzuki, Takafumi Komatsu and Tadahiko Inohara	Yoriko Murakami and Satoshi Cho	Jan Drozd and Marek Sibinský
16:15 - 16:30	[AFGS2021 #61] VERTICALITY ASSURANCE FOR CONSTRUCTING BORED PILES USING LASER SCANNER	[AFGS2021 #45] A METHOD FOR CONFIRMATION OF VEHICLE DISTANCE IMPRESSIONS USING CAMERA MOVEMENT IN VR SPACE	[AFGS2021 #29] POST MORTEM: DISTRIBUTED GAME DEVELOPMENT IN INTERCULTURAL STUDENT TEAMS
	King Chi Lo, Rongyan Li, Hung-Lin Chi, Ming Fung Francis Siu and Chi-Keung Lau	Motonori Terawake and Shingo Sadakuni	Dominik Wilhelm
16:30 - 17:00	Q&A for all papers in this session	Q&A for all papers in this session	Q&A for all papers in this session

Parallel Sessions | 09:00 – 12:30, December 07, Tuesday

Time (HKT)	FS5 Parallel Fullpaper Session 5 Room A (Zoom) Applied Graphics and Geometry in Building Engineering	FS6 Parallel Fullpaper Session 6 Room B (Zoom) Applied Graphics and Geometry for Image processing (2)
Session Chair	**Prof. Inhan Kim** Kyung Hee University	**Prof. Naomi Ando** Hosei University
11:00 - 11:15	[AFGS2021 #19] ANALYSIS OF DEVELOPMENT OF OPEN BIM-BASED AUTOMATED RULE CHECKING SYSTEM IN KBIM PROJECT Saddiq Ur Rehman, Sejin Lee, Jungsik Choi and Inhan Kim	[AFGS2021 #26] DIFFERENCES IN PERCEPTION OF HYBRID IMAGES BY PROJECTION Narumi Araya, Sayaka Ushimaru and Hidekazu Tsujiai
11:15 - 11:30	[AFGS2021 #40] A STUDY ON THE DEVELOPMENT OF DFMA-BASED BIM LIBRARY REFLECTING THE RESIDENTIAL CHARACTERISTICS OF EACH USER Soyeong Ryu, Ahjin Lee and Inhan Kim	[AFGS2021 #35] NIGHTSCAPES AS IMAGES OF CITIES - IMAGE ANALYSIS OF ACTIVITIES REPRESENTED IN NIGHTSCAPES Naomi Ando and Jianing He
11:30 - 11:45	[AFGS2021 #63] HOW DOES GAZE BEHAVIOR OF HAZARD RECOGNITION IN AN IVR ENVIRONMENT RELATE TO SITUATION-AL AWARENESS? AN EXPERIMENTAL STUDY USING EYE-TRACKING TECHNOLOGY Yanfang Luo, Joonoh Seo and Seungjun Ahn	[AFGS2021 #31] THE PHOTOGRAPHED 3D OBJECT ATTACHED WITH GEOMETRIC TEXTURES IS PERCEIVED LARGER THAN ITS ACTUAL SIZE Tomoko Ohtani and Kazushi Maruya
11:45- 12:00	[AFGS2021 #28] A STUDY ON THE CHARACTERISTIC OF URBAN BLOCK RESIDENTIAL DISTRICT Chen Yijun and Naomi Ando	[AFGS2021 #62] AUTOMATIC GEOMETRIC CALIBRATION OF SPATIAL AUGMENTED REALITY FOR ARCHITECTURAL DESIGN VISUALIZATION Yixuan Jin and Joonoh Seo
12:00 - 12:30	Q&A for all papers in this session	Q&A for all papers in this session

Parallel Sessions | 15:30 – 17:00, December 07, Tuesday

Time (HKT)	FS7 Parallel Fullpaper Session 7 Room A (Zoom) Computer Graphics	FS8 Parallel Fullpaper Session 8 Room B (Zoom) Graphics Education
Session Chair	**Dr. Hung-Lin Chi** The Hong Kong Polytechnic University	**Dr. Hidekazu Tsujiai** University of Toyama
15:30 - 15:45	[AFGS2021 #8] HOMOGENEOUS PARAMETERS FOR BERNSTEIN-BEZIER CURVES AND SURFACES IN AN ORIENTED PROJECTIVE SPACE Masatoshi Niizeki	[AFGS2021 #7] THE DEEPENING PROCESS OF VERIFICATION ABILITY FOR ARCHITECTURAL DRAWING Maiko Tsujii K and Ayako Kita
15:45 - 16:00	[AFGS2021 #9] DATABASE CREATION AND CLASSIFICATION OF CUBE CONNECTED MODELS Yasushi Niitsu and Ami Matsuda	[AFGS2021 #15] 3D VIDEO PRODUCTION TRAINING WITH POV-RAY Hidekazu Tsujiai
16:00 - 16:15	[AFGS2021 #11] A GRAPHICAL COMPUTING METHOD AND REALIZATION OF GRAPHICAL STATICS PROBLEM Zheng Peng-Fei, Lou Jing-Jing and Lin Da-Jun	[AFGS2021 #20] VITALITY GAINED BY LOCAL STUDENTS BY ATTEMPTING TO CONVERT LOCAL HISTORICAL HERITAGE INTO 3D Kazuhiro Yamashima and Seiji Hori
16:15 - 16:30	[AFGS2021 #13] PERSONALIZED RECOMMENDATIONS BASED ON INTELLIGENT PROOFREADING OF ENGINEERING DRAWING INTEGRATED TRANSFER LEARNING Yicong Gao, Yankun Wang, Shaomei Fei and Kangjie Li	[AFGS2021 #27] INNOVATION AND PRACTICE OF TEACHING METHODS FOR ENGINEERING GRAPHICS TEACHERS UNDER THE NEW TECHNOLOGY PARADIGM Yi Sun and Weiwei Ye
16:30 - 16:45	[AFGS2021 #33] AN ANALYSIS OF VISUAL INTEREST DETECTION IN 2D GAME CONCEPT ART Tiancheng San, Yoshihisa Kanematsu and Koji Mikami	[AFGS2021 #21] (abstract) LEARNIG-CENTERED INSTRUCITON OF ENGINEERING GRAPHICS COURSE FOR FIRST YEAR ENGINEERING STUDENTS Yan Wei, Xiaochuan Xiao, Dong Lu, Fang Liu and Yiming Rong
16:45 - 17:00	Q&A for all papers in this session	Q&A for all papers in this session
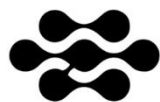
AFGS 2021
13th Asian Forum on Graphic Science

The 13th Asian Forum on Graphic Science (AFGS 2021) will be held in Hong Kong, from 6th-7th December.

The AFGS 2021 aims to provide a platform for experts and scholars to exchange and discuss in the fields of geometry and graphics, computer graphics, industrial applications and research, graphics education and other related fields. The conference will recommend selected excellent papers to the relevant journals.

The official conference language is English.

The participants are not confined to the Asian region in AFGS 2021. Welcome experts and scholars from all over the world to attend the conference.

About AFGS

The AFGS (Asian Forum on Graphic Science) is an international conference on graphics participated mainly by Asian countries. It is held in odd-numbered years every two years in contrast to the ICGG (International Conference on Geometry and Graphics) which is held in even-numbered years.

AFGS evolved from its predecessor Japan–China Joint Conference on Graphics Education, which was held eight times between 1993 and 2007. The Japan–China Joint Conference on Graphics Education was an international conference held jointly by the Japan Society for Graphic Science and China Graphics Society focusing on graphics topics.

After the 8th Japan–China Joint Conference on Graphics Education, the conference name was changed to AFGS, and its scope was expanded to include topics other than graphics education, and participating countries mainly from Asia other than Japan and China.

ABOUT THE ORGANIZER

The Hong Kong Polytechnic University

With over 80 years of proud tradition, PolyU is a world-class research university, ranking among the world's top 100 institutions.

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We strive in inter-disciplinary research and impactful innovations for discoveries to solve real-world challenges. Our researchers are developing breakthrough ideas, fostering sustainability, lifting economic outcomes, and improving communities' lives for the benefit of Hong Kong, the nation and the world.

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Department of Building and Real Estate

As a department, our roots go back to 1937. Under our current identity as the Department of Building and Real Estate we have become internationally recognized as a leader in providing a wide range of undergraduate and postgraduate programmes that nurture well-rounded graduates for the building and real estate industry.

With our dedication to excellence, we are committed to providing students with the best educational experience possible. Students are enabled to develop in their professional competences, and also their proficiency in generic intellectual skills, both of which are essential to their future success in the challenging world of construction and real estate, as well as in other domains. Our programmes are recognized and accredited by international and local professional bodies.

We have a multi-disciplinary team of faculty members who possess expertise in the respective fields of surveying, engineering, town planning, building technology, real estate, finance, law and economics. We actively participate in a wide variety of high-quality application-oriented research projects and consultancies. We are recognized internationally for our research strengths in our main fields of knowledge. Amongst these, according to a 2014 research paper published by the Journal of Construction and Building Materials, our BRE faculty members and colleagues of other sister departments within the Faculty, top the world in the publication of articles related to construction and building technology.

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