ISIC
INTERNATIONAL SOCIETY FOR INTELLIGENT CONSTRUCTION

Universidade do Minho

International Society for
Intelligent Construction (ISIC) 2022 Conference

TRENDS ON CONSTRUCTION IN THE POST-DIGITAL ERA

VILA FLOR CULTURAL CENTRE, GUIMARÃES, PORTUGAL
6TH TO 9TH SEPTEMBER, 2022

PROGRAMME AT GLANCE

	Tuesday, Sep. 6	Wednesday, Sep. 7	Thursday, Sep. 8	Friday, Sep. 9
08h30		Registration CCVF - Foyer Small Auditorium	Registration CCVF - Foyer Small Auditorium	Registration CCVF - Foyer Small Auditorium
09h00	Registration CCVF - Foyer Small Auditorium	Opening Ceremony CCVF - Small Auditorium	Keynote Lecture *Luis Simões da Silva* CCVF - Small Auditorium	Keynote Lecture *Guanghui Xu* CCVF - Small Auditorium
09h50			Special Lecture *Anand Puppala* CCVF - Small Auditorium	Special Lecture *T. F. Fwa* CCVF - Small Auditorium
10h00	Workshops/Mini-symposia CCVF/EAAD	Inaugural Lecture *Miroslaw Jan Skibniewski* CCVF - Small Auditorium		
10h30			Coffee break	Coffee break
11h00		Coffee break	Keynote Lecture *Andrés Muñoz Ortega* CCVF - Small Auditorium	Special Lecture *Erol Tutumluer* CCVF - Small Auditorium
11h30		Keynote Lecture *Soheil Nazarian* CCVF - Small Auditorium		
11h40				Closing Ceremony CCVF - Small Auditorium
11h50			Special Lecture *Philippe Block* CCVF - Small Auditorium	
12h15				Free Time
12h20		Special Lecture *Jayantha Kodikara* CCVF - Small Auditorium		
13h00	Lunch	Lunch		
13h10			Lunch	
14h30	Workshops/Mini-symposia CCVF/EAAD	TS 1.1 CCVF - Small Auditorium TS 2 CCVF - Room 1	TS 6.2 CCVF - Small Auditorium TS 3 CCVF - Room 1	
16h00	Coffee break			
16h30	Workshops/Mini-symposia CCVF/EAAD	TS 5 CCVF - Small Auditorium TS 6.1 CCVF - Room 1	TS 4 CCVF - Small Auditorium TS 1.2 CCVF - Room 1	
18h00				
18h50	Free Time	Welcome Reception Vila Flor Cultural Centre	Free Time	
20h00			Gala Dinner Hotel de Guimarães	
23h00		Free Time	Free Time	
	Workshops & Mini-Symposia	Conference		

CCVF - Vila Flor Cultural Centre, Guimarães
EAAD - School of Architecture, Art and Design of University of Minho (Auditorium 1), Campus de Azurém, Guimarães

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WELCOME

ISIC (www.IS-IC.org) was renamed in 2019 from the International Intelligent Construction Technologies Group (IICTG), launched in Guimarães, Portugal, during the 3rd International Conference of Transportation Geotechnics, in 2016.

ISIC 2022 is the third ISIC international conference, following the first conference in Minnesota, USA, in 2017 and the second conference in Beijing, China, in 2019.

ISIC 2022 will follow the ISIC mission:

> ***"... promote intelligent construction technologies applications to the life-cycle of infrastructure: from the survey, design, construction, operation, and maintenance/rehabilitation by adapting to changes of environments and minimizing risks. The goals of its mission are to improve the quality of construction, cost-saving, and safety."***

ISIC 2022 will take a holistic approach to integrate civil engineering, construction machinery, electronic sensor technology, survey/testing technologies, information technology/computing, and other related fields. While the world is in the digital era, it is our vision to take a step forward by addressing societal issues and improving the wellbeing of people in their physical environments.

On behalf of the organizing committee, I am honored to invite you to **ISIC 2022** in the City of Guimarães, UNESCO World Heritage, from September 6 to 9, 2022.

António Gomes Correia
University of Minho
Chairman ICISIC 2022

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University of Minho

Paulo Cruz
University of Minho

Paulo Novais
University of Minho

Paulo Pereira
University of Minho

CO-ORGANISERS

João Neves Coutinho
BUILT CoLAB

António Aguiar Costa
BUILT CoLAB

THE CITY OF GUIMARÃES

Guimarães is located in the north-western part of Portugal, 40 minutes away from Porto international airport. It is, nowadays, with a population of about 60.000 habitants, one of the most important historical cities in the country having been declared World Heritage Site in 2001 by UNESCO. Its many monuments and precious historical centre are associated with the past where the city played a major role in Portuguese history as the cradle of the nation.

Guimarães was designated the European Cultural Capital of 2012 and was elected by the New York Times as one of the top destinations to visit in 2011. Guimarães is 40 minutes away from Porto and both cities are listed in the top 10 World destinations for Lonely Planet Guide in 2012. Porto is also a World Heritage Site by UNESCO and is world famous by being home to Port wine cellars.

Porto's city centre was also designated a UNESCO World Heritage Site in 1996. With its tradition of wine making, magnificent Baroque architecture, distinct local cuisine and stunning landscape, this city has an abundance of culture. Porto was awarded the European Best Destination 2017.

The Douro Valley is a region located in the North of Portugal, where the Port wine production and the unique scenery sculpted by the Douro river are not to be missed. You can plan your visit by road, by train, on a cruise boat and even by helicopter. None will leave you indifferent.

COMMITTEES

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PRACTICAL INFORMATION

DATE

ISIC 2022 will take place from Tuesday 6th to Friday 9th September 2022.

VENUE

MINI-SYMPOSIA
6th September – School of Architecture, Art and Design of University of Minho (Auditorium 1), Campus de Azurém and Vila Flor Cultural Centre (CCVF), Guimarães, Portugal

PRE-CONFERENCE AND WORKSHOPS
6th September - Vila Flor Cultural Centre (CCVF), Guimarães, Portugal

CONFERENCE
7th - 9th September – Vila Flor Cultural Centre, Guimarães, Portugal

ADDRESSES

School of Architecture
Art and Design of University of Minho
Campus de Azurém
4800-058 Guimarães
GPS: 41°27'11.4"N 8°17'22.1"W
View on Map

Vila Flor Cultural Centre (CCVF)
Avenida D. Afonso Henriques, 701
4810-431 Guimarães
GPS: 41°26'13.0"N 8°17'43.9"W
View on Map

CONTACTS

ICISIC 2022 Secretariat
University of Minho
Civil Engineering Department
School of Engineering, Institute for Sustainability and Innovation in Structural Engineering
Campus Azurém
4800-058 Guimarães
PORTUGAL

Mobile Phone: (+351) 935 485 802 *(WhatsApp available only)*
Fax: (+ 351) 253 510 217
Email: icisic2022@civil.uminho.pt
Website: www.icisic2022.com

REGISTRATION

Registration desk for the conference will open on Tuesday 6th September from 09h00 till 18h00 Vila Flor Cultural Centre, Guimarães, Portugal. The remaining days, from 7th to 9th September the registration starts at 8h30.

ONSITE REGISTRATION FEES

The access to all the General Assembly activities is subject to registration. All invoices will be processed in Euro (€).

Registration Category	Regular	Student
Conference	550€	250€
Workshops	200€	50€
Conference + workshops	650€	300€
Online Participation*	200€	200€

** Not applicable to speakers. Applicable to passive participants with restriction to travel.*

CONFERENCE DINNER

Tickets for the conference dinner can be purchased in site during the 1st day of registration for the cost of 60€ each. If you would like to bring a guest with you to the dinner you will have to purchase additional tickets.

WHAT IS INCLUDED IN YOUR REGISTRATION

- Welcome Reception* in the Exhibition Halls on Wenesday Evening (7th September 2022);
- Access to all Scientific Sessions;
- All lunch and tea and coffee refreshments throughout the conference;
- Delegate's bag and all conference materials;
- Electronic conference proceedings.

** Welcome Reception, lunchs and dinner throughout the conference are not included for student registration.*

WHAT IS INCLUDED IN YOUR PRE-CONFERENCE, WORKSHOPS AND MINI-SYMPOSIA REGISTRATION

- Access to all workshops;
- All lunch and tea and coffee refreshments throughout the workshop day;
- Workshop material.

** Lunch is not included for student registration.*

PRACTICAL INFORMATION

SPEAKERS' PRESENTATION

Each conference room, Small Auditorium and Meeting Rooms, is equipped with a projector and a laptop. Personal laptops are not allowed. Speakers of technical sessions have 15min of talk + 5 min for discussion and are requested to send their presentations to the organizing committee (secretariat - icisic2022@civil.uminho.pt) until Friday, 2nd September.

NOTES FOR SPEAKERS

Be aware that presentations sent to the organizing committee cannot be changed.

ACCOMPANYING PERSONS

If you would like to standard register an accompanying person, passes can be purchased for 30€ each. Please note these passes will only allow attendance at the Welcome Reception on Wednesday 7th September 2022. They do not allow access to the scientific sessions, Exhibition Hall, lunch or tea and coffee breaks. For attendance of the Conference dinner only, the price of 60€ applies.

INTERNET ACCESS

Free internet access is available in all the places of the conference venue.

SSID: **CCVF_EVENTOS**
Pass: **Eventos22**

GETTING TO THE CONFERENCE VENUE

Guimarães is located approximately 350 km from Lisbon, the Portuguese capital, and about 50 km from Porto, the country's second largest city. The Porto or Oporto (in English) International Airport (OPO) has regular flights to the main international cities by several flag companies as well as low cost ones.

HOW TO REACH GUIMARÃES FROM PORTO

By bus from Porto airport (recommended)
There is a regular coach service between Porto airport and the Guimarães coach station. The journey takes 50 min. and has no stops. Further information about the schedule and prices can be found at getbus.eu. To ensure seat availability it is advisable to buy the ticket on-line.

By Train from Porto Airport
Take the Metro (subway) from Porto Airport to Campanhã Railway Station: 40 minutes (direct journey, line E, check the metro map). Cost of 1.85€ for a single journey (+0.5€ for a reusable card). At Campanhã follow the signs to railway station and get the train to Guimarães (see next). Detailed information about the schedule and prices can be found at metrodoporto.pt.

By Train from Porto
There are regular train services between "São Bento" and "Campanhã" stations and Guimarães (see schedule). The journey to Guimarães takes 75 minutes, and the average cost is around 4€ for a commuter train. There are also intercity services by a price of nearly 20€. Pay attention to the schedule as these trains are less frequent on weekends. Detailed information about the schedule and prices can be found at cp.pt.

By Car from Porto Airport
40 minutes by Highway (you can rent-a-car at the Airport, please ask for Via Verde – Green Way so that you don't stop for tolls).

By Taxi from Porto Airport
40 minutes. Week fare 65€; weekend fare 75€.
Please contact Mr. Pinto (Taxi driver) at:
Email: david.diaspinto@gmail.com;
WhatsApp: +351 912 303 205.

HOW TO REACH GUIMARÃES FROM LISBON

From Lisbon Airport
Take the Metro (subway) to Oriente (cost 1.25€ for a single journey + 0.50€ for a reusable card - more info here). Otherwise take bus number 208 or 744 to "Estação Oriente". There you can take a train (see next).

By Train (recommended)
You can catch trains at "Oriente" station. There is one single direct train from Lisbon to Guimarães per day, but there is roughly one train per hour to Porto - Campanhã. At Porto – Campanhã you can find a connection to Guimarães (see above). Pay attention to the schedule as these trains are less frequent on weekends. The total journey time is around four hours, and the minimum price of the ticket (which includes a reservation of seat - limited places) is around 25.00€. Detailed information about the schedule and prices can be found at cp.pt.

By car from Lisbon Airport
About 4 hours by Highway, you can rent-a-car at the Airport, please ask for Via Verde – Green Way so that you don't stop for tolls.

ACCOMMODATION

A List of Hotels were booked with the special rates for the ISIC 2022. Hotel reservation can still be requested to Viagens Abreu and onsite registration.

For more information please contact:
Maria João Coelho - *Congress Designer*
Abreu Events Portugal | www.abreuevents.com
T.: +351 22 204 3571 | S.: pco.abreupco
Porto Office: Praça da Trindade, 142, 4º
4000-539 Porto, Portugal

GENERAL INFORMATION

EMERGENCY, POLICE, FIRE BRIGADE AND AMBULANCE

In case of emergency while you are in Guimarães or Porto, always dial 112. It is a free call which will connect you to the National Emergency Service (SOS) in case of an accident.

A technician will forward your call to the service that can best serve, either the police, fire brigade or hospital. Speak slowly and distinctly, and state your telephone.

BANK, CURRENCY, EXCHANGE RATE, CREDIT CARDS AND DEBIT CARD

Banks are open to the public between 8:30 am and 3:00 pm, Monday to Friday. The currency in Portugal is the Euro.

Exchange Rates:
For your orientation only, visit e.g.: oanda.com.

Visa and MasterCard credit cards are widely accepted. Other cards are also accepted, but there could be exceptions.

Debit cards associated with Maestro and Visa Electron multi-national debit card services are widely accepted.

TOURIST INFORMATION

Portuguese: guimaraesturismo.com
English: tripadvisor.com

CLIMATE

Mainland Portugal is defined as having a Mediterranean climate, while also being one of the warmest countries in Europe. In early September, the weather in Guimarães should be relatively hot and dry.

The average daily temperature varies between 15ºC and 30ºC. Rainfall is highly unlikely during this particular period.

ELECTRICITY, POWER SUPPLY

220 volts AC, 50Hz. Continental two-pin plugs CEE7/4 Schuko are in use. Depending on your country, you may need an adapter.

SMOKING

Smoking – cigarettes, cigars and pipes – is banned in indoor public places in Portugal (as of 1 January 2008).

The ban prohibits smoking in all government buildings as well as work places, public transport, schools and sports facilities, hospitals, museums, food and beverage establishments, covered car parks, theatres, libraries, and bars and restaurants where smoking is only allowed in designated smoking areas or venues.

VAT

There are different rates of VAT (Value Added Tax, in Portugal: Imposto sobre o Valor Acrescentado – IVA) due for different goods and services.

These rates are: IVA geral (general VAT): 23%; IVA intermédio (intermediate VAT): 13%; IVA reduzido (reduced VAT): 6%. Prices in shops and restaurants include IVA (VAT).

UNITS OF MEASUREMENT

Metric (kg, g, l, m, km, …)

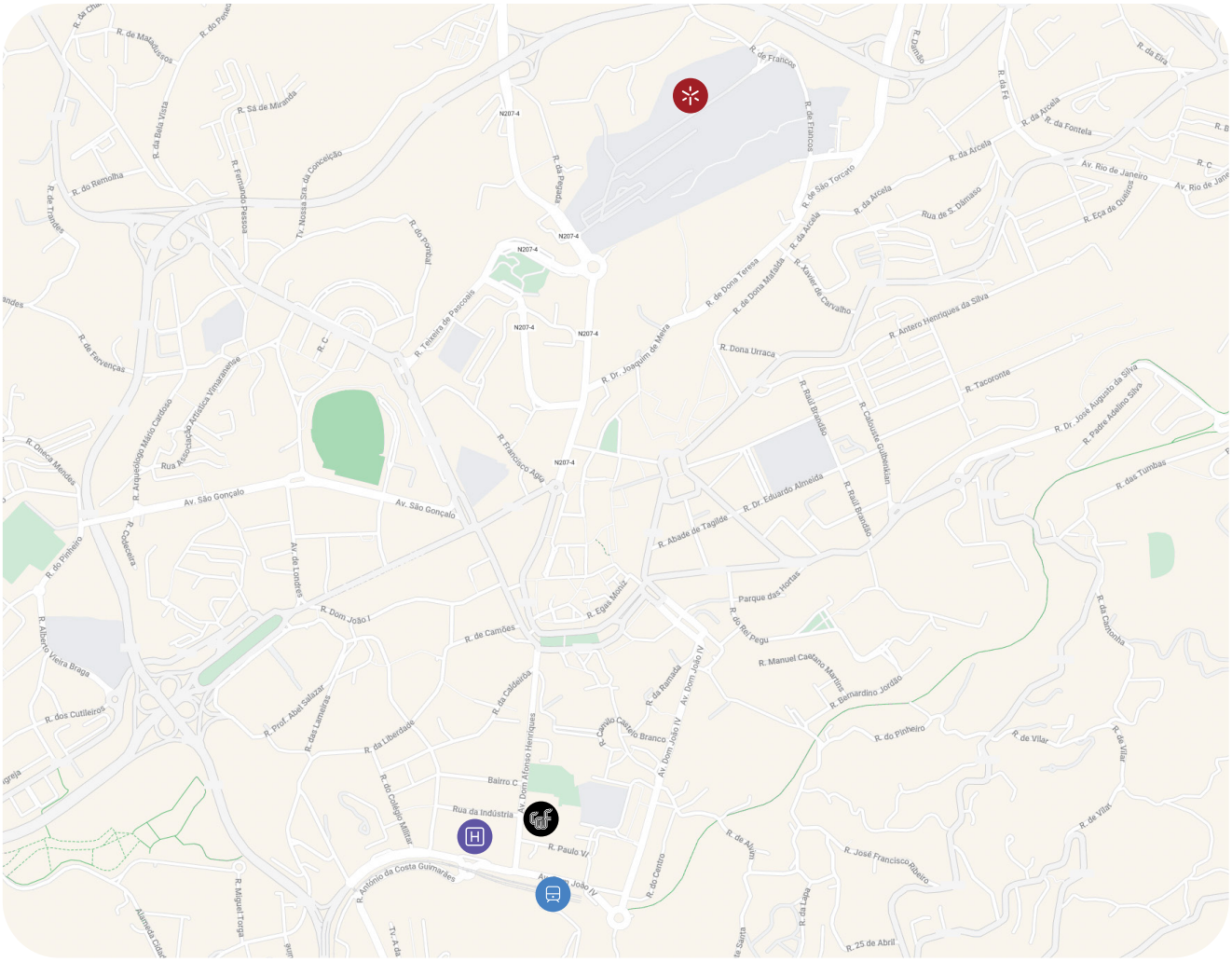
LIABILITY

The Organising Committees and/or Conference Organisers shall not be held liable for personal accidents or losses or damage to private property of registered delegates of the Conference.

Delegates should make their own arrangements in regarding of personal insurance.

GENERAL INFORMATION

CITY MAP *(GUIMARÃES MAP)*



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Campus de Azurém
4800-058 Guimarães
View on Map

Train Station
Av. Dom João IV
4800-039 Guimarães
View on Map

Vila Flor Cultural Centre (CCVF)
Avenida D. Afonso Henriques, 701
4810-431 Guimarães
View on Map

Hotel de Guimarães
R. Eduardo Manuel de Almeida 202,
4810-440 Guimarães
View on Map

INAUGURAL LECTURE

New Opportunities and Challenges within Construction 5.0

Miroslaw Jan Skibniewski
University of Maryland
USA

ABSTRACT

This lecture presents Construction 5.0 - a construction industry equivalent of Industry 5.0 - a new paradigm for all branches of production and service industries. Construction 5.0 aims at harnessing the abilities of smart tools, equipment, materials, information technologies and automation for the benefit of onsite employees and improvement of their work environments.

An additional goal of the advanced technologies and their implementations within the Construction 5.0 paradigm is improved protection against contamination of air, soil and water, increased resilience of the built infrastructure in the face of the ongoing climate change and the increased frequency of natural disasters such as floods, hurricanes, tornadoes, and widespread fires.

Resulting challenges in research and development are addressed, including the need for improved artificial intelligence-, automation-, ergonomics-, and sensor- based solutions for improved characteristics of construction work environments and the new built environment.

BIO DETAILS

Mirosław J. Skibniewski holds his M.Eng. degree from the Warsaw University of Technology, as well as M.S. and Ph.D. from Carnegie Mellon University, all in Civil Engine ering. Formerly a Professor and Associate Provost at Purdue University, he is currently a Professor of Civil Engineering and leader of the e-Construction Group within the Center of Excellence in Project Management at the University of Maryland.

His research interests are in intelligent construction, information and communication technologies for construction project management, and in construction automation and robotics. Prof. Skibniewski served as the Founding Dean of Engineering at Khalifa University in Abu Dhabi and as distinguished visiting/honorary/endowed chair professor and eminent scholar at the University of Maryland, Arizona State University, Chaoyang University of Technology, Hong Kong Polytechnic University, Hong Kong University of Science and Technology, Tsinghua University, Huazhong University of Science and Technology, Tianjin University, Hanyang University, National Universityof Singapore, Nanyang Technological University, University of Technology Sydney, CSIRO Australia, Loughborough University, Cardiff University, University of Central Lancashire, Aarhus University, Warsaw University of Technology, Cracow (Kraków) University of Technology, Moscow State Industrial University, and others. He is an elected member of the National Academy of Construction (USA), member/foreign member of the Academy of Engineering in Poland, Russian Academy of Engineering, and a former Distinguished Visiting Fellow of the Royal Academy of Engineering (UK).

Among Prof. Skibniewski's honors are the National Science Foundation's Presidential Young Investigator Award (USA), American Society of Civil Engineers' Walter L. Huber Research Prize, International Association of Automation and Robotics in Construction R. Tucker-Y. Hasegawa Award, as well as Humboldt and Fulbright Foundation grants for visiting appointments at the Technical University of Munich, Pontifical Catholic University of Chile, and at Universidad Austral, Buenos Aires. He is an author/coauthor of over 400 scholarly publications and several books, including Artificial Intelligence in Construction Engineering and Management published by Springer earlier this year. Since 1994 Prof. Skibniewski has been serving continuously as editor-in-chief of Automation in Construction , an international research journal published by Elsevier, and since 2018 as an honorary co-editor-in-chief of Frontiers of Engineering Management published by Springer.

KEYNOTE LECTURES

Designing Smart Habitats: Trends and Opportunities

Andres Muñoz Ortega
Polytechnic School, Catholic University of Murcia
Spain

ABSTRACT

Our society has been experiencing a demographic change over the last decades, leading to a gradual ageing of the population.

According to the World Health Organization (WHO), in 2030 it is expected that 1.4 billion people will be aged 60 years and older.

This change represents a challenge for society as a whole, and especially for the older population. In addition to age-related health problems such as physical and cognitive decline, ageing people are at risk of facing situations that lead to potential social exclusion, with considerable negative consequences for their independence, their quality of life, the quality of life of their caregivers and the sustainability of health and care systems.

In this context, digitized constructions can play a key role in addressing these challenges, and in particular those aimed at creating smart environments to assist elderly people at home.

These environments are designed to provide services through the use of sensors, with a very particular nuance, as these services must be personalized, i.e. adapted to the user's preferences and needs at all times. Within these solutions, the need for creating smart habitats that allow for active ageing at home is deemed as a fundamental one.

This talk focuses on the potential collaborations among architects, designers and IT professionals and researchers aimed at designing these habitats to assist the senior population in active ageing activities at home.

BIO DETAILS

Andrés Muñoz received the B.S. degree in computer science and the Ph.D. degree in computer science from the University of Murcia, Spain, in 2005 and 2011, respectively.

He is currently an Associate Professor with the Polytechnic School, Catholic University of Murcia.

His research interests include Semantic Web technologies, ambient intelligence, and intelligent environments.

He has published more than 35 articles in international impact journals and more than 40 articles at international conferences.

KEYNOTE LECTURES

Development of Intelligent Compaction in China: From Research to Practice

Guanghui Xu
Southwest Jiaotong University
China

ABSTRACT

As a pioneer of intelligent construction, intelligent compaction is the most successful case of intelligent construction.

This speech will start with the essential characteristics of intelligent construction and introduce the working process of intelligent compaction in the order of "perception, analysis, decision-making, and execution."

Then, the summary of the development of intelligent compaction technology in China will be presented, including the key characteristics of China's six intelligent compaction technology standards.

On this basis, the technical route of applying neural networks, expert systems, and reinforcement learning in intelligent compaction is introduced.

An example of the virtual construction of an expressway from Beijing to Dezhou will be demonstrated.

Finally, several critical questions about intelligent compaction are addressed, including the conditions for applying the compaction pass control method, the control index issue, and the layer-specific intelligent compaction measurements of the fillers.

BIO DETAILS

Prof. Guanghui Xu, Ph.D. is a professor at Harbin Institute of Technology and Southwest Jiaotong University, China.

Prof. Xu is an ISIC co-founder and vice president. Dr. Xu is the leading advocate and promoter of China's intelligent compaction technology, and the chief expert of China's intelligent compaction. With intelligent construction technology as the core, Prof. Xu co-developed the overall framework of intelligent construction technology for transportation infrastructure, including intelligent design and intelligent maintenance.

Prof. Xu has led a multidisciplinary scientific research team and carried out long-term independent research and development on intelligent construction monitoring technology.

Prof. Xu also formed a series of research results with intellectual property rights. In 2011 and 2017, he presided over the compilation of China's first industry construction standards and product standards for intelligent compaction (IC) technology. He also published an IC monograph in Science Press and China Railway Press.

Professor Xu Guanghui is currently a chief subject matter expert reviewer for core journals such as China Journal of Highway and Transport, Journal of Transportation and Tongji University, and a chairman of the engineering technology review committee for the National Publishing Fund.

In recent years, he has been offering advanced courses of "Introduction to Intelligent Construction Technology of Transportation Infrastructure" for undergraduates of the School of Transportation of Harbin Institute of Technology (roads, bridges, traffic engineering, traffic information control, etc.).

He has been consulting on the curriculum development for some domestic colleges and universities that offer undergraduate majors in intelligent construction.

KEYNOTE LECTURES

Digital Steel Construction: a Holistic Viewpoint in a Lifecycle Context

Luís Simões da Silva
University of Coimbra
Portugal

ABSTRACT

In the construction sector, steel fabrication was one of the first industrial activities that embraced automation.

During the 1990s, the emergence of 3D modeling systems developed specifically for steel structures (e.g. Strucad, Bocad or Tekla) enabled the automation of the fabrication of steel beams and columns directly from a 3D model of the steel structure. CNC machines were able to receive directly from a computer machine control instructions and execute them with no or very little human intervention.

Despite these early advances, the construction process remained fragmented with all sharing of information between the different actors being accomplished by independent written documents or drawings and oral communication. In line with industry 4.0 revolution Building Information Modeling (BIM) was developed to overcome this inefficiency in the construction sector.

Sharing a common database with all the required information for all the actors in the lifecycle of a building (from owner organizations, designers, construction managers, contractors, subcontractors, fabricators, suppliers and outside organizations) has the potential to optimize the investment from all points of view (return on investment, environmental impacts, social benefits, etc).

This presentation addresses current challenges and recent breakthroughs in the field of steel construction covering the following aspects:

1. Context;
2. Design concepts and strategies;
3. Life cycle multicriteria assessment;
4. Intelligent structural design;
5. Merging design and execution: additive manufacturing and topological optimization.

BIO DETAILS

Luis Simões da Silva graduated in Civil Engineering at the University of Coimbra in 1984, received an MSc in "Structural Steel Design" with Distinction at Imperial College London in 1986 and a PhD in "Structural Mechanics" also at Imperial College London in 1989.

He received the title of Docteur Honoris Causa from the University of Liege, Belgium, in 2018.

He is Vice-Rector of the University of Coimbra and Professor of Steel Construction at the Department of Civil Engineering of the University of Coimbra.

Head of Department of Civil Engineering (2001-2003; 2005-2007; 2013-2015).

Director/Co-Director of ISISE – Institute for Sustainability and Innovation in Structural Engineering (2008-2023), Research Centre financed by FCT (Portuguese Science Foundation).

President of CMM (Portuguese Steelwork Association).

Member of the Portuguese Academy of Engineering. Chair of the Technical Management Board of ECCS (2007-2013) and President of ECCS (2011-2013). Involved in large number of Technical and Scientific Committees in the field of Steel Construction.

Author of 700+ scientific papers in peer-reviewed journals and conferences. Large involvement in internationally-funded R&D projects.

KEYNOTE LECTURES

Use of Intelligent Construction Techniques toward Construction of High-Quality Pavement Foundation Layers

Soheil Nazarian
University of Texas at El Paso
USA

ABSTRACT

With the emphasis on mechanistic-empirical pavement design procedures in the last decade, significant research effort has been devoted to understanding and implementing modulus-based performance management of compacted geomaterials.

Performance management signifies that the modulus of each layer is close to the value specified by the designer, and the compacted layer is uniform in terms of modulus.

A systematic protocol that addresses several technical and institutional complications related to incorporating modulus-based testing in the mechanistic-empirical pavement design procedures is needed to implement the first item (i.e., modulus verification).

Proof rolling with the intelligent compaction (IC) technique can be an effective technology for achieving the second item (i.e., uniformity) systematically.

In this presentation we intend to share our efforts toward identifying the technical and institutional issues that have impeded the implementation of IC proof-mapping, elaborating on the associated causes, proposing a solution through the supplementary field and laboratory investigations, and demonstrating that the pro-posed solution can be used to obtain IV measured values (ICMVs) that are related to layer-specific mechanical properties of the compacted embankment, subgrade, and base materials.

BIO DETAILS

Dr. Nazarian is the McIntosh Murchison Chair Professor of Civil Engineering at The University of Texas at El Paso (UTEP) where he has served as the Director of the Center for Transportation Infrastructure Systems and the Campus Director of the newly - established Engineering Research Center entitled “Advancing Sustainability through Powered Infrastructure for Roadway Electrification (ASPIRE)” funded by the National Science Foundation.

Dr. Nazarian has more than 40 years of experience in the areas of design, evaluation, and nondestructive testing of geotechnical and transportation infrastructure.

He has been one of the pioneers in the development and improvement of nondestructive testing methods for infrastructure assessment.

He has significantly contributed to the body of knowledge in construction quality management, and mechanistic characterization of earthwork using innovative technologies.

He currently chairs the Geotechnical Instrumentation and Modeling Committee of the Transportation Research Board and is on the Executive Board of the International Society of Intelligent Construction.

SPECIAL LECTURES

Innovations in Geotechnical Engineering: Current Focus Areas and Contributions from USA

Anand J. Puppala
Texas A&M University
USA

ABSTRACT

This presentation focuses and showcases Unmanned Aerial Vehicles based technologies and tools, as well as data analyses that can be applied in various geotechnical problems encompassing design, construction, performance monitoring, asset management and rehabilitation decisions.

Various infrastructure examples including pavements, airports, bridges, Railways and communication towers are presented and these include UAV survey data, analyses and performance assessments.

Analyses focuses on how to perform proactive management of infrastructure assets with an emphasis on addressing underlying geotechnical factors including the presence of problematic soil conditions that induce distress to the infrastructure.

Future asset management needs will also be outlined. The later part of the presentation covers new innovations in the geotechnical engineering in USA and describes various initiatives that are currently being planned. A few the emerging topics that will be of interest to construction and maintenance works will be summarized.

BIO DETAILS

Dr. Anand Puppala currently serves as A. P. Wiley and Florence Chair of Zachry Civil and Environmental Engineering at Texas A&M University and is also a Director of Center for Infrastructure Renewal (CIR). He served as a Distinguished Scholar Professor in the Civil Engineering department and served as Associate Dean – Research in College of Engineering at the University of Texas at Arlington (UTA) in Texas, USA. He has over 25 years of experience in teaching, research, continuing education and administration in public universities in Texas.

Dr Puppala has been conducting research on stabilization of expansive soils, sustainable utilization and stabilization of recycled materials for low to high volume roads, in situ intrusive methods for site characterization, infrastructure resilience and pavement material characterization studies. Dr. Puppala has been a recipient of several major research grants from federal, state and local government agencies.

Dr. Puppala is the director of NSF's Industry University Co-operative Research Center (IUCRC) on Composites in Civil Infrastructure (CICI) at TAMU, College Station, Texas. Dr Puppala currently serves as a Chair of ASCE GeoInstitute's new committee on Innovations in Geotechnical Engineering.

Dr. Puppala was the past Chairman of Soil Mechanics section (AFS00) of the Transportation Research Board (TRB) and is a member of Design and Construction group of TRB. He is the current vice chair of ISSMGE TC307 on Sustainability in Geotechnical Engineering. He chaired American Society of Civil Engineers (ASCE)'s Geotechnical Institute's (GI) "Engineering Geology and Site Characterization" committee and TRB committee on 'Soil and Rock Instrumentation'.

He has extensively published with over 500 publications and participates with many esteemed organizations including ISSMGE, TRB, ASCE-GI and others to develop and deliver technical programs. He is on the editorial board of many esteemed journals including ASCE Journal of Geotechnical and Geoenvironmental Engineering, ASCE Journal of Materials, ASTM Geotechnical Testing Journal, Engineering Geology, International Journal of Pavement Engineering and many others.

He received many awards and distinctions including a recent prestigious 2020 Ralph Peck Award from ASCE-Geo Institute and he delivered the Peck lecture at GeoCongress meeting in Minneapolis, Minnesota in February, 2020.

SPECIAL LECTURES

Applications of Advanced Imaging and Sensor Technologies in Intelligent Road Construction

Erol Tutumluer
University of Illinois at Urbana-Champaign
USA

ABSTRACT

Aggregate size and shape are key properties for determining quality of aggregate materials used in road construction and transportation geotechnics applications.

The composition and packing, layer stiffness, and load response are all influenced by these morphological characteristics of aggregates.

A convenient and affordable system for acquiring 3D aggregate information from stockpiles and constructed layers in the field has been developed as an innovative 3D imaging approach, whereby engineers can perform inspection by taking videos/images with mobile devices such as smartphone cameras.

The approach leverages Structure-from-Motion (SfM) techniques to reconstruct the stockpile surface as 3D spatial data, i.e. point cloud, and uses a 3D segmentation algorithm to separate and extract individual aggregates from the reconstructed stockpile.

The preliminary results presented demonstrate the future potential of using 3D aggregate size and shape information for onsite Quality Assurance/Quality Control (QA/QC) tasks.

In addition, smart mobility now requires sensing infrastructure through advanced and novel sensing technologies that can continuously monitor aggregate layer deformations and stiffness characteristics during construction and in-service performance.

Specifically, two new smart sensors, i.e. Bender Element (BE) shear wave transducer and SmartRock, recently developed for sensing constructed aggregate layer behavior will be discussed.

BIO DETAILS

Dr. Erol Tutumluer is Abel Bliss Professor specializing in Transportation Geotechnics in the Department of Civil and Environmental Engineering at University of Illinois at Urbana - Champaign. Dr. Tutumluer has research interests and expertise in characterization of pavement and railroad track geomaterials, i.e., subgrade soils and base/ballast unbound aggregates, soil/aggregate stabilization, geosynthetics, applications of artificial intelligence and deep learning techniques to transportation infrastructure, structural health monitoring of transportation facilities using sensors, sustainable use of foundation geomaterials and construction practices for transportation infrastructure, discrete element analysis of ballast, dynamic response measurement and analyses of track systems, and mechanistic analysis and design.

Dr. Tutumluer has served as an investigator on over 100 research projects and graduated 21 PhD and 44 MS students, and authored over 350 peer reviewed publications.

He is a Founding Editor-in-Chief of Transportation Geotechnics Elsevier journal and the current chair of ISSMGE Technical Committee 202 on Transportation Geotechnics.

Dr. Tutumluer served as the Chair of ASCE Geo - Institute's Pavements Committee in 2006 - 2012. He is a member of AREMA Committee 1 on Ballast, a Council Member and Publication Committee Chair of International Geosynthetics Society and serves as Chair of Transportation Research Board's AKG00 Geology and Geotechnical Engineering Section. He received Yangtze River Scholar Award by Chin a Ministry of Education in 2016 and delivered Zeng Guoxi honor lecture in China in 2019.

Dr. Tutumluer is 2020 recipient of ASCE T&DI James Laurie Prize in recognition of his career accomplishments for promoting Transportation Geotechnics field and 2021 recipient of ASCE Geo - Institute's Carl Monismith Lecture Award.

SPECIAL LECTURES

Reimagining the Unbound Pavement Testing, Design, and Construction in the Post-Digital Era

Jayantha Kodikara
Monash University
Australia

ABSTRACT

The world is experiencing the effects of increasing digitalisation within the so-called Industry 4.0 revolution, where physical and digital worlds are merging. A key aspect of Industry 4.0 is the integration of processes to maximise benefits.

Building on the ideas generated within SPARC Hub, this presentation will focus on a practical approach to the integration of processes involved in unbound pavement technology.

While unbound pavements have served well, particularly in Australia, in terms of its local climate and traffic conditions, much of the processes involved in testing, design, construction and subsequent condition assessment of these pavements are predominantly disparate processes without much connectivity.

In addition, some of the processes are highly empirical based on age-old data and have not benefitted sufficiently from the recent advances in unsaturated soil mechanics.

It follows then that we are at crossroads to reimagine these processes so that this technology can reap due benefits of the ongoing digitalisation. In this context, this lecture will highlight a practical approach that integrates these processes through smarter yet cheaper testing leading to the up-to-date science-based design and performance-based intelligent construction.

The presentation will also highlight some of the innovations that SPARC made to achieve this goal and show their applicability in the global context.

BIO DETAILS

Professor Jayantha Kodikara is Director of ARC Hub for Smart Next Generation Transport Pavements – SPARC (www.sparchub.org.au) at the Department of Civil Engineering, Monash University.

He is also the Leader of Monash Pipeline Research Group (www.criticalpipes.com), which has led/ is leading multi-million global projects, including Advanced Condition Assessment and Pipe Failure Prediction Project and CRC-p Smart Lining for Deteriorated Pipe Rehabilitation Project.

His current primary research areas are unsaturated soils, geo-infrastructure, including pipelines and road pavements, and structural health monitoring using advanced sensings such as distributed fibre optics, GPR and associated modelling.

Altogether, he has over 300 publications on a diverse range of topics and graduating about 40 PhD students. He is a Chartered Professional Engineer in Australia and a Fellow of Engineers Australia.

His fundamental research has led to the development of the MPK (Monash-Peradeniya-Kodikara) Framework and Model for unsaturated compacted soil modelling, which uncovered a direct link between the traditional compaction curve to advanced unsaturated soil modelling.

Seminal contributions in the applied research area include the elucidation of buried water pipe failure and deterioration mechanisms, which has led to paradigm shifts in pipeline asset management globally.

He has received several awards for innovation and industry collaboration, including three national and International Water Association Awards, B/HERT Award in 2016, ARRB Impact Award in 2019, and Monash Vice-Chancellor's and Dean's Awards for Innovation and Enterprise in 2019 and 2013.

SPECIAL LECTURES

Sustainable Digital Concrete Construction

Philippe Block
ETH Zurich
Switzerland

ABSTRACT

Concrete does not want to be a beam, it wants to be an arch. Reintroducing funicular geometry for the artificial stone, concrete, significantly reduces the amount of material needed, but also, because of the very low stresses in the structures, to build with lesser emitting materials.

Recent developments in computational design and engineering and construction-scale digital fabrication now allow the introduction of concrete as an extremely sustainable solution for spanning structures such as floor "slabs" or footbridges.

This talk will introduce how we can disrupt concrete construction: lightweight, low embodied emissions, using construction demolition waste, fire resistant, providing thermal mass, acoustically performant, prefabricated, dry-assembled, so easily demountable and reusable or entirely and easily recyclable at the end of its life, available globally and at scale, and economically competitive.

Sounds too good to be true?

This lecture will introduce two developments: the Rippmann Floor System, a novel rib-stiffened funicular floor needing only 1/3rd of material volume compared to a reinforced-concrete floor slab, resulting in a reduction of over 75% in embodied emissions; and, Striatus, a fully unreinforced concrete 3D-printed masonry footbridge, introducing novel circular construction principles.

BIO DETAILS

Dr. Philippe Block is a full professor at the Institute of Technology in Architecture (ITA) at ETH Zurich, where he leads the Block Research Group (BRG) with Dr. Tom Van Mele and is Head of the Institute. Philippe is a lso Director of the Swiss National Centre of Competence in Research (NCCR) in Digital Fabrication.

He studied architecture and structural engineering at the Vrije Universiteit Brussel (VUB) in Belgium and at the Massachusetts Institute of Technology (MIT) in the US, where he earned his PhD in 2009.

He is the recipient of numerous awards, including the Rössler Prize for most promising young professor from ETH Zürich (2018) and the Berlin Arts Prize 2018 for Baukunst.

The Block Research Group develops novel design and engineering approaches for efficient structural form and proposes new and economical construction approaches.

To address the grand challenges posed by climate change, the group's research and built prototypes strive the motto "strength through geometry" to reduce embodied greenhouse gas emissions and utilise fewer first - use resources.

To minimise construction waste and increase labour productivity, the group develops innovative bespoke prefabrication strategies and novel construction paradigms.

SPECIAL LECTURES

Post-Digital Era Challenges to the Road Infrastructure Sector – A Highway Engineering Researcher's Perspective

T. F. Fwa
Chang'an University, China and National University of Singapore Singapore

ABSTRACT

The emergence of the fifth-generation data network (5G), combined with the ever-growing capability of IoT and AI technology, has begun to create revolutionary transformation to the transportation sector. The industry has seen major changes in the way transportation planning, traffic control and management are being conducted. The pace of change has accelerated significantly in recent years owing to the increasingly keener competition in the race to produce smarter cars and higher level of driving automation. In comparison, the transportation infrastructure sector has been slow in responding to the new opportunities available and the call for value-added applications utilizing technologies involving 5G, IoT and AI.

This presentation examines the current state of digital development in the road infrastructure industry, and identifies the areas in need of research and development to match up with the advancements already made in other related fields of road transportation, as well as the potential and opportunities. In particular, emphasis is placed on the gaps in road infrastructure information and data required for supporting the digital and intelligent transformation of road traffic operations. It is highlighted that much R&D efforts are needed to provide timely and accurate data economically for safe and efficient road transport operations.

As an illustration of the role of road infrastructure R&D in the post-digital era, suggested road-infrastructure related R&D efforts needed in the following application areas are elaborated: (i) Smooth and efficient high-speed traffic flow; (ii) Hazard-free traffic operation, and (iii) Safe all-weather driving. In each of the application area, focus is given on the research challenges in the aspects of road network level data acquisition, data reliability and precision, data processing and interpretation, and information application analysis.

BIO DETAILS

Dr. Fwa is currently Distinguished Professor, and Dean of School of Future Transportation at the Chang'an University, China and Emeritus Professor, National University of Singapore. He received his BEng from the National University of Singapore, MASc from the University of Waterloo, Canada, and PhD from Purdue University, USA. Professor Fwa is also active academically in R&D of highway and airfield engineering, and transportation infrastructure management.

He has published more than 200 technical papers in leading international journals, and approximately equal number of conference papers. He has been invited to lecture in more than 20 countries. His research has led to more than 12 best papers awards in journals and conferences. He currently serves on the editorial boards of six leading international journals in the areas of transportation infrastructure, pavement engineering and pavement materials. Professor Fwa is also active professionally.

He is the Founding President and current President of the Pavement Engineering Society (Singapore), and the founding and current President of the Asia Pavement Engineering Society (APES). He was a Past President of the International Society for Maintenance and Rehabilitation of Transport Infrastructure (iSMARTi), currently serving as a Board Member.

He founded two international conference series, namely the International Conference on Road and Airfield Pavement Technology (ICPT), and the Asia Pacific Symposium on Transportation and the Environment (APTE), both of which are now in their 12 edition. In 2019, he co - founded the conference series International Symposium on Pavement Service Functional Design and Management (PFDM).

SPECIAL LECTURES

Two trends on Construction in the Post-Digital Era: Building with Paper and Additive Manufacturing

Ulrich Knaack
UDelft, The Netherlands and TUDarmstadt Germany

ABSTRACT

Our built environment is driven by global / societal forces to serve for a better performance. As a sample the impulse of the 1970ies energy crises with the first step reception of transparency and the following countertrend of maximal glassing can be seen.

This was followed by climate active fully glassed double facades. And as always, each technology provides benefits and drawbacks – with the changes and drivers for design and engineering.

Follow-up of the energy performance and sustainability is now circularity, the search for a holistic energy-material-performance driven design.

This contribution will provide snapshots of the current status of additive manufacturing for the built environment as a potential technology to reduce material consumption while increasing technical performance – and of course freedom of design.

In a second part current research in the field of building with paper, the technical boundaries, the construction and application solutions, the recyclability and the potentials for explicit short-term function, will be expressed.

BIO DETAILS

Professor Dr. Ing. Ulrich Knaack (1964) was trained as an architect at the RWTH Aachen / Germany. After earning his degree he worked at the university as researcher in the field of structural use of glass and completed his studies with a PhD.

In his professional career Knaack worked as architect and general planner in Düsseldorf / Germany, succeeding in national and international competitions.

His projects include high - rise and offices buildings, commercial buildings and stadiums.

In his academic career Knaack was professor for Design and Construction at the Hochschule OWL / Germany.

He also was and still is appointed professor for Design of Construction at the Delft University of Technology / Faculty of Architecture, Netherlands where he devel ped the Façade Research Group.

In parallel he is professor for Façade Technology at the TU Darmstadt / Faculty of Civil engineering/ Germany where he participates in the Institute of Structural Mechanics + Design.

He organizes interdisciplinary design workshops and symposia in the field of facades and is author of several well - known reference books, articles and lectures.

PRE-CONFERENCE AND WORKSHOP

September 6th

Pre-Conference Seminar and Workshop for
Construction Engineering and Management Researchers

How to Become a Successful Author of Scholarly Papers for Publication in Prestigious Scholarly Journals in the Field of Intelligent Construction

COORDINATION

Miroslaw Jan Skibniewski

Editor-in-Chief, Automation in Construction, an international research journal.

DESCRIPTION

This one-day seminar and workshop is intended for junior academics and industry researchers in the field of intelligent construction and allied technical disciplines.

Participants will gain practical, hands-on knowledge directly from a presenter with 28 years of personal experience as editor-in-chief of a top-ranking scholarly journal in this field.

You will have your questions answered on how to compose a successful paper, what the paper reviewers are looking for, how to avoid bad translations from an author's native language to English, and what to do and not to do when communicating with journal editors and reviewers.

Aspiring authors are welcome to bring along the text of their papers currently in preparation to seek advice on how to maximize the chance for their acceptance after a competitive review process.

MINI-SYMPOSIA

September 6th

Intelligent Construction and Automation - Challenges and emerging technologies

COORDINATION

Paulo Cruz
School of Architecture, Art and Design, University of Minho, Guimarães, Portugal

Christian Louter
Institute of Building Construction, Faculty of Civil Engineering, Technische Universität Dresden, Dresden, Germany

Mariana Popescu
Dept. Materials, Mechanics, Management & Design (3Md), Faculty of Civil Engineering and Geosciences, TU Delft, Delft, The Netherlands

Bruno Figueiredo
School of Architecture, Art and Design, University of Minho, Guimarães, Portugal

DESCRIPTION

This mini-symposia aims to address the challenges and emerging technologies that are boosting the fields of additive manufacturing and construction and automation, exploring fundamental issues related with the design, conception, and realization of architectural structures.

AGENDA

10h15 – 10h30	Reception and introduction to the Mini-Symposia
10h30 – 10h55	**Individualized standardization in the context of intelligent construction and automation** *J. Albus, K. Hollmann-Schröter*
10h55 – 11h20	**Auto(mated)nonous Assembly** *O. Tessmann, Yuxi Liu*
11h20 – 11h55	**Digital Fabrication of Thin-glass composite elements** *D. Pfarr, C. Louter*
11h55 – 12h20	**Additive Manufactured (3D-Printed) Connections for Thermoplastic Facades** *Ina Cheibas, Beril Önalan, Ena Lloret-Fritschi, Matthias Kohler, Fabio Gramazio*
12h20 – 12h45	**Robotic On-Site Adaptive Thin-Layer Printing: Challenges and Workflow for Design and Fabrication of Bespoke Cementitious Plasterwork at Full Architectural Scale** *S. E. Jenny, D. Mitterberger, E. Lloret-Fritschi, L. Vasey, E. Sounigo, Ping-Hsun Tsai, P. Aejmelaeus-Lindström, D. Jenny, F. Gramazio and M. Kohler*
12h45 – 14h00	**Lunch**
14h00 – 16h00	**Visit to the laboratorial facilities in Construction, Manufacturing and Automation** Arena - Advanced Design & Technology DONE Lab - Advanced Manufacturing of Products and Tools

MINI-SYMPOSIA

September 6th @ 14H30 to 18H30

ISIC 2022 – BUILT CoLAB, Mini-Symposia

Digital Construction Revolution in Portugal

COORDINATION

João Neves Moutinho

Business Director & Internationalization BUILT CoLAB

António Aguiar Costa

Technical Coordinator REV@ Construction | RD&I Director BUILT CoLAB

DESCRIPTION

This session is addressed to the AEC community in general and will provide a view about the future of the construction sector in Portugal.

It will present the intermediate results of the largest project for digital construction ever conducted in Portugal: REV@Construction.

The project will be presented by the several work packagescoordinators.

The session will also include several inspirational Keynote Speakers,coming from prestigious Universities and Companies to present the latest scientific and technical breakthroughs in the area.

The project "Digital Construction Revolution – REV@ Construction" focuses on the digital transformation of the AEC sector to promote their competitiveness, sustainable growth, and strategic alignment with the sector at the European level.

Its R&D activities focus on developing digital tools and solutions to create the foundation for future innovations, attract new companies to the AEC sector, and create new business models to emerge in the future.

WORKSHOP

September 6th

Asphalt Process Control – Using Digital Technologies to Improve Construction Performance

COORDINATION

Seirgei Miller (PhD)
ASPARi research unit, University of Twente, the Netherlands

George Chang
President of ISIC, Transtec Group

Curt Turgeon
US Minnesota department of transportation

DESCRIPTION

Recent advances in intelligent construction machinery have seen several new sensors and software being added to asphalt construction equipment. Digital technologies such as GPS, infrared and other sensors, real-time process control, and advanced communication systems enable tracking, visualization, and data mining of key process parameters during asphalt construction, such as logistics, temperature homogeneity, and compaction consistency.

Yet, despite the availability of these technologies, implementation is slow, and barriers to technology adoption remain an obstacle. Using the Netherlands as a case, this workshop will address SMART technology implementation for the asphalt construction industry, its benefits, challenges, complications, and strategies to make it successful and sustainable. A panel discussion will include international experiences from the US Minnesota department of transportation and global experiences.

AGENDA

14h30 – 14h35	**Introduction** - *All Speakers*
14h35 – 14h40	**Why Digitise?** - *Miller*
14h40 – 15h40	**The Road to Digitisation** Addressing challenges of variability and construction quality - the case of the Netherlands & Digital Technologies - *Miller* Lessons from the United States - *Turgeon* Digital Technologies – A Global Perspective - *Chang*
15h40 – 16h10	**Mini-breakout Session** - *All Speakers* 1. Given what you have heard, how would you approach implementing digital technologies in your country? 2. What factors to consider when considering the broader adoption and implementation of digital technologies? 3. Which stakeholders should be driving implementation?
16h10 – 16h20	**Break**
16h20 – 16h50	**Mini-breakout Session** - *All Speakers* Which STRENGTHS, WEAKNESSES, OPPORTUNITIES, and THREATS do digital technologies have for the road construction industry?
16h50 – 17h00	**Break**
17h00 – 17h30	**Mini-breakout Session** - *All Speakers* 1. What are the first "must" steps to be taken to encourage and foster technology implementation 2. What do you think are the essential elements to be included in a Digital Technology Roadmap 3. Task – Developing Roadmap 2030
17h30 – 18h00	**Panel discussion**- *All Speakers*
18h00	**Adjourn**

WORKSHOP

September 6th

Intelligent Construction of Flexible Pavements – Recent Theoretical and Technological Advancements in Australia

COORDINATION

Jayantha Kodikara

Professor and Director, ARC Industrial Transformation Research Hub (ITRH) – SPARC, Department of Civil Engineering, Monash University, Clayton Campus, Australia

Arooran Sounthararajah

Research Manager, ARC Industrial Transformation Research Hub (ITRH) – SPARC, Department of Civil Engineering, Monash University, Clayton Campus, Australia

DESCRIPTION

SPARC Hub (sparchub.org.au) at the Department of Civil Engineering, Monash University is the focal point for university-industry based transport pavements research in Australia sponsored by the Australian Research Council's Industry Transformation Research Hub (ITRH) Scheme with 20 leading industry partners, 8 local universities and 7 overseas partners.

SPARC Hub is leading the effort to implement the intelligent compaction (IC) technology and make further advancements in IC across Australia.

The workshop will focus on our recent theoretical and technological advancements in the intelligent construction of flexible pavements.

AGENDA

10h00 – 10h05	**Introduction to SPARC Hub and the format of the workshop** *Jayantha Kodikara*
10h05 – 10h35	**Relevance of unsaturated soil mechanics to unbound pavement performance and new and more practical approach to testing and design** *Jayantha Kodikara* Q & A 5 minutes
10h40 – 11h55	**Proximal measurement technique for pavement material density and other properties in real-time during compaction** *Amir Tophel* Q & A 5 minutes
11h00 – 11h15	**Proximal measurement of pavement material moisture content in real-time during compaction** *Mai Nguyen* Q & A 5 minutes
11h20– 11.45	**Advancement of pavement design for practical use incorporating climatic effects for unbound granular pavements with thin seal** *Chathuri MahaMadakalapuge* Q & A 5 minutes
11h50 – 12h05	**Light Weight Deflectometer (LWD) as a QA/QC tool for pavement compaction–addressing the effect of variability in the material moisture content and properties** *Jayantha Kodikara* Q & A 5 minutes
12h10 – 12h35	**The limitations of IC technology in asphalt pavement compaction and proposed potential ways to overcome these limitations** *Suthakaran Sivagnanasuntharam*
12h35 – 12h45	**Q&A session**

PROGRAMME

TUESDAY, 6TH SEPTEMBER

09h00 - 18h00

REGISTRATION

CCVF - Foyer Small Auditorium

10h00 - 12h45

Mini-Symposia

Intelligent Construction and Automation – Challenges and Emerging Technologies

Auditorium 1, School of Architecture, Art and Design of University of Minho

Coordinators:
- Paulo J. S. Cruz *(University of Minho, Portugal);*
- Christian Louter *(Technische Universität Dresden, Germany);*
- Mariana Popescu *(TU Delft, The Netherlands);*
- Bruno Figueiredo *(University of Minho, Portugal).*

10h00 - 18h00

Pre-Conference and Workshop

How to Become a Successful Author of Scholarly Papers for Publication in Prestigious Scholarly Journals in the Field of Intelligent Construction

Vila Flor Cultural Centre – room 2

Coordinator: M. J. Skibniewski *(Editor-in-Chief, Automation in Construction, an international research journal).*

10h00 - 12h45

Workshop

Intelligent Construction of Flexible Pavements – Recent Theoretical and Technological Advancements in Australia

Vila Flor Cultural Centre (CCVF) – room 1

Coordinators:
- Jayantha Kodikara *(Monash University, Clayton Campus, Australia);*
- Arooran Sounthararajah *(Monash University, Clayton Campus, Australia).*

13h00 - 14h30

LUNCH

Café Concerto & Vila Flor Restaurant

14h30 - 18h00

Workshop

Asphalt Process Control – Using Digital Technologies to Improve Construction Performance

Vila Flor Cultural Centre (CCVF) – room 4

Coordinators:
- Seirgei Miller *(University of Twente, The Netherlands);*
- Curt Turgeon *(US Minnesota department of transportation);*
- George Chang *(President of ISIC, Transtec Group).*

14h30 - 18h00

BUILT CoLAB Mini-Symposia

Digital Construction Revolution in Portugal (in Portuguese, by invitation)

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Coordinators:
- João Neves Moutinho *(Business Director & Internationalization BUILT CoLAB);*
- António Aguiar Costa *(Technical Coordinator REV@Construction | RD&I Director BUILT CoLAB)*

16h00 - 16h30

COFFEE BREAK

Vila Flor Cultural Centre (CCVF) – Foyer Small Auditorium

PROGRAMME

WEDNESDAY, 7TH SEPTEMBER *(MORNING)*

08h30 - 18h00

REGISTRATION

CCVF - Foyer Small Auditorium

09h00 - 10h00

Opening Ceremony

Vila Flor Cultural Centre (CCVF) – Small Auditorium

- Pedro Arezes, *President EEUM*
- Paulo Cruz, *President EAAD*
- George K. Chang, *President ISIC*
- Ana Cotter, *Councilwoman CMG*
- João Neves Moutinho, *Director BUILT CoLAB*
- António Gomes Correia, *Chair ISIC 2022*

10h00 - 11h00

Inaugural Lecture

New Opportunities and Challenges within Construction 5.0

***Miroslaw Jan Skibniewski**, University of Maryland, USA*

Vila Flor Cultural Centre – Small Auditorium

Chair: Anand Puppala *(Texas A&M University, Texas, USA)*

11h00 - 11h30

COFFEE BREAK

Vila Flor Cultural Centre (CCVF) – Foyer Small Auditorium

11h30 - 12h20

Keynote Lecture

Use of Intelligent Construction Techniques Toward Construction of High-Quality Pavement Foundation Layers

***Soheil Nazarian**, University of Texas at El Paso, USA*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: George Chang *(Transtec Group, USA)*

12h20 - 13h00

Special Lecture

Reimagining the Unbound Pavement Testing, Design, and Construction in the Post-digital Era

***Jayantha Kodikara**, ARC Industrial Transformation Research Hub (ITRH) – SPARC and Monash University, Clayton Campus, Australia*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: Bernardo Caicedo *(U. Los Andes, Colombia)*

13h00 - 14h30

LUNCH

Café Concerto & Vila Flor Restaurant

WEDNESDAY, 7TH SEPTEMBER *(AFTERNOON)*

14h30 - 16h00

TS 1.1: *Artificial Intelligence for Design and Built Environment*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: Paulo Pereira *(University of Minho, Portugal)*
Discussion Leader: Manuel Parente *(BUILT CoLAB, Portugal)*

Towards the Development of a Budget Categorization Machine Learning Tool: a Review

Luís Jacques de Sousa (Faculdade de Engenharia da Universidade do Porto, Portugal), João Poças Martins, Santos Baptista, Luís Sanhudo

Transforming Construction Entities from Traditional Management to Autonomous Management Using Blockchain

Mohammad Darabseh (Faculdade de Engenharia da Universidade do Porto, Portugal), João Poças Martins

Disruptive Innovation in AEC: The Case of Artificial Intelligence Applied to Project Management

Ricardo de Matos Camarinha (BIMTEC Consultancy, Doha, Qatar), David Porter, Cuong Quang

A Machine Learning Approach for UCS Prediction of Soil-Cement Mixtures Reinforced with Fibers

Joaquim Tinoco (University of Minho, Portugal), António Alberto S. Correia, Paulo da Venda

14h30 - 16h00

TS 2: *Building Information Modelling (BIM)*

Vila Flor Cultural Centre (CCVF) – Room 1

Chair: Miguel Azenha *(University of Minho, Portugal)*
Discussion Leader: Bruno Figueiredo *(University of Minho, Portugal)*

BIM-to-FEM: Development of a Software Tool to Increase the Operational Efficiency of Dam Construction Projects

Michael Giangiulio (Graz University of Technology, Austria), Andreas-Nizar Granitzer, Franz Tschuchnigg, Jens Hoffmann

Development of a BIM Model for Facility Management with Virtual/Augmented Reality Interaction

Filipe Finco, Andressa Oliveira, Nuno Sousa, Célia Pinto, José Granja (University of Minho, Portugal), Miguel Azenha

10 Years Experience of BIM Teaching at University of Minho: Lessons Learned and Future Outlooks

Miguel Azenha (University of Minho, Portugal), José Granja, José Carlos Lino

16h00 - 16h30

COFFEE BREAK

Vila Flor Cultural Centre (CCVF) – Foyer Small Auditorium

16h30 - 19h00

***TS 5**: Intelligent Construction*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: George Chang *(Transtec Group, USA)*
Discussion Leader: João Moutinho *(BUILT CoLAB, Portugal)*

Construction Sector Transformation: Developing a New Learning Paradigm
Ricardo de Matos Camarinha (BIMTEC Consultancy, Doha, Qatar), Jack Goulding, Camaren Peter

Discrete Aggregate Mass Calculation Method for Visual Detection of Aggregate Gradation and Elongated and Flat Aggregate Content
Zeqi Chen (Southeast University, China), Ying Gao, Jiupeng Zhang, Siyu Chen, Tao Ma, Xiaoming Huang

Aggregating High-Precision GNSS Intelligent: Construction Data for Quality Asphalt Pavements
George K. Chang (The Transtec Group Inc., USA), Amanda L. Gilliland, Abbasali Taghavi Ghalesari

Digitalization of the Asphalt Paving Workflow and Process - its Challenges and Opportunities
Christoph Bertsch (Topcon Europe Positioning B.V., The Netherlands)

Laboratory Investigation of Sensors Reliability to Allow their Incorporation in a Real-time Road Pavement Monitoring System
Francisco Rebelo, Asmasadat Dabiri, Hugo Silva, Joel Oliveira (University of Minho, Portugal)

Use of L-band Radiometer for Remote Moisture Measurements of Soil Subgrade in Road Construction
Thi Mai Nguyen (Monash University, Australia), Jeffrey Walker, Jayantha Kodikara

A Constitutive Modelling Approach Towards Performance-based Intelligent Compaction
Liuxin Chen (The Monash University, Australia), Javad Ghorbani, Chunshun Zhang, Troyee Tanu Dutta, Jayantha Kodikara

An Exploration of Graph-based FEM Optimization for Construction Industry
Luxin Luo (Guiyang College of Humanities and Science, China)

16h30 - 18h50

***TS 6.1:** Sustainable and Smart Infrastructures*

Vila Flor Cultural Centre (CCVF) – Room 1

Chair: Jayantha Kodikara *(Monash University, Australia)*
Discussion Leader: Carlton L. Ho *(University of Massachusetts, USA)*

Climate Change: Evaluation of a Failed Roadway Embankment with Expansive Soils using Unmanned Aerial Vehicle (UAV) Inspection
Surya Sarat Chandra Congress, Omar Ulloa, Prince Kumar, Navid H. Jafari, Xinbao Yu, Anand J. Puppala (Texas A&M University, USA)

A Novel Graphene-based Geotextile for Use in Smart Pavements
Harini Senadheera (Monash University, Australia), Abdelmalek Bouazza, Jayantha Kodikara, Daniel Gibbs

Adaptive Fuzzy Inference System for Automated Pavement Condition Evaluation of Large Pavement Sections from Ground Penetrating Radar (GPR) Thickness Data
Nikhil Singh (Monash University, Australia), Kaushal Kishore, Ravin Deo, Ye Lu, Ernesto Urbaez, Jayantha Kodikara

In-Situ Dynamic Modulus Prediction for Asphalt Pavement Combining Machine Learning Algorithm and Sensing Technology
Shihui Shen (Penn State Altoona, USA), Cheng Zhang, Hai Huang, Linbing Wang, and Dylan G. Ildefonzo

Evaluation of the Temporal Moisture Variations in Flexible Pavements with Thin Seals under Melbourne Climate
Chathuri Maha Madakalapuge (Monash University, Australia), Troyee Tanu Dutta, Jayantha Kodikara

Using a Novel Instrumented Roller to Estimate Soil Dry Density During Compaction
Amir Tophel (Monash University, Australia), Jeffrey P. Walker, Troyee Tanu Dutta, Jayantha Kodikara

Rail Track Monitoring using AI and Machine Learning
K Popov, R De Bold, H-K Chai, MC Forde, Carlton L. Ho (University of Massachusetts, USA), JP Hyslip, P Long, SS Hsu

WEDNESDAY, 7TH SEPTEMBER *(LATE AFTERNOON)*

19h00 - 20h00

WELCOME RECEPTION

Vila Flor Cultural Centre (CCVF)

THURSDAY, 8TH SEPTEMBER *(MORNING)*

08h30 - 18h00

REGISTRATION

CCVF - Foyer Small Auditorium

09h00 - 09h50

Keynote Lecture

Digital Steel Construction: a Holistic Viewpoint in a Life-Cycle Context

***Luis Simões da Silva**, University of Coimbra, Portugal*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: António Gomes Correia *(University of Minho, Portugal)*

09h50 - 10h30

Special Lecture

Innovations in Geotechnical Engineering: Current Focus Areas and Contributions from USA

***Anand Puppala**, Texas A&M University, College Station, Texas, USA*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: Soheil Nazarian *(UTEP, USA)*

10h30 - 11h00

COFFEE BREAK

Vila Flor Cultural Centre (CCVF) – Foyer Small Auditorium

11h00 - 11h50

Keynote Lecture

Designing Smart Habitats: Trends and Opportunities

***Andrés Muñoz Ortega**, Polytechnic School, Catholic University of Murcia, Spain*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: Paulo Novais *(University of Minho, Portugal)*

11h50 - 13h10

Special Lecture

Sustainable Digital Concrete Construction

***Philippe Block**, ETH Zurich, Switzerland*

Chair: Miguel Azenha *(University of Minho, Portugal)*

Two trends on Construction in the Post-Digital Era: Building with Paper and Additive Manufacturing

***Ulrich Knaack,** TUDelft, The Netherlands and TUDarmstadt, Germany*

Chair: Paulo Cruz *(University of Minho, Portugal)*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

13h10 - 14h30

LUNCH

Café Concerto & Vila Flor Restaurant

THURSDAY, 8TH SEPTEMBER *(AFTERNOON)*

14h30 - 16h00

***TS 6.2**: Sustainable and Smart Infrastructures*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: Soheil Nazarian *(UTEP, USA)*
Discussion Leader: Mike Winter *(Winter Associates Limited, UK)*

Monitoring and State Conditions Evaluation of Rockfall Protection Systems with Shock Sensors and/or Radar Technology
Suzana Svetličič (ELIMO DRI Investment Management Ltd, Slovenia), Richard Koschuch (BTP Koschuch e.U., Austria)*

Laboratory Investigation on the Correlation Between Density and Intelligent Compaction Measurement Value (ICMV) for Asphalt
Suthakaran Sivagnanasuntharam (Monash University, Australia), Arooran Sounthararajah, Jayantha Kodikara

Structural Health Monitoring with Artificial Neural Network and Subspace-based Damage Indicators'
Marco Martino Rosso (Politecnico di Torino, Italy), Angelo Aloisio, Raffaele Cucuzza, Dag Pasca, Giansalvo Cirrincione, Giuseppe Carlo Marano

Intelligent Compaction Measurement Values Classification
Guangghui Xu, George K. Chang (Transtec Group, USA), António G. Correia, Soheil Nazarian

14h30 - 16h00

***TS 3**: Construction Automation and Robotics*

Vila Flor Cultural Centre (CCVF) – Room 1

Chair: Paulo Cruz *(University of Minho, Portugal)*
Discussion Leader: Bruno Figueiredo *(University of Minho, Portugal)*

A Toolbox for the Automatic Interpretation of Bender Element Tests in Geomaterials
Dragos Ionut Moldovan (CERIS, Instituto Superior Técnico, University of Lisbon, Portugal), Abdalla Almukashfi, Antonio Gomes Correia

Converting Algorithms into Tangible Solutions: A workflow for Materializing Algorithmic Facade Designs
Inês Caetano (INESC-ID/Instituto Superior Técnico, University of Lisbon, Portugal), António Leitão, Francisco Bastos

Improv-Structure: Exploring Improvisation in Collective Human-Robot Construction
Isla Xi Han (Princeton University, USA), Stefana Parascho

Additive Manufacturing & Robotics in Construction at UMinho
Paulo Cruz (University of Minho, Portugal), Bruno Figueiredo

16h00 - 16h30

COFFEE BREAK

Vila Flor Cultural Centre (CCVF) – Foyer Small Auditorium

16h30 - 18h50

***TS 4**: Sustainable Construction*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: Jayantha Kodikara *(Monash University, Australia)*
Discussion Leader: Joel Oliveira *(University of Minho, Portugal)*

Smart Gypsum Mortars with Phase Change Materials
Sandra Cunha (University of Minho, Portugal), Jhonny Castro, José Aguiar

Integration of Spot Tests and Vibratory Roller Data in Rural Road Pavement Layers Made with Recycled Aggregates
Sajjad Pourkhorshidi (University of Bologna, Italy), Cesare Sangiorgi, Daniele Torreggiani, Patrizia Tassinari

Multiphysical Coupling Analysis of the Transition Zone Behaviour in Corroded Reinforced Concrete Structures
Yasmine Meterfi (Sidi Bel Abbes University, Algeria), Habib Trouzine, Youcef Houmadi

Deterioration of Highway Geotechnical Assets: Data and Modelling
Verity Wadesmith, Jack Randall (Mott MacDonald, UK), Christopher Power, Michelle Duffy-Turner, Mike G Winter, Ian M Nettleton, Angus Wheeler

Assessing Hazardous Spills Impact on Road Surface Performances by 3D High Resolution Surveying Techniques
Valentina Alena Girelli, Luca Cotignoli (Università di Bologna, Italy), Navid Ghasemi, Claudio Lantieri, Maria Alessandra Tini, Rossella Vecchione, Gabriele Bitelli, Valeria Vignali

A Review of Lean Design Management Methods: Conceptual Framework
Mahmoud Karaz (Universidade do Minho, Portugal), José Cardoso Teixeira

Integrating Smart and Sustainable Construction: A review of Present Status and Possible Opportunities
Mai Ghazal, Ahmed Hammad (University of Alberta, Canada)

16h30 - 18h50

***TS 1.2**: Artificial Intelligence for Design and Built Environment*

Vila Flor Cultural Centre (CCVF) – Room 1

Chair: Paulo Novais *(University of Minho, Portugal)*
Discussion Leader: Joaquim Tinoco *(University of Minho, Portugal)*

Prediction of Airport Pavement Moduli by Machine Learning Methodology Using Non-destructive Field Testing Data Augmentation
Nicola Baldo, Fabio Rondinella, Clara Celauro (University of Palermo, Italy)

Prediction of Geological Conditions Ahead of the Tunnel Face: Comparing the Accuracy of Machine Learning Models Trained on Real and Synthetic Data
Alla Sapronova (Graz University of Technology, Austria), Paul J. Unterlass, Thomas Dickmann, Jozsef Hecht-Méndez, Thomas Marcher

Neural Network-Based Model to Predict Permanent Deformation Induced in the Subgrade by the Passage of the Trains
Ana Ramos (Faculty of Engineering of the University of Porto, Portugal), António Gomes Correia, Rui Calçada

Digital Construction Strategy for Project Management Optimization in a Building Renovation site: Machine Learning and Big Data Analysis
Sofia Agostinelli, Fabrizio Cumo, Riccardo Marzo, Francesco Muzi (Sapienza University of Rome, Italy)

A WGAN Approach to Synthetic TBM Data Generation
Paul J. Unterlass (Graz University of Technology), Georg H. Erharter, Alla Sapronova, Thomas Marcher

20h00 - 23h00

GALA DINNER

Hotel de Guimarães

PROGRAMME

FRIDAY, 9TH SEPTEMBER *(MORNING)*

08h30 - 11h00

REGISTRATION

CCVF - Foyer Small Auditorium

09h00 - 09h50

Keynote Lecture

Intelligent Compaction in China: from Research to Practice

Guanghui Xu, *Southwest Jiaotong University, China*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: George Chang *(Transtec Group, USA)*

09h50 - 10h30

Special Lecture

Post-Digital Era Challenges to the Road Infrastructure Sector – A Highway Researcher's Perspective

T. F. Fwa, *National University of Singapore, Singapore; Chang'an University, China*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: Paulo Pereira *(University of Minho, Portugal)*

10h30 - 11h00

COFFEE BREAK

Vila Flor Cultural Centre (CCVF) – Foyer Small Auditorium

11h00 - 11h40

Special Lecture

SL1: Applications of Advanced Imaging and Sensor Technologies in Intelligent Road Construction

Erol Tutumluer, *University of Illinois at Urbana-Champaign, USA*

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Chair: Soheil Nazarian *(UTEP, USA)*

11h40 - 12h15

CLOSING CEREMONY

Vila Flor Cultural Centre (CCVF) – Small Auditorium

Tim Kowalski, *ISIC North America Chapter*
George Chang, *President ISIC*
João Neves Moutinho, *Director BUILT CoLAB*
Alexandre Pinto, *President SPG*
António Gomes Correia, *Chair ISIC 2022*

SOCIAL PROGRAMME

WELCOME RECEPTION

The Welcome Reception will start at Vila Flor Cultural Centre at 19h00 (congress venue), from where a walking tour until Guimarães City Hall will take place.

- Venue: Vila Flor Cultural Centre
- Date: Wednesday, 7th September 2022
- Time: 19h00 – 20h00
- Dress code: Business casual

At 19h30, a walking tour will be made towards the city centre of Guimarães, with passage through several important landmarks, including industrial heritage from the leather industry, the city walls and the central 'Praça da Oliveira'.

At the end of the walking tour, participants will be in the centre of Guimarães, where plenty of restaurants and bar offers exist for further networking and relaxing.

VILA FLOR CULTURAL CENTRE

HOTEL DE GUIMARÃES

CONFERENCE DINNER

The Conference Dinner will take place on Hotel de Guimarães (see Guimarães map).

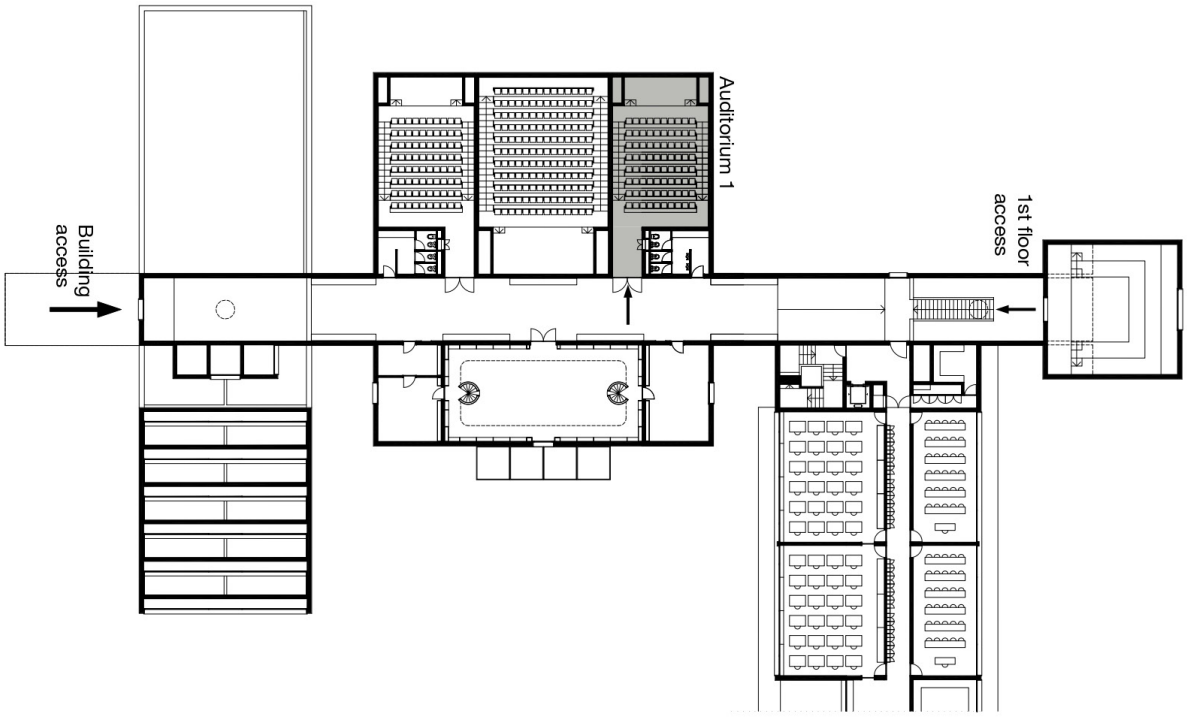
This event is open only to conference delegates and accompanying persons that have registered for the dinner (please bring the invitation you received when you did registration).

Hotel de Guimarães is at walking distance from the Venue of the conference, hence no transportation is necessary.

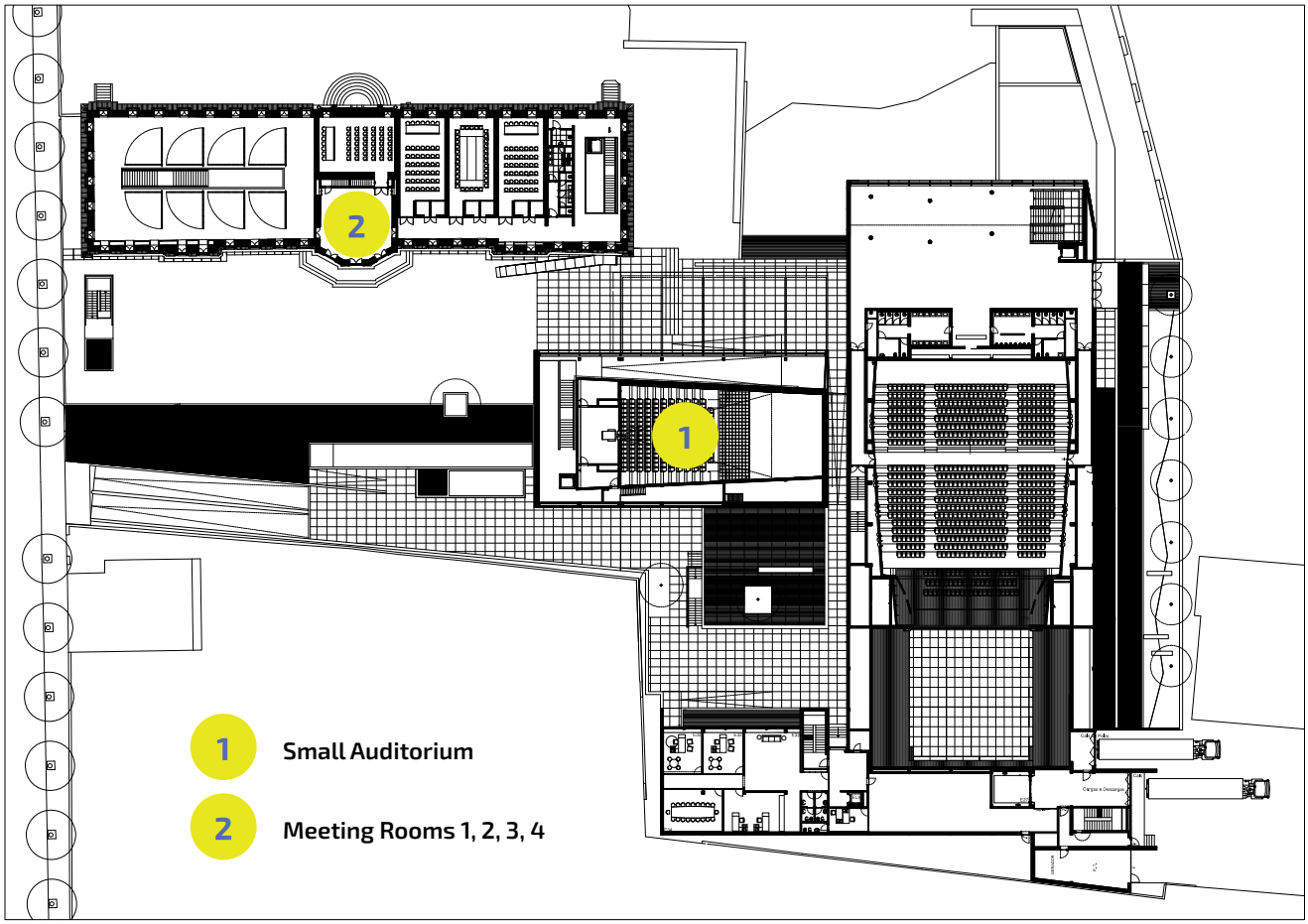
- Venue: Hotel de Guimarães
- Date: Thursday, 8th September 2022
- Time: 20h00 – 23h00
- Dress code: Business attire is recommended.

CONFERENCE MAP

6TH SEPTEMBER – SCHOOL OF ARCHITECTURE, ART AND DESIGN, UMINHO



6TH - 9TH SEPTEMBER – VILA FLOR CULTURAL CENTER



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ICISIC 2022 Secretariat

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