SCHOLAR

Global Experts Meet on

Civil, Architectural, and Environmental Engineering

(GEMCAEE22)

June 16 -18, 2022 in Rome, Italy

Welcome

Dear colleagues,

It gives me great pleasure to welcome you to GEMCAEE-2022 – The Global Experts Meet on Civil, Architectural, and Environmental Engineering to be held on June 18th, 2022. The conference aims to become the premier international meeting for presentations, discussions and exchange of state-of-the-art information on fundamental and applied knowledge in the diverse area of Civil, Architecture Engineering. The conference offers the participants an international forum for following key research challenges not only in their specific areas of interest but also an opportunity to be fully informed in the latest developments in other areas of Civil, Architecture and Environmental Engineering. We will be putting together a programme of keynote presentations by leading experts in their fields, followed by presentations on specific research topics, offering ample time for discussion and exchange of ideas. We aim to promote a true global interaction between academic and industrial colleagues, encourage exchange of ideas and facilitate international collaboration. We look forward to welcoming you at live stream.

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Speakers

Curtainwalls Resistance of Building Movements, Including Seismic Effects

Peter Lalas
Janus Facades Pty Ltd, Australia.

Abstract:

A curtain wall is a building cladding system, made of contiguous elements, which envelopes the building structure on which it hangs like a curtain and excludes wind and weather, at the same time including the conditioned internal environment. A curtain wall absorbs building movements and resists no building loads. The manner in which a curtainwall absorbs building movements and remains weatherproof is a matter of determined design, proven by performance testing and years of satisfactory performance. The writer's curtainwall experience comes from Australia which has typically been seismically stable for recorded history, and New Zealand which has been seismically active for the same time. In this paper I show that it is possible to design a curtainwall with whatever movements are written into the curtainwall specification.

Biography:

Peter Lalas is Principal Engineer, Façade Systems, of Janus Facades Pty Ltd in the facade and remedial engineering disciplines. With more than 38 years of facade engineering experience, Peter has specialised in the design, manufacture and installation of new and assessment of existing facades, including curtainwalls, doors and windows, skylights, cladding and precast.

Peter is a fully trained Arbitrator with extensive experience as an expert witness in façade related matters.

Numerical Evaluation of Structural Wall to Slab Joint Region Subjected to Lateral Loading

Surumi Rasia Salim
University in Dubai, UAE

Abstract:

High rise buildings are constructed to ensure economical use of land in areas where land is scarce, and its cost is high. Tall building structures are subjected to lateral loads due to wind and earthquakes. The structural form of a high-rise building is influenced strongly by its function, while having to satisfy the requirements of strength and serviceability under all probable conditions of gravity and lateral loading. Major advancements have occurred in structural forms out of which the most noted ones are the use of shear walls, frame with shear wall, framed tubes, large scale braced systems and space frames. It has been observed that the shear wall structures are more effective in resisting the lateral forces. In this structural form the floor slabs and shear walls act together as a rigid jointed frame in resisting loads. The connection between slab and shear wall is an important link in the lateral load resisting mechanism of the system. The performance of the connection can influence the pattern and distribution of lateral forces to the walls. The study of the behaviour of connections is of paramount importance in understanding the seismic resistance of structures. To analyze such behaviour, it requires modeling of materials, modeling of the structure and also modeling of the loading. Finite element analysis will probably be the best choice to incorporate the variances in the above parameters. There have been several attempts at modeling and analysing reinforced concrete structural elements and joints. However, with much advancement in the field of computational mechanics; the efficacy of prominent software in predicting the response of structures has already been established.

In the past decade, various studies were undertaken to address the lack of information on the interaction between floor slabs and shear wall. The design procedure for shear wall is addressed by major international codes such as ACI, Euro Code, Canadian, New Zealand, British, Architectural Institute of Japan etc. However, the detailing of shear wall–floor slab connection has been mentioned only in British Standards. Hence an attempt has been made to understand the behaviour of the connection with the conventional detailing as per British Standards and a proposed non - conventional detailing option in order to provide an integral and better performance of the structural system. Numerical simulations based on Finite Elements Models (FEMs) developed using the Abaqus/CAE software have been performed to apply a simple model for a wall-slab subassembly with a reasonable calibration for joint capacity. Better performance of the proposed nonconventional type of joint detailing was observed on comparison with the conventional type.

Biography:

Dr. Surumi Rasia Salim is working as Assistant Professor of Civil Engineering at Manipal Academy of Higher Education, Dubai Campus' School of Engineering & IT, where she teaches in the B.Tech., M.Tech., and Ph.D. programs. Her research interests relate to reinforced concrete structures, steel structures, construction materials & practices, finite element analysis and computer aided design. Her research is widely cited, and has appeared in many leading academic journals. She has presented her research in various conferences and seminars in the USA, UK, Chile, Japan, UAE and India.

Her consulting activities are in the areas design of concrete and steel structures, finite element analysis and design thinking. As an acclaimed teacher, she has taught structural analysis, earthquake engineering, design of high-rise structures, design of steel and concrete structures and advances in concrete technology in India and in Dubai.

Keynote

Hen Friman*[1]
Ifaa Banner[2] , Yafa Sitbon[3], Yulia Einav[1],[4] , Nava Shaked[5]
*[1]Holon Institute of Technology, Israel
[2]H.I.T - Holon Institute of Technology, Director of "Israeli Hope" program (ISRAEL)
[3]H.I.T - Holon Institute of Technology, Dean of Students Office (ISRAEL)
4H.I.T - Holon Institute of Technology, Dean of Students (ISRAEL)
[5]H.I.T - Holon Institute of Technology, Head of the School of Multidisciplinary Studies (ISRAEL)

Abstract:

In order to create the world's cleanest energy future, global energy consumption is heavily dependent on coal, oil, and natural gas, which eventually run out and become too costly or too damaging to recover. In contrast, renewable energy sources, including wind and solar power, are constantly replenished and cannot be deleted. Due to the rising need for professionals and academics with a background and understanding in the Renewable Energy field, developed at the "HIT – Holon Institute of Technology" ("HIT") developed a new program at its Faculty of Electrical Engineering. The Renewable Energy program gives the students technical and practical aspects of energy use (technology and methodology of the study) and energy efficiency. The program also deals with minimizing the environmental impacts of energy use, as well as with energy economy and environmental policy. Public education plays an essential role in preparing public opinion and reducing barriers to sustainable citizenship. When schoolchildren are educated, we can prepare the public opinion in the community to accept distributed energy systems and renewable energy sources.

The project will be conducted in collaboration with the Dean of Students' Social Involvement Unit at the School of Multidisciplinary Studies with funds provided by the Higher Education Council (the Planning and Budgeting Committee of the Council for Higher Education). In the project, students from the Faculty of Electrical Engineering, Renewable Energy program, along with all other Institute students, work with elementary school children and teach them how to protect the environment by preventing pollution of air, water, and soil, as well as reducing waste.

It's important to continue to take great strides even during challenging times, and to remember that the best way to achieve intelligent use and energy efficiency is to start with children.

Biography:

Hen Friman holds Ph.D. and Master's degrees from Bar-Ilan University. His master's thesis investigated the effect of Cyt1Aa on prokaryotes, and his Ph.D. research focused on energy production from aromatic chemical degradation of bacteria Using "Bio-Fuel Cells".
Since 2012, Dr. Friman is research and lecturer at the Faculty of Engineering. He is currently the academic director at the Renewable Energy & Smart Grid Excellence Center at the HIT - Holon Institute of Technology.
Dr. Friman developed an innovative teaching method for a "paperless" laboratory in the field of solar, wind, and water energy. He also managed the "Energy Supervisor" training program at HIT.
He was part of the team responsible for developing "Pre-Project and Developing Soft Skills for Engineers" for the undergrad B.Sc. students. The purpose of the course is to define and improve the "toolbox courses" that will provide students with employability skills - Teamwork, effective management of time, risk and quality control, design excellence, and presentation excellence
Dr. Friman's research interests include renewable energy, fuel cells, microbial fuel cells, water and wastewater treatment, chemical engineering, ecological education, and academic collaboration.

Speakers

Experimental Research on Transverse Compressive Mechanical Properties of CFRP Tendons-Wedge System

Lichen Wang
Tianjin University, China

Abstract:

Carbon fiber reinforced polymer (CFRP) tendons have become a viable alternative for steel cable in the cable roof structures due to their high tensile strength, low weight and corrosion resistance. However, effective anchoring is a challenge for CFRP tendons due to its poor transverse mechanical properties. In this paper, the mechanical properties of CFRP tendons and tendon-wedge system under transverse compression are investigated through a loading scenario that is designed to simulate the force environment of CFRP cables in the wedge anchorages. The effect of tendon diameter, tendon length and aluminum tube on the mechanical properties of CFRP tendons were compared based on the transverse compressive test. The deformation process and local damage of CFRP tendons under transverse compression was discussed by load-strain curves and strain cloud plots measured by digital image correlation (DIC). The experimental results show that the diameter and length have no effect on the local damage form and force transmission mode of CFRP tendons, and the typical load values on the load-strain curve increase as the diameter and length increase until the length greater than 110mm. Furthermore, the aluminum tube makes a better gripping action on CFRP tendon compared with the case without aluminum tube. Since the aluminum tube simulated the wedge inside the anchorage, the contact deformation law of CFRP tendon-wedge under the pressure environment was explored by studying the contact deformation of CFRP tendon-aluminum tube. In addition, the contact pressure and its distribution between the CFRP tendon and aluminum tube are investigated through experimental and simulation results. Some design methods of integrated wedge are suggested to promote the development of wedge anchorage for CFRP tendons.

Biography:

Dr. Lichen Wang is an associate professor in the School of Civil Engineering at Tianjin University (TJU) in China. He obtained his Ph.D. in Structural Engineering in 2017 from Tianjin University and did research as a postdoctoral fellow at the University of Tokyo. His research interests include CFRP-cable roof structure and computer-vision-assisted structural damage detection. He has published over 15 papers in top journals and conferences and applied for over 10 national patents. He has taken one program from the National Natural Science Foundation of China and participated in several projects in China and Japan.

Analytical Method for Laterally Loaded Pile Foundations

Fan Zhang

Southeast University, China

Abstract:

Most of the analytical methods for laterally loaded pile foundations depend on experiment and experience. An analytical method for laterally pile foundations which can consider both the pile head condition and the soil type is proposed. Different from the p-y curve method, the analytical method theoretically establishes the relationship between the one-dimensional Winkler foundation beam parameters and the three-dimensional soil through the relationship between the load and stress, the displacement and strain and the stress and strain. The modulus of the soil foundation reaction is also calculated theoretically. The finite difference method is used to solve the deflection differential equation of foundation beam iteratively. P-y curves of pile foundation can also be extracted by the analytical method. The analytical method is verified by field experiments measurement and finite element results. The comparison shows that the results calculated by analytical method agree with the field test measurement and finite element analysis results.

Biography:

Fan Zhang is a Ph.D. candidate in the School of Civil Engineering at Southeast University in China. Her research interest includes foundation engineering and numerical modelling.

Development and Behavior of Novel FRP-UHPC Tubular Members for Marine Construction

Jun Jie Zeng
Guangdong University of Technology, China

Abstract:

A series of novel forms of tubular members made of prefabricated ultra-high-performance concrete (UHPC) internally reinforced with fiber-reinforced polymer (FRP) grid (referred to as "FRP-UHPC tubular members") are developed. FRP-UHPC tubular members have excellent mechanical properties, and their excellent performances are demonstrated through three preliminary studies: i) tensile and flexural behavior FRP-UHPC plates; ii) flexural and shear behavior of FRP-UHPC tubular beams; ii) compressive behavior of FRP-UHPC tubular columns. A novel connection system between two prefabricated FRP-UHPC plates is also proposed. The proposed FRP-UHPC tubular members are attractive in various structural applications such as pipelines, bridge box girders, permanent formwork of structural elements, especially applications in marine environments.

Biography:

Dr. Jun-Jie Zeng is currently a Professor in Structural Engineering and Associate Head of Department of Civil Engineering at Guangdong University of Technology, China. He received a PhD in Structural Engineering from The Hong Kong Polytechnic University. He is an active researcher in field of high-performance materials and structures (e.g., fiber-reinforced polymer composites, ultra-high-performance concrete, floating structures). Dr Zeng has published over 60 SCI indexed journal papers. Dr Zeng has received a number of research grants, including an ARC Discovery Early Career Researcher Award and two NSFC funds. He is in the 2021 World's Top 2% Scientists List of Stanford University.

Structural Health Diagnosis Under Limited Supervision: Model, Data, and Algorithm

Yang Xu
Harbin Institute of Technology, China

Abstract:

Currently, structural health diagnosis has been extensively investigated following a data-driven paradigm with advanced deep learning and computer vision techniques. However, the identification accuracy and generalization ability of data-driven models highly rely on the quality and diversity of the collected data. In contrast, data with specific patterns and concerned characteristics are always in small quality and diversity under real-world scenarios, causing the problem of da-ta incompleteness. This paper established a framework for structural health diagnosis under limited supervision following data, model, and algorithm perspectives to fix the above issue. Firstly, a data augmentation process of random elastic deformation was designed to enrich the feature space using a few structural dam-age images. Secondly, a novel neural network model was constructed to enhance the nonlinear expression power, feature extraction ability, and recognition accuracy by introducing the subnet inside a single neuron and self-attention module. Thirdly, a task-significance-aware meta-learning optimization algorithm was pro-posed to learn across various tasks and enhance the generalization ability for structural damage identification. Finally, an unsupervised deep learning method for structural condition assessment was proposed to mine the shared latent space between the source and target domains based on intra- and inter-class probabilistic correlations of quasi-static responses. Real-world applications, including tiny fatigue crack segmentation in steel box girders, multitype structural damage identification for bridge inspection, and condition assessment for long-span cable-stayed bridges, were successively performed to demonstrate the effectiveness of the proposed framework for structural health diagnosis under limited supervision.

Biography:

Dr. Yang XU is an assistant professor and lecturer in the School of Civil Engineering at Harbin Institute of Technology (HIT) in China. He obtained his PhD in Engineering Mechanics in 2019. His research interests include deep-learning-enhanced structural health monitoring and computer-vision-assisted structural damage detection. He has published over 20 papers in top journals and conferences and applied for over 10 national patents. As PI, he has taken several programs from the National Natural Science Foundation of China, National Key and Develop Plan Program, Postdoctoral Science Foundation of China, Heilongjiang Province Postdoctoral Research, and State Key Laboratory. He was awarded the Fellowship of China National Postdoctoral Program for Innovative Talents.

Thermophysical Characterization and Chemical, Mineralogical Analysis of the Red Earth from the City Region of Rabat-Morocco

Abdelkrim Moufakkir[1*],
Abderrahim Samaouali[1], Asmae Arbaoui[1], Abdellah Elbouzidi[2], and Mohamed Amine Hachimi[3]

[1*]Mohammed V University in Rabat, Morocco.
[2]Hassan II University of Casablanca, Morocco.
[3]Ibn-Tofail University, Kenitra, Morocco.

Abstract:

The objective of this work is to determine the thermo-physical properties and the chemical and mineralogical analyzes of the red earth coming from the city region of Rabat-Morocco. This clay material is abundant in Morocco and also in almost all of Africa, the Middle East and Latin America. Its cost is lower, it is used in several sectors such as: constructions, industry, petrochemicals …. etc. In this study, we are interested in the chemical and mineralogical characterization of several samples of red earth by ray diffraction (XRD), scanning electron microscopy (SEM) and chemical microanalysis by energy dispersive X-ray spectroscopy (EDS). Thermophysical parameters (thermal conductivity, specific heat capacity, thermal diffusivity, and thermal effusivity) are determined by a hot ring apparatus (CT-Metre).

Keywords:

Thermal conductivity, the red earth, Thermophysical parameters,
Temperature, Specific heat capacity, Chemical and mineralogical analysis.

Biography:

Abdelkrim MOUFAKKIR, Doctor of Physical Sciences, Specialization: Mechanics and Energetics, Thermodynamics, Laboratory of Thermodynamics - Energetics (LTE), Energy Research Center, Department of Physics, Faculty of Sciences, Mohammed V University, Rabat, Morocco. He holds a Master's degree in Materials and Renewable Energy (2016), holds a Certificate of Qualification in Education and Training, Physics and Chemistry, Faculty of Science, Ibn Tofail University, Kenitra (2017). Member of the Organizing Committee of the International Scientific Conference of RIPAM: International Meeting of Mediterranean, Architectural Heritage: Science, Issues and Prospects, 20-21-
22 November 2019, Rabat, Morocco. He works on the thermal, physical and mechanical characterization of building materials such as red earth, concrete, wood...etc. This work has resulted in numerous articles published in international scientific journals indexed SCOPUS. Research interests: Thermodynamics / Mechanics of material points / Mechanics of solid / Fluid mechanics / Electricity / Heat transfers / Heat exchangers / Resistance of materials and porous media.

Integrated Ecological Footprint Assessment: A Sustainable Comparative Study of Office Buildings

Alice Paola Pome

Polytechnic University of Milan, Italy

Abstract:

The Architecture-Engineering-Construction-Operation industry has been widely known as a major contributor to global gas emissions (GHG) and resources consumption. Buildings, and especially office buildings, consume 40% of the total materials consumed in the economy and emit 50% of the total GHG. To solve this problem the European Commission has established several legislative frameworks with the goal to build nearly zero-energy buildings and reduce the environmental pressure of the industry. These policies have principally focused on design and construction stages. However, the definition of sustainable development encompasses several areas, which include the operational stage of building life cycle. In addition, studies demonstrate that users are a key element in the maximization of buildings' sustainable performance. To overcome the gap, this study develops a multi-method approach, based on the Ecological Footprint. This sustainable index allows to model the users' influence in office building environmental impact.

The aim of the method is to identify the environmental impact of office buildings during their in-use stage. The method is based on nine addenda (Built-up, Energy Consumption, Water Consumption, Material Consumption, Food & Drink, Mobility, Waste Generation, Recycle Potential, and Occupant) that reveal the building impact of consumptions, and waste generation. So, the Occupant addendum aims to understand the relevance of users' behaviours in the estimation of sustainability performance.

To test the model, the present research interviews four facility managers of Italian companies on data of the year 2020. The comparison demonstrates the importance of monitoring users' behaviours to minimize office buildings footprints. Indeed, in all case studies the Food & Drink addendum represents a high percentage of the total footprint.

The main limit of the research is the collection of data, which cannot be standardized among companies. Facility managers found hard the collections of data about consumptions and maintenance activities, as they had general expenditures reports. Moreover, other information, such as the amount of hour each employee spend in the building, are collected in different ways among companies. Therefore, the paper comments on the results and give back some possible overcomes of the limits.

Biography:

Alice Paola Pome is a Building Engineer, graduated with honors in Management of Built Environment at Politecnico of Milano (2019). She is currently a PhD candidate in Politecnico di Milano – Department of Architecture, Built Environment, and Construction Engineering, and she is collaborating with the Real Estate Center (REC) of Politecnico di Milano. The PhD research aims to integrate sustainability in office buildings' operations by looking not only at energy consumptions, but focusing on users' behaviours.

She is part of the Joint Research Center – PropTech, which is a strategic partnership between REC and real estate companies with the aim to integrate technology into real estate operations. She is also a research member of the Italian PropTech Network (IPN). IPN aims to monitor the digitalization of the real estate industry in Italy, and compare it with other countries.

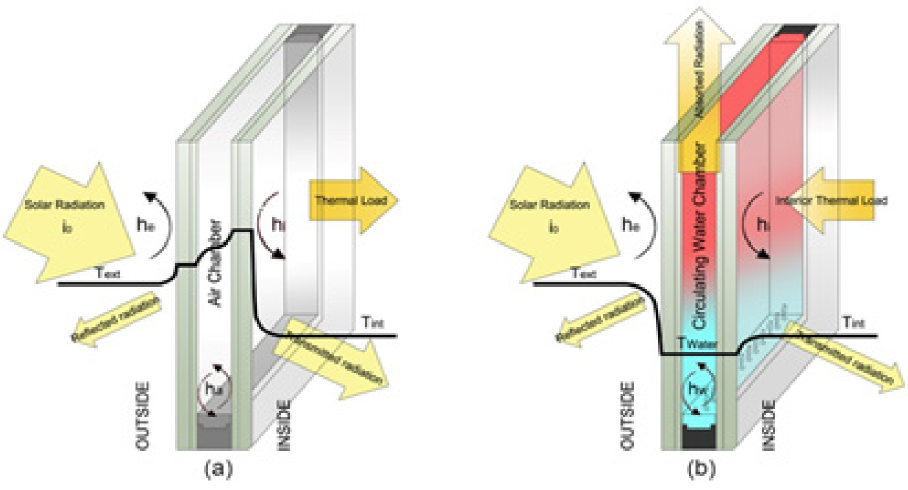
The Effect of Mean Radiant Temperature on Human Comfort. Case Studies in Office Buildings with Glass Facades

Fernando Delamagonzalo
Keene State College, New Hampshire, USA

Abstract:

The crucial reason for the increase in building cooling loads is the solar radiation impinging on glazing. Therefore, optimizing the thermal and visual features of glazing is the most important goal for building design and retrofit. Office buildings with large glazed surfaces suffer overheating issues and lack visual comfort, especially in Mediterranean countries. The Energy Performance Buildings Directive (EPBD) urges practices and materials to develop net-aero and decarbonized buildings by 2050. Therefore, designing passive systems is the first stage to achieving Net Zero Energy objectives. A second step includes integrating active technologies for energy production and management. Water Flow Glazing has been tested over the last decade, and its potential to save energy and provide occupants with better comfort conditions has been proved. The regulations of the cooling systems usually depend on setting a comfortable temperature. Some research articles have stated that increasing the operative temperature from 24ºC to 26ºC can save up to 12% of cooling energy. Radiant walls and ceilings can help increase the operative temperature of indoor air in summer conditions. In addition, the transport of energy by water on large surfaces reduces the difference between water and indoor air temperature, so the peak power demand is decreased.

The figure compares Water Flow Glazing with traditional double glazing. Part of the solar radiation that impinges on traditional glazing is reflected outdoors, and another part is transmitted inside the room. Water Flow Glazing absorbs most of the solar energy, and, in addition, the water chamber can also absorb the internal loads of the room.



In this research, Water-Flow Glazing has been evaluated as a hydronic radiant heating and cooling system component. It showed final energy-saving potential and improved thermal comfort conditions.

Biography:

Fernando del Ama Gonzalo is an Assistant Professor of Architecture at Keene State College, New Hampshire, USA. He possesses a Ph.D. in Architectural Acoustics and spatial perception of Concert Halls from the School of Architecture of Madrid, Spain. He has taught Architecture courses related to construction technology, building physics, acoustics, energy management in buildings, building construction, and architectural design at four universities in four different countries. His research interests are related to energy simulation and monitoring systems in net-zero energy buildings, new materials for regenerative buildings, Active Noise Control, and geometric considerations for the spatial perception of an architectural project. His professional activity as an architect and 3D designer includes more than fifty residential projects, videogame design, and art exhibitions. In addition to the teaching and professional activity, he was the CEO of IntelliGlass S.L., a spin-off company founded by university researchers, architects, and engineers. The company was born to exploit the water flow glazing technology and simulate and design advanced light envelopes for Net Zero Energy Buildings. He participated in the HORIZON 2020 research project InDeWaG Grant number 680441. S

How to Design a Structure as it is Encountering Flow--A Lesson from Ancient Time

Tsung Chow Su
Florida Atlantic University, USA

Abstract:

The Dujiangyan irrigation system engineered by Li Bing in 256 BC in China used porous structures for flow control. The system still operates today. Design paradigms to achieve this unprecedented sustainability are carved on the wall of a nearby monument and are surprisingly modern. According to Li Bing, "when flow is encountered, make structure hollow". Li Bing's design reflects the teaching of Lao Tze, who once taught Confucious: "object making perfect with part missing; yet its use is sustained (The Way, chapter 45, Lao Tze, 600-500 BC). We have used this ancient paradigm for the design of new airfoils. The airfoil has an internal slot and when the angle of attack increases, the foil encounters the flow. The slot, which makes the foil hollow, changes the flow field (Figure 1), increasing the lift and reducing the drag, significantly improving the lift/drag ratio. Other researchers who have used slotted foils in the vertical axis wind turbine design also report significant improvement, with an average torque coefficient increase of 93.4% for slotted blades.

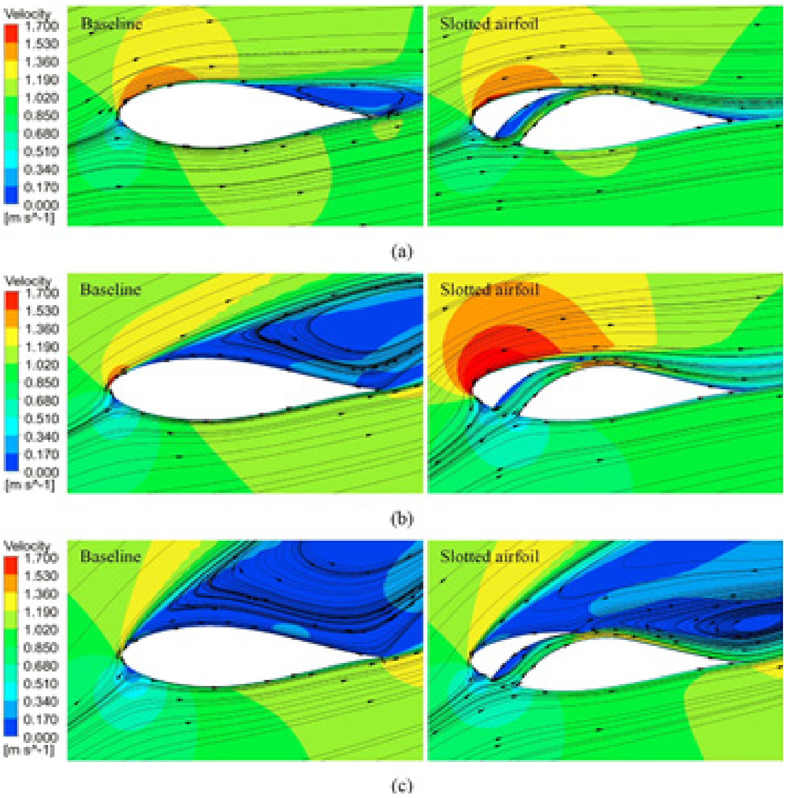


Figure 1. Comparison of baseline and slotted airfoil on streamlines and velocity contour at different angles of attack: (a) 9° (b) 18° and (c) 27°.

Biography:

Tsung-chow Su is a professor of Ocean and Mechanical Engineering of Florida Atlantic University in Boca Raton. Florida, USA. He specializes in the general area of fluid mechanics and dynamics. He received his bachelor's degree in Civil Engineering from National Taiwan University in Taipei, Taiwan, his master's degree in Aeronautics from Caltech in Pasadena, California, and his Doctoral of Engineering Science degree in Ocean Engineering from Columbia University, in New York City. He has taught at Florida Atlantic University since 1982. He has been an affiliated member of Harbor Branch Oceanographic Institution (HBOI) since 2017. His current projects include self-sustained autonomous marine vehicles, vortex switching in flow with multiple outlets, and robotic system for aquaculture farms. His research aims at producing more fish, monitoring the new Arctic, exploring the ocean beneath with autonomous vehicles (AUV), developing subsea morphing structures, learning from the old to make structures resilient, advancing scouring research, making airfoil/hydrofoil resilient/efficient, and opening a new world: nexus of food, energy, water, and environment. He is also very interested in promoting undergraduate research and collaborative research.

His research has been funded by the NSF, ONR, AFOSR, US Coast Guard, USDOT, US Maritime Administration, and NIFA (National Institute of Food and Agriculture.

John Cribbs

Wentworth Institute of Technology, USA

Abstract:

Data is abundant in the construction industry. Identification, timing and management of required stakeholder project data is critical to unlocking potential efficiency increases during the physical construction process. The ability to engage parametric construction graphics and object-based data management tools enables construction teams to visualize, sequence, virtually test and digitally mock-up advanced assemblies, systems and means and methods, resulting in cutting-edge construction advancements. Ultimately, digital disruption enables cross-disciplinary collaboration within construction project teams and provides opportunity for collapsing of design and construction timelines. This research concludes that the basics of the digital disruption process for construction teams centers around the accuracy of geometric data. Once geometric information is trusted through a verification and validation process, additional parametric data can be attached and engaged downstream for the enhancement of labor time utilization during the physical construction process.

Biography:

Dr. John Cribbs is currently the Associate Dean of the School of Management and an Assistant Professor of Construction Management at Wentworth Institute of Technology, in Boston, MA. Dr. Cribbs earned his MArch degree from the Herberger Institute of Design and the Arts and his Ph.D. in Construction Management from the Del E. Webb School of Construction, both located within Arizona State University's flagship campus located in Tempe, AZ (#1 University for innovation in the U.S. according to U.S. News & World Report). His research focuses on modular design and construction techniques, sustainability of the built environment and more specifically, Building Information Modeling (BIM) workflows for enhanced quality control and labor time utilization for coordinated MEP and specialty trade equipment, from design-to-install, in retrofit environments. Before joining Wentworth, Dr. Cribbs served as a Principal at Green Ideas Building Science Consultants, based in Phoenix where he regularly engaged in BIM workflows for design analysis, reporting, and review with the full spectrum of project stakeholders. He has also taught both undergraduate and graduate-level courses in design, construction management, and Building Information Modeling at Arizona State University and the Frank Lloyd Wright School of Architecture (Taliesin West). Dr. Cribbs has presented on both the national and international stages discussing topics related to modular and offsite construction techniques, BIM and other data-centric design/construction workflows, pedagogical models for training the future of the construction industry and research specific findings that are scalable to the industry at large. He is a Leadership in Energy and Environmental Design (LEED) Accredited Professional (AP) in the Building Design and Construction (BD+C), Interior Design and Construction (ID+C), and Operations and Maintenance (O+M) specialties. Additionally, he holds accreditation with the Construction Specifications Institute (CSI), as a Construction Documents Technologist (CDT).

Autonomous Robotic Systems for Concrete Pipe Inspection Using Mapping Techniques and Nondestructive Testing

Sameer Hamoush*[3]
Hossameldin El-Sherif1, Xingguang Li[2], Sun Yi[2] and Ahmed Cherif Megri[3]
[1], [2] &[3] North Carolina A&T State University, USA

Abstract:

The objective of this work is to investigate the use of the combined system of the Husky UGV equipped with the Velodyne LiDAR and a camera to allow for a fully autonomous system for navigating and mapping the underground pipes. The developed system uses the SVM algorithm for assessing the internal condition of the Reinforced Concrete Pipes (RCP). This presentation is to summarize the development of the system by integrating a LiDAR and a Husky robot to perform crack detection and classification algorithm. A bicycle model and controller Automatic navigation mapping algorithm as well as a 3D point cloud are used to develop the model.
As concrete pipes age, they develop cracks which can cause flow contamination, collapses or environmental hazards. This necessitates a maintenance program for early detection of cracks. The most common pipe inspection method is CCTV, that operates by a controlled drone that moves through the pipe manually and performs inspecting. It shows footage of the detected defects. This method however, has some limitations including high cost and time consumption. Multiple studies proposed the use of machine or deep learning models but were mostly concerned with the detection of defects and do not address the network mapping or navigation of the rover through the pipe. Velodyine LiDARs have been commercially available and used for several applications including object extraction from point clouds and topographical mapping. It has not been tested for mapping pipeline networks so far. Autonomous vehicles such as the Husky UGV have also been useful in multiple applications and can be equipped with LiDAR and camera. The underway study shows that the 3D map of the pipe generated by the SLAM system in the RViz is an effective system for underground pipe inspection. The 3D point cloud can be also generated in real-time. It also shows that the system can be used for determining pipe's geometry and its existing internal conditions.

Biography:

Dr. Sameer A. Hamoush is currently a Professor at NC A&T and the Program Director for the NNSA/MSIPP Consortium, guiding the research and educational outreach pursued through the STEAM initiative. His initial focus of research in fracture mechanics and structural rehabilitation of defected elements has expanded over the years to encompass a wider variety of topics such as materials characterization, real-time monitoring, and modeling and simulation to ensure the stability of vital infrastructure in various communities. He has led projects sponsored by the DOE, NNSA, NSF, NCDOT, and the Army of Engineering Corps. He has published numerous articles in scientific journals and has been a speaker at many industry events. As the former Chair of the Civil, Architectural, Agricultural, and Environmental Engineering Department at NC A&T, he led the Department through two successful ABET reviews. He currently focuses his attention on research and advising current faculty and students. He has sponsored and advised the research of many students. He holds a Ph.D. in Civil Engineering from North Carolina State University.

Poster

New Method of Photoactive Cement Preparation

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Abstract:

Photoactive cements are building materials that additionally have self-cleaning properties and are able to clean the air of compounds such as volatile organic compounds or NOx. In recent years, photocatalysis has aroused great interest because it is called reverse photosynthesis. Figure 1 summarizes the mechanisms of photocatalysis and

photosynthesis. Sunlight is needed to initiate both processes. Photocatalysis is called reverse photosynthesis, under the irradiation the number of reactions occur on the surface of the photocatalysts, which lead to, the production of hydroxyl radicals that are able to decompose organic compounds into carbon dioxide and water.

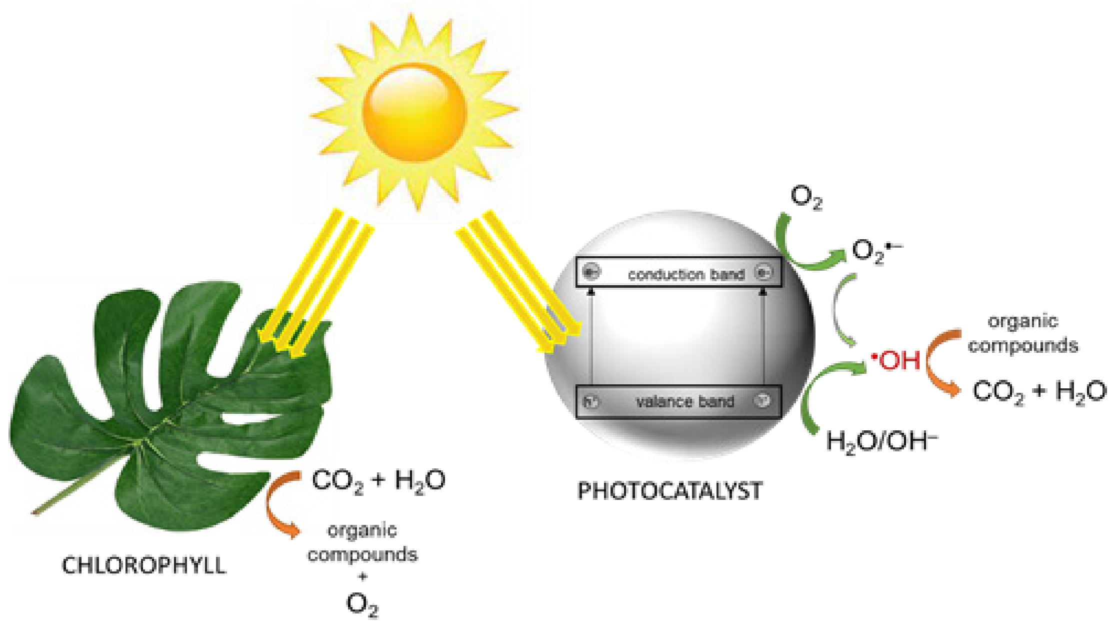

Figure 1. Mechanism of photosynthesis and photocatalysis.

In this study we would like to present the compressing and bending strength and moreover the initial setting time of new photoactive cements. The new materials were prepared by mixing the clinker with temperature 300, 600 and 800°C with semi product of titanium dioxide production by sulfuric method with 1, 3 and 5 weight % in calculating to titanium dioxide. As was expected the addition of photocatalyst to clinker reduced the compressive strength by 8.5 to 29.5 % and reduce bending strength by 1.5 to 15.8%. Unexpectedly, it turned out that in most cases the addition of a photocatalyst prolongs the initial setting time from 45 minutes for unmodified clicker to for example to 71 minutes for clinker modified by addition of 5wt. % of semi product at 300 °C.

The National Centre for Research and Development

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Biography:

Prof. Magdalena Janus works at the Department of Civil and Environmental Engineering, the West Pomeranian University of Technology in Szczecin, Poland. Her research interest includes photocatalysis, water, and wastewater treatment technologies, photoactive building materials, nanomaterials. In 2014 she was awarded by the Ministry of Science and Higher Education of Poland for scientific achievements. She is the co-author of more than 60 research papers published in international journals, results of her studies were present at more than 90 national and international conferences.

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