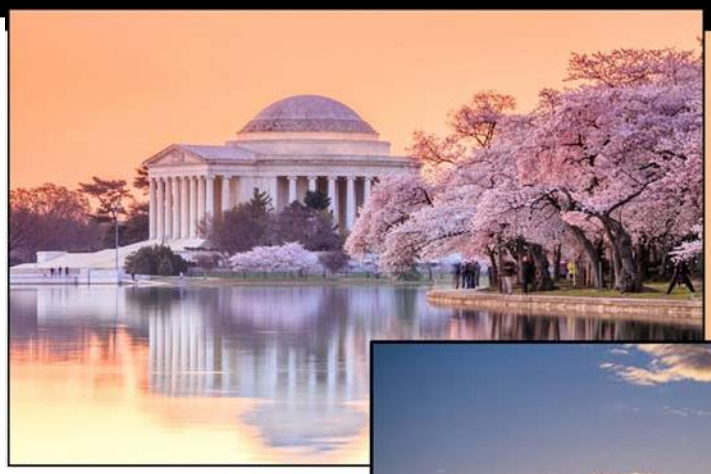
2018

The 8th IACIP Annual Workshop



Next Generation of Transportation Infrastructure

Date: Sunday Jan. 7, 2018
Time: 8:00 AM to 5:30 PM
Room: Marquis Ballroom
Salon 2 (M2) /
Marriott Marquis

The 8th IACIP Annual Workshop Program

Next Generation of Transportation Infrastructure

Date	**Sunday Jan 7., 2018 from 8:00 AM to 5:30 PM**
Location	Marquis Ballroom Salon 2 (M2) / Marriott Marquis, near the Convention Center at 901 Massachusetts Avenue, Washington, D.C.
8:00– 8:30	**Registration, Poster Setup** (Moderator: Dr. Lu Gao) Assisted by: Maoyun Li; Wilson Ren
8:30– 8:35	**Conference Opening by Dr. Hao Wang, Chair of IACIP Annual Workshop** • Welcome everyone • Acknowledge the sponsors of the annual workshop • Introduction of Dr. Chung Wu, President of IACIP
8:35 – 8:45	**Dr. Chung Wu, President of IACIP** • Summary of his term • IACIP outstanding student • Introduction of Dr. Bill Yu, new President of IACIP
8:45 – 8:55	**Dr. Bill Yu, New President of IACIP** • Plan for the new Board of IACIP • Summary of work plan
8:55 – 9:15	**IACIP Keynote Speaker** (Moderator: Dr. Hao Wang) • Dr. Doc. Zhang, Louisiana Transportation Research Center/Louisiana Department of Transportation and Development, "Prediction of In-situ Resilient Modulus of Subgrade for Pavement Design"
9:15 – 10:45	**Session I: Characterization and Modeling of Transportation Material (1)** (Moderators: Dr. Hao Wang) • Dr. Yuhong Wang, Hong Kong Polytechnic University "Asphalt Pavement Aging: A Driving Factor for Long-Term Pavement Deterioration" • Dr. Chundi Si, Shijiazhuang Tiedao University, "Dynamic Behavior of Asphalt Pavement Thermal-Hydraulic-Mechanical Multi-Physical Coupled System" • Dr. Songtao Lv, Changsha University of Science & Technology, "Fatigue Damage Properties of Asphalt Mixture and New Method for Axle Load Conversion" • Dr. Shuaicheng Guo, Michigan Technological University, "Damage Characterization and Thermodynamic Mechanism Simulation of Alkali-Silica Reaction in Recycled Glass Mortar Samples
10:45 – 11:00	**Break and Poster Session**

11:00-12:30	**Session II: Sustainable Asphalt Technologies** (Moderators: Dr. Shenghua Wu) • Dr. Chunying Wu, JSTI Group, "Study on Performance Evaluation and Construction Technology of Foam Asphalt Mixture" • Dr. Kun Zhang, Washington State University ,"Mixture Blending Chart Design and Quasi-Microstructure Analysis of Asphalt Mixtures Containing Reclaimed Asphalt Pavement (RAP)" • Dr. Minghui Gong, Sobute New Materials Co. Ltd., "Multi-Scale Investigation on Properties of Bio-Rejuvenated Asphalt Mixture: from Laboratory Research to Field Application" • Dr. Chao Peng, China University of Geosciences, "Effect of Silane Coupling Agent on Improving the Adhesive Properties Between Asphalt Binder and Aggregate"
12:30 – 1:30	**Lunch Break**
1:30 – 2:00	**Poster Session** (Moderator: Dr. Lu Gao)
2:00– 3:30	**Session III: Characterization and Modeling of Transportation Material (2)** (Moderators: Dr. Xinbao Yu) • Dr. Xue Luo, Texas A&M University, "Kinetics-Based Aging Evaluation of In-Service Recycled Asphalt Pavement" • Dr. Zhi Wang, Zhengzhou University, "Mechanical Properties of Fractured Brittle Material after Grouting Reinforcement" • Dr. Xiong Zhang, Missouri University S&T, "Limitations of Suction-Controlled Triaxial Tests in the Characterization of Unsaturated Soils" • Dr. Wenbo Ma, Xiangtan University , "Study on Transportation System in Deep Sea and Analysis of the Driving Performance of the Mining Collector"
3:30– 3:45	**Break and Poster Session**
3:45 – 5:30	**Session IV: Sustainable Transportation Infrastructure** (Moderator: Dr. Qing Lu) • Dr. Joshua Q. Li, Oklahoma State University, "Exploring Pavement Texture and Surface Friction Using Soft Computing Techniques" • Dr. Xinbao Yu, University of Texas at Arlington, "Laboratory Evaluation of An Attached Hydronic Loop Design for Geothermal Heated Bridge Deck" • Dr. Zhongren Wang, Caltrans, "Caltrans APCS Data Collection and Analysis Experiences" • Dr. Shih-Huang Chen, National Central University, "Permeable Pavement Experience in Taiwan- Build up a Sponge City" • Dr. Hui Li, Tongji University, "Overview of China's Sponge City Initiatives and Permeable Pavement Technology"
5:30-5:35	**Workshop Adjoin** (Moderator: Dr. Bill Yu)

BANQUET

8th IACIP Annual IACIP Workshop Banquet

Sunday Jan. 7, 2018 from 7:00 PM to 11:00 PM

Chinatown Garden (龙之味), 618 H Street, N.W., Washington, D.C.

More information at the end of this brochure

REGISTRATION

1. Professionals with IACIP membership registration only (attending the workshop only and not attending the banquet): $20
2. Students with IACIP membership registration for workshop only: $5
3. Professionals with IACIP membership registration and banquet ticket: $30
4. Students with IACIP membership registration and banquet ticket: $15
5. Banquet ticket only/separately (at workshop or restaurant): $25
6. Complimentary workshop registration and banquet for speakers, representative from sponsors, one student or young professional for each poster, and organizing committees (including student members).

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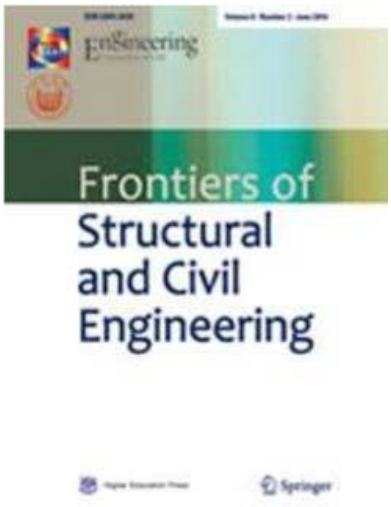

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ABOUT THE WORKSHOP CO-SPONSORS

FSCE Journal (Frontiers of Structural and Civil Engineering, Transaction of Chinese Academic Engineering): http://www.springer.com/engineering/civil+engineering/journal/11709

- Publishes peer-reviewed articles of original contributions on all aspects of structural and civil engineering
- Provides an international forum for the exchange of knowledge and experience on fundamental research and application technologies in structural and civil engineering
- *Frontiers of Structural and Civil Engineering* is an international journal that publishes original research papers, review articles and case studies related to civil and structural engineering. Topics include but are not limited to the latest developments in building and bridge structures, geotechnical engineering, hydraulic engineering, coastal engineering, and transport engineering. Case studies that demonstrate the successful applications of cutting-edge research technologies are welcome. The journal also promotes and publishes interdisciplinary research and applications connecting civil engineering and other disciplines, such as bio-, info-, nano- and social sciences and technology. Manuscripts submitted for publication will be subject to a stringent peer review.
  Originally established in 2007 as *Frontiers of Architecture and Civil Engineering in China*, the journal was renamed *Frontiers of Structural and Civil Engineering* in 2011.The journal is supported by the Chinese Academy of Engineering.

National Central University (Taiwan): http://www.ncu.edu.tw/en

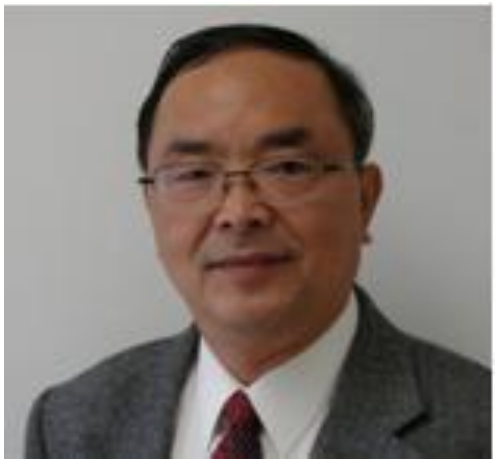
- NCU was founded in 1915 with roots from 258 CE in mainland China.. In 2003, NCU and three other national universities established the University System of Taiwan cooperative partnership. Now NCU is a research-oriented national comprehensive university.
- The university's Taoyuan City campus is situated in the northern part of the island, about 45 minutes from Taipei. The large, green hilltop campus, is some distance away from the busy downtown Zhongli. NCU is only half an hour away from the Taiwan Taoyuan International Airport (TPE), which makes it very convenient for international travel.
- NCU consists of eight colleges: Earth Science, Electrical Engineering and Computer Science, Engineering, Hakka Studies, Health Science and Technology, Liberal Arts, Science, and Management. Each college houses numerous research centers, such as the Center for Space & Remote Sensing Research, Hazard Mitigation & Prevention, Taiwan Economic Development, Biotechnology & Biomedical Engineering, and several boutique-style humanities centers. In total, the eight colleges contain 19 undergraduate departments, 48 graduate institutes, and 38 research centers.

IACIP KEYNOTE ABSTRACT

Prediction of In-situ Resilient Modulus of Subgrade for Pavement Design

Zhongjie "Doc" Zhang, PhD, PE
Pavement & Geotechnical Research Administrator
Louisiana Transportation Research Center/Louisiana Department of Transportation and Development

AASHTO PaveME has adopted the Enhanced Integrated Climatic Model (EICM) to predict the variation of resilient modulus of subgrade soils in a pavement design process. As a local calibration effort, Louisiana Transportation Research Center (LTRC) has collected some field resilient modulus data of subgrade soils in Louisiana to validate such predictions. Shelby tube sampling was conducted on six different roadways to a depth of approximately 8 m beneath the shoulder pavement's base course. The AASHTO T-99 MR test method was used on all samples with an additional 8 specimens being tested with NCHRP 1-28A MR test method. Four soils from Louisiana which were not from the six roadways were also tested and included in the analyses. It was noticed that the original EICM model could not fit the Louisiana's data well due to a reason that has not been explored and discussed. This presentation will discuss this phenomenon and a new modified method as its potential solution.



Dr. Doc. Zhang is the founding president of IACIP. He has over 30 years' practical experiences in the design, construction, maintenance, operation, and research of pavement and geotechnical engineering with respect to highway infrastructures. Dr. Zhang is currently Pavement & Geotechnical Research Administrator at LTRC and has managed over 200 research projects in the pavement and geotechnical areas and authored or co-authored about 95 peer-reviewed journal papers. Dr. Zhang obtained his PhD, MS, and BS from Louisiana State University, Tongji University, and Xian Highway Transportation University, respectively, in 1994, 1984, and 1982.

Dynamic Behavior of Asphalt Pavement Thermal-Hydraulic-Mechanical Multi-Physical Coupled System

Chun-di Si
Professor, Shijiazhuang Tiedao University

As increasing speed and heavy-duty traffic, the premature damage of highway asphalt pavement has become a concern. The objective of this presentation is to propose a systematic approach to simulate the dynamic characteristics of highway asphalt pavement and failure mechanism, along with the common effect of vehicle dynamic load and environmental factors. In the simulation, the asphalt viscoelasticity constitutive equation is established using Burgers model, and the moving load is computed from the tire pressure and area of the tire-pavement contact, the nonlinear control equation of thermal-hydraulic-mechanical coupled field of asphalt pavement is derived, then ABAQUS finite element model of asphalt pavement is built.

In the finite element model, the vertical displacement, vertical stress, longitudinal stress, transverse stress and shear stress of different structure layers are analyzed and computed, which is compared with the single stress field. it shows that with the interaction of water and temperature, the stress change of subbase is little, but shear stress of asphalt layer and base has increased greatly than single stress field, especially in asphalt treated base, the rate of increase is larger, which indicates in hot and rainy summer, the bigger shear force will create rutting and crack which seriously affect the normal performance of road. Field test is carried out in Daguang highway, and the validity of the simulation model is verified. This presentation reveals dynamic response rules of asphalt pavement with common effect of vehicle load and natural environment, which is important to clarify the destructive characteristics and mechanism of asphalt pavement structure, also has important theoretical value and practical significance for the future asphalt pavement design and operation management.

Bio:

Dr. Chundi SI received her Ph.D. degree in Hydraulic Engineering from Tianjin University, and now is a professor in Institute of Transportation Environment and Safety Engineering at Shijiazhuang Tiedao University. Dr. Chundi SI's primary professional and scholarly contributions have dealt with nonlinear dynamics analysis of asphalt pavement and vehicle-road interaction. As the Principal Investigator, Dr. Chundi SI has been leading more than 10 influential research programs, from NSFC and Hebei Province. Dr. Chundi SI has published more than 40 academic papers in national and international journals.

Kinetics-Based Aging Evaluation of In-Service Recycled Asphalt Pavement

Xue Luo
Associate Research Scientist
Center for Infrastructure Renewal (CIR) at Texas A&M University

Reclaimed asphalt pavement (RAP) is a type of material that already suffers long-term aging in the field, so its aging characteristics become prominent since they are closely related to premature distresses and longevity of recycled pavements. While most of investigations of RAP mixtures are carried out in the laboratory, this study focuses on in situ aging of asphalt pavements with RAP overlays. A kinetics-based aging modeling approach is proposed to analyze and quantify long-term field aging of RAP overlays using the Falling Weight Deflectometer (FWD) data and climate data. The kinetics-based approach contains a modulus aging model with kinetic parameters (e.g. aging activation energy) for asphalt mixtures. Eight asphalt overlays are selected with different mixtures (RAP and virgin), thickness (50 mm and 125 mm), and surface preparation (milling and no milling). An asphalt pavement with an overlay has a composite aging process since the aging speeds of different asphalt layers are different. Thus an approach to separate the FWD modulus is developed in order to obtain the actual aging behaviors and properties of the overlay. By applying the kinetics-based modeling to the separated FWD moduli, the aging activation energies of both the overlays and old asphalt layers are determined. It is found that the RAP overlay has the highest aging activation energies and slowest aging rates among the RAP overlay, virgin overlay, and old asphalt layer. It also reveals through the aging activation energy that the thick overlays age slower than thin ones, and the overlays on milled pavements age slower than those placed without milling. These findings are validated using the field performance data of overlay pavement sections.

Bio:
Dr. Luo's research experience includes materials and pavement engineering, geotechnical engineering, and engineering mechanics. Her specialized research has focused on mechanics-based characterization and modeling of pavement materials, multiphysics-coupled modeling of environmental impacts for climate resilient pavements, and optimization of strategies of preventive maintenance for pavement infrastructure. Her expertise relates to various problems in flexible and composite pavements, including fatigue damage, rutting, moisture damage, reflective cracking, top-down cracking, and effect of aging. She has led or participated in research projects that cover a diverse range of subjects in transportation infrastructure, including those sponsored by the NCHRP, FHWA, TxDOT, NDOT, and SWUTC. She has served as the Co-PI for the NCHRP project and Task PI for TxDOT Innovation project. She has authored over 30 scholarly journal and conference articles in prominent peer-reviewed journals and conference periodicals of international circulation. She is the member of American Society of Civil Engineers, Association of Modified Asphalt Producers, International Road Federation, and Association of Asphalt Paving Technologists. She is also the Associate Editor for the ASCE Journal of Transportation Engineering, Part B: Pavements.

Asphalt Pavement Aging: A Driving Factor for Long-Term Pavement Deterioration

Yuhong Wang
Associate Professor, Hong Kong Polytechnic University

The majority of highways worldwide are surfaced with hot-mix asphalt (HMA) pavements. Reconstruction of highway pavements at the end of their lives is not only costly, but also impairs the environment. In Hong Kong, for instance, the reconstruction of the Tuen Mun Rd. (TMR, 15.6 km) was estimated to cost US$ 0.9 billion in 2008. The final costs will be much higher due to the recent escalation of construction costs. Traveler costs due to the 7 years of road closure were estimated to be several times of the construction costs. Production of one ton of HMA consumes approximately 6.35 kg of fuel and generates 20.4 kg of CO2 equivalent, not even considering energy consumption and emission generation during material extraction and transportation. Additionally, more than 70 percent of the demolished HMA is not recycled. These issues affect highway sustainability in multiple dimensions.

The above issues may be alleviated by developing 'long-life' flexible pavements with more than 40 years of life expectancy. "long-life" pavements are found to be the most sustainable solution for heavily trafficked roads. Significant social and environmental benefits follow if longer pavement lives can be realized. Current long-life flexible pavement practice commonly focuses on structural design for the control of critical strains or cumulative distress. Recent studies, however, found that asphalt binders throughout the HMA layers in some field pavements had aged severely by oxidization. Aging stiffens HMA but makes it brittle and susceptible to cracking and fracture. Aging also affect asphalt pavement's self-healing capacity. Therefore, there is a critical need to: 1) assess binder aging severity in existing HMA pavements, 2) assess the binder aging effects on the critical performance-related properties of HMA mixture, and 3) find effective aging-control solutions. This presentation discusses recent advances made in these topics.

Bio:

Dr. Wang Yuhong is an associate professor at the Civil and Environmental Engineering Department, Hong Kong Polytechnic University, where he served as an assistant professor from December 2010 to June 2016. He is a registered professional engineer in the United States. After he received his PhD degree from the Civil Engineering Department at University of Kentucky in 2003, he worked at the Kentucky Transportation Research Center as a research Engineer, at Lawrence Technological University as a tenure-track assistant professor, and at East Carolina University as a tenure-track assistant professor. Dr. Wang's main research areas include the structural design of flexible pavement, asphalt pavement materials, and pavement construction and management. Dr. Wang led and participated in more than 30 road-related research projects, including the durability of the asphalt pavement, flexible pavement design of Hong Kong, road maintenance decision-making and optimization methods, environmentally-friendly integrated porous pavement systems. Dr. Wang published more than 60 journal papers, two monographs as co-author, and has held positions in a number of academic groups.

Effect of Silane Coupling Agent on Improving Adhesive Properties between Asphalt Binder and Aggregate

Chao Peng
Associate Professor, China University of Geosciences, Wuhan

The moisture damage has greatly shortened the service life of the pavement. A main way to delay the moisture damage process is to improve the adhesion between asphalt binder and aggregate. Adding anti-stripping agent is one of the most effective methods to improve the adhesion between asphalt binder and aggregate, and silane coupling agent (SCA) is a typical anti-stripping agent. We measured the contact angles of the aggregates treated with each SCA, respectively. The surface energy of each sample as well as the adhesion work and spalling work with the asphalt were calculated. Then the tensile stresses between asphalt and aggregate before and after immersion in water were measured. Finally, the interfacial interactions between SCA and the aggregates were studied by scanning electronic microscopy (SEM) and Fourier transform infrared (FTIR). The surface energy results show that the SCA can significantly reduce the surface energy of the aggregate and improve the adhesion work/spalling work between the aggregate and the asphalt. The tensile test results show that the tensile stress of the aggregate modified with SCA before immersion was increased by 58.34%, and the tensile stress after the immersion was increased by 154.61%.

Bio:
Dr. Chao Peng is an associate professor at the Faculty of Engineering in China University of Geosciences, Wuhan. He is currently a visiting scholar of the Civil and Environmental Engineering department in Michigan Technological University. He received a bachelor's degree from Wuhan University of Technology in 2008, a master's degree from Loughborough University in 2011 and a doctoral degree from Wuhan University of Technology in 2015. His main interests are focused on the application of polymers in modification of asphalt binder, development of environmental and sustainable de-icing additives for asphalt pavement and service life assessment of recycled asphalt pavement.

Study on Performance Evaluation and Construction Technology of Foam Asphalt Mixture

Chunying Wu
Deputy Chief Engineer, JSTI Group, Nanjing, China

This presentation investigates the mix design, construction technology and performance verification of Warm Foam Mix Asphalt Mixture (WFMAM), concerning freezing climate in winter time of Jiangsu Province. This research proposes the quality standard of raw material, the design method of warm foam mix asphalt mixtures, as well as acceptance criteria. Besides, a test section was paved with WFMAM in #104 National Highway of Xuzhou. Consequently, warm foam mix asphalt mixtures demonstrate noticeable advantages over conventional hot mix asphalt mixtures, especially in economical and environmental aspects. For instance, each tonne of warm mix asphalt mixtures can save 1.21 kg heavy oil and meanwhile reduce energy consumption as much as 18.8%. Besides, harmful gas emissions can be greatly diminished during the mixing process of asphalt mixtures. Specifically, the emissions of carbon dioxide and nitrogen oxide can decrease by 74.6% and 53.8%, respectively, which helps relieve greenhouse effect.

Bio:
Wu Chunying, deputy chief engineer of JSTI GROUP in highway field, holds the Doctor degree of solid mechanics major from Shanghai Jiao tong University. As a senior engineer, Wu is experienced in theoretical study and engineering practice referring to these fields such as application of waste resource in highway, asphalt pavement material and structure, asphalt pavement maintenance and technology of asphalt pavement on concrete bridge deck.

As the technical director, Wu directed and completed the project “research & development and industrialization of high performance waste tire rubber modified asphalt and its engineering application” supported by the special fund of Jiangsu scientific and technological achievements transformation. The project finally formed the rubber modified asphalt technology system suited to national conditions by importation, digestion and innovation of abroad advanced technology aiming to relieve the black pollution caused by waste tire. In the project, the high viscosity and high elasticity rubber modified asphalt and its standard were developed, and the specialized production equipment was first developed over the world. The achievement has been applied in more than 200km expressway construction and maintenance. Moreover, in recent 5 years, Wu has directed and completed more than20 scientific and technological projects such as “research on maintenance technology and decision support system of Jiangsu highway”, which have been awarded such 20provincialsas third prize of Jiangsu Science and Technology Progress Prize. Also, more than 10 papers were published including 1 SCI and 3 EI. Besides, the monograph New Materials and New Technology Applied in Guizhou Province Highway Asphalt Pavements has been published with Wu as the first author. In addition, 11 invention patents and 9 utility model patents were authorized, and 2 local standards of Jiangsu Province were worked out.

Mixture Blending Chart Design and Quasi-Microstructure Analysis of Asphalt Mixtures Containing Reclaimed Asphalt Pavement (RAP)

Kun Zhang
Clinical Assistant Professor, Washington State University

The use of reclaimed asphalt pavement (RAP) in asphalt mixtures contributes to sustainable construction, since the RAP can be used as a substitute for virgin binder and virgin aggregate. However, the aged binder in RAP can increase the stiffness or brittleness of RAP mixtures, resulting in compromised resistances to fatigue and thermal cracking. In order to alleviate the stiffening effect of the RAP binder, a softer virgin binder is selected and its performance grade (PG) is determined based on the binder blending chart, when more than 25 percent RAP is used in an asphalt mixture. This binder blending chart is developed based on the assumption of the fully-blending between RAP and virgin binders, which has been questioned by several studies. Thus, a more representative practice to select the appropriate virgin binder and design a RAP mixture shall be based on the performance of RAP mixtures or the associated 'mixture blending chart'. Moreover, the nonuniform distribution of RAP materials in asphalt mixtures can affect the performance of RAP mixtures in asphalt overlays. In this context, this study discusses the development of mixture blending chart based on the dynamic modulus values of RAP mixtures. Two blending models based on the rule of mixtures, including Voigt model and Reuss model, were examined to develop the mixture blending chart equation. The quasi-microstructure analysis of RAP mixtures that can quantify the RAP distribution and predict the stiffness of RAP mixtures is proposed. The findings from this study are that the blended dynamic modulus values of a RAP mixture were found to follow the lower bound of the blended modulus between virgin mixture and 100% RAP mixtures, which is specified by the Reuss model. The current binder blending chart may overestimate the modulus of a RAP mixture. This leads to the selection of an unexpected softer virgin binder and result in lower rutting resistance of the RAP mixtures with more than 25 percent RAP, which has been reported in the literatures.

Bio:

Dr. Kun Zhang is a Clinical Assistant Professor at the Department of Civil and Environmental Engineering and the Co-director of Washington Center for Asphalt Technology (WCAT) at Washington State University (WSU). His feathered research interests and efforts focus on the advanced numerical modeling for particulate systems processing, production, and mechanical behaviors of asphalt mixtures, including the use of computational fluid dynamics (CFD), discrete element method (DEM), and finite element method (FEM); and optimization recycling of waste pavement materials and industrial by-products in asphalt materials, including RAP/RAS, waste carbon fiber composite materials, and waste cooking oil for bio-binder development, etc. He has served as PI/Co-PI for serval projects funded by various agencies, including FHWA, DOTs, and industrial companies.

Multi-Scale Investigation on Properties of Bio-rejuvenated Asphalt Mixture: from Laboratory Research to Field Application

Minghui Gong
R&D Engineer, Sobute New Materials Co. Ltd.
State key laboratory of high performance civil engineering materials

Research on recycling asphalt mixture using bio-rejuvenator has gained great attention nowadays. Present presentation mainly covers three key aspects regarding practical application of bio-rejuvenator: fabrication of bio-rejuvenator, characterizations of bio-rejuvenated asphalt binder's rheological and chemical properties, and investigation on the pavement performance of bio-rejuvenated asphalt mixture. In the first step, properties of bio-oils from different sources were analyzed and one of them was selected for fabrication of bio-rejuvenator due to its high compatibility with asphalt and potential excellent rejuvenation ability. Afterwards, bio-rejuvenator was used to restore the properties of aged asphalt binder. Both rheological and chemical tests were conducted to characterize the properties of bio-rejuvenated asphalt binder. It was found that bio-rejuvenator can somehow enhance aged asphalt's anti-fatigue and anti-cracking abilities. Chemical indexes proved that aged asphalt's properties were recovered through bio-rejuvenation. In the end, pavement performances of bio-rejuvenated asphalt mixture were checked. Test results showed that bio-rejuvenator enhanced recycled asphalt mixture's anti-cracking, anti-moisture and anti-fatigue abilities. Besides, a trial section was constructed in S325 in Jiangsu Province. Overall, both binder and mixture test results in the laboratory and field show that performance of bio-rejuvenated materials are fairly good.

Bio:

Dr. Minghui Gong is a R&D engineer in the State Laboratory of High Performance Civil Engineering Materials. He received his B.S., M.S. and Ph.D degrees from Southeast University. He visited Purdue University as a visiting Ph.D student for one year. Under the supervision of Prof. Jun Yang, he conducted several researches including development of bio-binder and bio-rejuvenator, investigation on asphalt's microstructures and analyzing the micro-mechanical properties of recycled asphalt mixture. He is the main investigator of several provincial and ministerial scientific research projects. He has published 5 SCI papers as first author and won the first prize in a poster section in workshops of International Association of Chinese Infrastructure Professionals (2016).

Fatigue Damage Properties of Asphalt Mixture and New Method for Axle Load Conversion

Songtao Lv
Associate Professor, Changsha University of Science & Technology

The stiffness and strength characteristics of asphalt mixture are effected by loading speed and temperature significantly. The influence of loading speed on fatigue performance of asphalt mixture has been considered rarely. Axle load conversion is usually based on the Miner's linear damage criteria, which does not consider the influence of damage history. The strength tests under different loading speeds were conducted. A series of laboratory tests of fatigue were carried out in different stress ratios and different loading frequencies. The test results show that the effect of loading speed on strength of asphalt mixture is obvious, and the relationship curve can be fitted by power function. The intersection of fatigue curve characterized by nominal stress ratio and abscissa axis is much larger than 1, which cannot reflect the characteristics of strength failure. While the fatigue curve characterized by real stress ratio can be extended to the strength failure point, which reveals the relationship between strength failure and fatigue failure. The normalization was realized for the fatigue equations in different loading frequencies by introducing the real stress ratio. The fatigue damage evaluation curves show that the fatigue damage is nonlinear. A new Axle Load Conversion method based on the nonlinear damage model was proposed. It can reflect the influence of loading history and damage history on axle load conversion at the same time.

Bio:
Dr. Songtao LV is an associate professor of School of Traffic and Transportation Engineering, Changsha University of Science & Technology. His research interests are the design theory & method of durable asphalt pavement and the fatigue damage properties of asphalt mixture. Dr. LV has received more than 10 influential research programs, from National Nature Science Foundation of China, Doctoral Scientific Fund Project of the Ministry of Education in China and Research Projects of Ministry of Transport in China etc. Dr. LV has published more than 40 academic papers in high-level national and international journals. He also won some awards, such as the Progress Award in Science and Technology of China, the Progress Award in Science Technology of China Highway & Transportation Society and the Young Talents in Science and Technology in Ministry of Transport of China etc.

Damage Characterization and Thermodynamic Mechanism Simulation of Alkali-Silica Reaction in Recycled Glass Mortar Samples

Qingli Dai
Associate Professor, Michigan Technological University

This study first characterized ASR damage inside the mortar samples containing reactive glass aggregates with/without Supplementary Cementitious Materials (SCMs). The length change tests were first conducted to examine the expansion potential based on the ASTM C1260 standard. This study further applied the optical microscope and Scanning Electron Microscope (SEM) to characterize the ASR damage in glass aggregate mortar samples with/without Supplementary Cementitious Materials (SCMs). In addition, the dynamic micron X-ray CT was conducted to monitor the damage development process.

In addition, this study applied the kinetic theory to investigate the silica dissolution process and thermodynamic model to analyze the formation of ASR gel. The model reactant tests were first conducted to study the silica dissolution and gel formation in the simulated pore solution system at different temperature. The kinetic model by considering the influence of temperature, ion concentration and surface area on reaction rate was first built and the model parameters were back calculated based on the model reactant test. The thermodynamic analysis by incorporating the kinetic model was then conducted with the GEMs method and the simulated pore solution changes with time were compared with the measured ion concentration results from model reactant tests through ICP-OES methods.

These study results will help to understand the ASR deterioration mechanism of glass aggregate in mortar samples. These also provide some information on early ASR damage mitigation with added supplementary cementitious materials such as glass powders. The kinetic and thermodynamic study can help to understand mechanism of alkali-silica reaction for the possible damage mitigation methods.

Bio:

Dr. Qingli Dai currently serves as associate professor in Department of Civil and Environmental Engineering at Michigan Technological University. Her primary professional and scholarly contributions have dealt with material design, characterization, test and analysis for sustainable civil infrastructure applications, especially on self-healing abilities, damage mechanism diagnosis and multi-physical interactions in asphalt mixtures or concrete. Dr. Dai has been one of the principle investigators of research projects funded by National Science Foundation and State Department of Transportation. Her group has investigated the performance and behavior of asphalt mixtures, chemo-physical characterization, fracture and self-healing construction materials, Non-destructive ultrasonic and acoustic techniques, internal damage diagnosis and simulation in concrete, actuator design and wind-structure interaction for vibration reduction. She has authored and co-authored more than 100 peer reviewed papers. She is an associate editor for ASCE Journal of Materials in Civil Engineering. She is a member of ASCE granular material committee, bitumen committee, pavement committee, and geophysics committee.

Properties of Fractured Brittle Material after Grouting Reinforcement

Zhi Wang
Associate Professor, School of Mechanics & Engineering Science
Zhengzhou University

As a large amount of infrastructure begins to enter service period, pavement repair and regular maintenance become a hot research issue discussed by Chinese scholars. One of the main concerns is the mechanical properties of the infrastructure after repair. This presentation will discuss the static and fatigue mechanical properties of fractured rock and cement-based material after grouting reinforcement. Pure and modified epoxy was introduced to grout the fractured specimens. Uniaxial compression and three point bend experiments were carried out to test the compression and bending strength. By comparing the failure modes and stress distribution before and after grouting reinforcement, the grouting reinforcement effect and failure mechanism were studied. The test results show that the distribution of cracks and the mechanical properties of the grouting material were the main factors to the failure mode. High-frequency (50Hz-100Hz) fatigue behavior of uniaxial compression and three point bend specimen was investigated. An inverted S-shaped model for nonlinear fatigue damage had been proposed to represent the process of damage evolution. The three-parameter Weibull distribution function was used to fit the test data of high frequency fatigue life. The test result was in good agreement with the theoretical model.

Bio:
Dr. Zhi WANG is an associate professor in the School of Mechanics & Engineering Science at Zhengzhou University. Dr. Wang is currently working with Dr. Qingli Dai and Dr. Zhanping You as a visiting scholar at Michigan Technological University. Dr. Wang's primary professional and scholarly contributions have dealt with rock and concrete fracture mechanics, especially on fatigue and damage mechanism. He has published over 40 technical papers including 30 journal articles and other 10 conference papers. Dr. Wang has been a Principle Investigator of several research projects funded by the National Natural Science Foundation of China. Other sponsors of his research program include the Foundation for University Key Teacher by the Henan Educational Committee and Educational Commission of Henan Province of China. Some of his other achievements include monographs, patents and software copyrights.

Limitations of Suction-Controlled Triaxial Tests in the Characterization of Unsaturated Soils

Xiong Zhang
Associate Professor, Missouri University of Science and Technology

Suction- controlled triaxial (SCTX) tests are considered to allow researchers to investigate influences of individual variables on unsaturated soils under specified stress path with controls of stresses, pore water and air pressures. In the past fifty years, SCTX testing method has been established as a standard approach to characterize constitutive behavior for unsaturated soils. Most important concepts for modern unsaturated soil mechanics were developed upon results from the SCTX tests. However, SCTX tests require sophisticated and therefore expensive equipment. It is usually laborious and time-consuming. It is not uncommon to take 3-5 years to fully characterize one unsaturated soil. Due to the lengthy testing process, the test results, especially for the water content change, are not reliable or simply not available. As a result, SCTX tests cannot be justified for ordinary engineering projects. In addition, our recent findings indicated that the SCTX tests in fact cannot control the stress path of an unsaturated soil during loading. This incapability, in combination with complicated loading/collapse behavior of unsaturated soils, makes the long-accepted Divide-and Conquer approach for characterizing unsaturated soil behavior unacceptable. This presentation discusses the limitations of the SCTX tests in the characterization of unsaturated soils. A possible solution to the problem was proposed based on a newly developed modified state surface approach (MSSA). It is proposed that results from undrained (constant water content) tests be used to replace the SCTX tests for the constitutive modeling purpose. Not only can it produce theoretically more correct results with much simpler testing equipment, but also significantly reduce the testing time (from 2-3 months/test to 4-5 hours/test). This can potentially leads to extensive applications of unsaturated soil mechanics in routine engineering projects.

Bio:

Dr. Xiong Zhang, P.E., is an associate professor in the Department of Civil, Architectural and Environmental Engineering at the Missouri University of Science and Technology (Missouri S&T). Before he joined in the Missouri S&T, he worked in the University of Alaska Fairbanks and University of Cincinnati for 10 years.

Dr. Zhang has been teaching and conducting research in the field of geotechnical engineering since 1992. His studies focus on development of advanced laboratory techniques to rapidly characterize geomaterials, constitutive modeling coupled hydro-mechanical behavior of unsaturated soils, numerical modeling of climate-soil-structure interaction, slope stability analysis, soil stabilization and ground improvement, and frozen ground engineering. He was one of the two speakers of ASCE Geo Institute Unsaturated Soils Committee Webinar on "Introduction to Constitutive Modeling of Unsaturated Soils." He just received the 2016 International Innovation Award in Unsaturated Soil Mechanics within the International Society for Soil Mechanics and Geotechnical Engineering.

Study on Transportation System in Deep Sea and Analysis of the Driving Performance of the Mining Collector

Wenbo Ma, Associate Professor
College of civil engineering and mechanics, Xiangtan University

Currently the transportation system in deep sea has attracted the attention from both academia and industry due to the increasing demand on the metallic minerals and the abundant mineral resources existed in the deep-sea sediment. Compared to the traditional transportation system, the deep sea transportation system will face with the deep-sea sediment and it can attach to the collector due to the adhesion force, which can reduce the effective shearing thickness for track tooth and the traction force. This problem needs to be resolved to enhance the deep mining efficiency.

This study analyzed the adhesion force between the track tooth and deep-sea sediment with the atomic force microscopy. The corrosion-resistant Titanium material was chosen to represent the track tooth, which has been widely used for mining collector manufacturing. The cylinder sample with 1 cm diameter and 5 cm height was first prepared and then surface was detailed polished with an abrasive finishing machine to obtain certain surface roughness. Six types ofsamples with different surface roughness were prepared in this study, including the 20, 30, 60, 70, 90 and 100 nm type. The surface roughens of the prepared Titanium cylinder samples were first examined with the microscope and analyzed through image analysis software to guarantee that the designed surface roughness had been achieved. Then the adhesion bonding strength between deep-sea soil particle and Titanium sample was measured using the phase mode with 1 Hz scanning frequency. The results demonstrated the adhesion force will first decrease with the surface roughness when roughens is lower than 70 nm. When the surface roughness reach above 70 nm, the adhesion force will increase with the surface roughens. An adhesion force model by combing the Hertz and JKR contact theory was further built. The adhesion force and energy between soil spherical particle and Titaniumsurface with different roughnesswere then analyzed. The built micromechanical model can well explain the AFM measured relationship between adhesion force and surface roughness. The obtained roughness threshold can help to the design optimization for mining collector to decrease the adhesion force and enhance its movability and mining efficiency.

Bio:

Dr. Wenbo Ma currently serves as associate professor in College of civil engineering and mechanics at Xiangtan University and visiting scholar at Michigan Technological University as. He gained his Ph.D. from Central South University in China. His research mainly involves macro and micro properties of soil, especially on micro adhesion and mechanism of soil to metals, rheological properties of soils, and damage mechanism diagnosis. Dr. Ma has been the principle investigators of research projects funded by National Natural Science Foundation of China and the Key Research and Development Plan of Hunan Province. He has authored and co-authored more than 13 peer reviewed papers. He plans to focus on the adhesion and rheological mechanics of soil and civil materials for improving their performance.

Laboratory Evaluation of an Attached Hydronic Loop Design for Geothermal Heated Bridge Deck

Xinbao Yu, Associate Professor
Department of Civil Engineering, University of Texas at Arlington

Bridge deicing is critical to ensure roadway safety, mobility, and productivity. However, the current deicing methods for bridge decks are energy intensive, corrosive to the bridge itself, and/or dangerous to the environment. Alternatives are heated bridge deck technology. Among them, geothermal heated bridge decks gains popularity in recent years because it harnesses shallow geothermal energy, a readily available all year around renewable energy source. Exiting geothermal heated bridge decks are designed for new bridges where the hydronic loops are imbedded inside the bridge deck during construction of the bridge. Due to the vast majorities of the existing bridges, a new geothermal heated deck with attached hydronic loops is presented in this presentation. This hydronic loops are attached to the bottom of a bridge deck and encapsulated inside geofoams. A model heated bridge slab was designed and fabricated in the laboratory. The developed heated bridge slab was tested in an environmental chamber under various environmental conditions. Test results show that this heated bridge deck allows for efficient heat transfer to the bridge deck surface for deicing. The designed heated bridge deck can be deployed by retrofitting existing bridges.

Bio:
Dr. Xinbao Yu is currently an associate professor at the University of Texas at Arlington. He obtained his Ph.D. degree in civil engineering in 2009 from Case Western Reserve University. Before joining UTA, Dr. Yu worked as a research associate at Louisiana Transportation Research Center (LTRC). Dr. Yu's research areas include geothermal energy applications, deep foundations, bridge scour, and soil sensors. Dr. Yu is currently working as the PI on the geothermal bridge deicing project founded by Texas Department of Transportation. Dr. Yu is a member of the TRB Committees AFP20 and AFP60 and Geo-Institute Technical Committee on unsaturated soils and Scour and Erosion.

Exploring Pavement Texture and Surface Friction Using Soft Computing Techniques

Joshua Q. Li
Assistant Professor, Oklahoma State University

Pavement friction and texture characteristics are important aspects of road surface safety. Despite extensive studies conducted in the past decades, the relationship between pavement texture and surface friction has not been fully understood. This presentation implements two soft computing techniques to investigate the application of pavement texture data for skid resistance and pavement safety analysis. First, pavement texture and friction data are collected in parallel at various locations via a portable ultra-high resolution 3D laser scanner and a Dynamic Friction Tester (DFT). The texture data are separated into macro- and micro-scale with a pre-designed Butterworth Filter. The top portion of 3D pavement surface with different simulated penetrating depths is evaluated to identify the critical depth of texture that is highly relate to pavement friction performance. Subsequently, the Total Energy (TE) of surface at the critical depth is calculated using discrete wavelet transform as the macro- and micro-texture indicators, and the relationship among DFT surface friction different measurement speeds and texture indicators is developed. The result indicates that pavement micro-texture contributes much significantly than macro-texture at low speed while both macro- and micro-texture are significant at high speed for pavement friction. Second, deep learning (DL), the fastest-growing technique in machine learning, has been implemented to explore pavement texture and friction. High speed texture profiles and grip tester friction data are collected simultaneously on High Friction Surface Treatment (HFST) sites including various types of lead-in and lead-out pavement sections distributed in 12 states. FrictionNet, a Convolutional Neural Network (CNN) based DL architecture, is developed to pavement predict friction levels using texture profiles. This architecture is composed of six layers including two convolution layers, three fully connected layers, and one output layer, with 606,409 tuned hyper-parameters. 50,400 pairs of texture and friction data sets are employed for training, while 12,600 pairs for validation and testing. The input data of the FrictionNet is the spectrogram of the original texture profile at every meter, and the output of FrictionNet is the friction levels ranging from 0.2 to 0.9 in 0.1 intervals. The FrictionNet achieve 99.99% accuracy for training and 90.63% for validation and testing. The result demonstrates the potential of using highway speed non-contact texture measurements for pavement friction evaluation.

Bio:
Dr. Qiang "Joshua" Li, is currently an Assistant Professor at Oklahoma State University and has been a project engineer at Applied Pavement Technology Inc. Dr. Li has more than 15 years of experience in pavement design, automated condition evaluation, roadway safety analysis, and asset management.

Caltrans APCS Data Collection and Analysis Experiences

Dr. Zhongren Wang
Office of Pavement Management, Caltrans

Automated Pavement Condition Survey (APCS) becomes a necessity of pavement condition monitoring following the requirements of the Moving Ahead and Making Progress in the 21st Century (MAP-21) Act. In this presentation, the Caltrans APCS data collection and analysis experiences will be presented. The topics covered range from data definition, collection methodology, performance measures, to data quality control and assurance.

Bio:
Dr. Zhongren Wang is Chief, Office of Pavement Management in the California Department of Transportation (Caltrans). His areas of expertise include pavement management, traffic operations and management, and intelligent management systems. A registered Civil Engineer and Traffic Engineer in the State of California, Dr. Wang has more than 25 years of experiences in project development and management, program administration, and academic teaching and research. Dr. Wang serves on four standing Committees of the Transportation Research Board (TRB). He also serves as panelists for multiple National Cooperative Highway Research Program (NCHRP) research projects. Dr. Wang published more than 30 journal papers and book chapters in various refereed journals and proceedings. He is now an associate editor of the International Journal on Transportation Science and Technology. Zhongren is a member of the Institute of Transportation Engineers.

Dr. Wang earned his Ph.D. degree from the University of Tennessee, Knoxville, his M.Sc. degree from the National University of Singapore, his M.Sc. and B.Sc. degrees from Tongji University. All degrees are in Transportation Engineering.

Permeable Pavement Experience in Taiwan- Build up a Sponge city

Shih-Huang Chen
Associate Professor, National Central University

The Taiwan annual accumulates rainfall is closing to 2,500 mm. Under the global warming influence, and flood is very popular on the urban area. In 2014 May 21th, the one day accumulates rainfall in Taipei city is over 243 mm, and broken the 117 year historic record. The traditional drainage system of city is insufficient to deal with the sudden huge rainfall, and it is time to find some approach to solve or reduce the frequency of flood. The Ministry of Interior Construction and Planning Agency, Taiwan, was tried to make a permeable specification and some test road in Taiwan. The challenge of permeable pavement is how to consider the permeable capacity and pavement structure at the same time. The traditional pavement structure design is try to prevent the water into pavement structure; the concept of permeable pavement is total different, the water could run through or contain in base or subbase layer, and the pavement should offer enough deformation resistance of heavy loading vehicle. The study adopts AASHTO pavement structure design and the permeable pavement guideline of Japan Road Association to design the first permeable pavement test road. The permeable pavement of test road could endure rainfall 83mm/hr under heavy traffic loading condition. After 3 year performance evaluation, the permeable pavement surface and structure condition is still excellent, and only the permeable coefficient is go down. According to inspection of field core specimen, only the air void of the 2 cm depth from surface was block or densification, the best maintenance is milling the 2 cm and repaving the top layer. Based on above, the permeable pavement could be used in heavy loading and reduce the chance of urban flood in Taiwan.

Bio:
Dr. Chen is Associate Professor at Dept. of Civil Engineering, National Central University and President of The Chinese Society of Pavement, Taiwan (R.O.C.). Dr. Chen's research areas include: The properties of Polymer Modified Bituminous; Superpave; Stone Matrix Asphalt (SMA) design and construction; Porous Asphalt (PA) design and construction; Recycle material; and Road test. Dr. Chen obtained his PhD from National Central University in 2013.

Overview of China's Sponge City Initiatives and Permeable Pavement Technology

Hui Li, Professor
College of Transportation Engineering, Tongji University
Associate Director, Transportation Research Institute at Tongji University

China's Spongy City National Plan was initiated in 2013 as the urban stormwater runoff management strategy to reduce flooding risk, mitigate water pollution and reuse rainwater resource. This presentation is to give an overview of the China's Spongy City National Plan, including concept, policy, and technology system. An introduction to permeable pavement technologies and its potential applications in Spongy Cities will be also presented as well as the issues and research needs associated to permeable pavement.

Bio:
Dr. Hui Li is Professor in the College of Transportation Engineering at Tongji University, Shanghai, China with support from "China 1000s Talent Program". Dr. Li is a registered Professional Engineer in the State of California. He completed his Ph.D. in Civil and Environmental Engineering at University of California Davis. He holds a B.S. in Civil Engineering and a M.S. in Highway and Railway Engineering from the Southeast University, Nanjing, China. Dr. Li also holds a M.S. in Environmental and Resource Economics from University of California, Davis. Dr. Li's research interests include sustainable and resilient transportation infrastructure, sustainable development in built environment, environmental impact assessment, life cycle assessment, and numerical modeling and simulation. Dr. Li has authored or co-authored more than 60 publications and three patents. Dr. Li is member in TRB Committee of Environmental Analysis in Transportation (ADC10), ACI Committee of Sustainability of Concrete (ACI 130) and Pervious Concrete (ACI 522), International Society for Weigh in Motion (ISWIM), RILEM Committee of Engineered Healing of Asphalt Concrete (EHA), ASCE Committee of Transportation & Development Institute, International Association of Life Cycle Civil Engineering (IALCCE), and Association of Environmental and Resource Economists (AERE).

List of Posters by Students

1. Title: Enhanced Permeable Asphalt Pavement with Recycled Cured Carbon Fiber Composite Material (CCFCM)
Presenter: Justin Lim
Advisor: Dr. Kun Zhang
University: Washington State University
Email:justin.y.lim@wsu.edu

2. Title: Feasibility analysis of integrating renewable energy resources and electric vehicles into electric grid
Presenter: Jiale (Jerry) Li
Advisor: Xiong (Bill) Yu
University: Case Western Reserve University
Email: jxl780@case.edu

3. Title: Use of Reclaimed Asphalt Pavement Aggregates in Portland Cement Concrete: A Feasibility Study for Pavement Applications
Presenter: Xijun Shi
Advisor: Dan Zollinger and Anol Mukhopadhyay
University: Texas A&M University
Email: jeffshixijun@tamu.edu

4. Title: High Temperature Performance Evaluation of Bio-asphalt Based on Multiple Stress Creep Recovery Test
Presenter: Junfeng Gao
Advisor: Hainian Wang and Zhanping You
University: Chang'An University
Email: junfenggao@126.com

5. Title: Lab Testing and Modeling of Asphalt Mixtures Compaction with Selected Coarse Aggregates Shapes
Presenter: Fangyuan Gong
Advisor: Zhanping You and Yu Liu (Co-advisor)
University: Chang'an University
Email: fgong1@mtu.edu

6. Title: Study on Bacteria-Based Self-Healing Concrete
Presenter: Xijin Zhang
Advisor: Xiong (Bill) Yu
University: Case Western Reserve University
Email: xxz677@case.edu

7. Title: Review of 3D Printing of Concrete in Construction: Potentials and Challenges
Presenter: Jiajie Hu
Advisor: Xiong (Bill) Yu
University: Case Western Reserve University
Email: jxh919@case.edu

8. Title: Developing Mixed-Effects Logistic Regression Model for the Maintenance Decision of Pavement Warranty Program
Presenter: Xiaohua Luo
Advisor: Feng Wang
University: Jackson State University
Email: xiaohua.luo@students.jsums.edu

9. Title: Numerical Modeling of Swelling Induced Fracture in Bentonite Clay
Presenter: Chanjuan Han
Advisor: Xiong (Bill) Yu
University: Case Western Reserve University
Email: chanjuan.han@case.edu

10. Title: Rheological Behavior and its Chemical Interpretation of Crumb Rubber Modified Asphalt Containing Warm-mix Additives
Presenter: Haopeng Wang
Advisor: Tom Scarpas and Xueyan Liu
University: Delft University of Technology
Email: haopeng.wang@tudelft.nl

11. Title: The influence of repeatedly heating on the performance of asphalt binders in laboratory
Presenter: Dongdong Ge
Advisor: Zhanping You
University: Michigan Technological University
Email: dge1@mtu.edu

12. Title: Investigating the effect of pore pressure on the permeability and porosity of dense-graded HMA
Presenter: Siyu Chen
Advisor: Sanjeev Adhikari and Zhanping You
University: Michigan Technological University
Email: siychen@mtu.edu

13. Title: Multiscale Modeling of Clay and Clay Particles through Discrete Element Method and Atomic Force Microscope Measurement
Presenter: Yuan Guo
Advisor: Xiong (Bill) Yu
University: Case Western Reserve University
Email: yxg223@case.edu

14. Title: Intelligent asphalt pavement crack recognition and repairing robot
Presenter: Siqi Zhou
Advisor: Feng Li
University: Beihang University
Email: zsq47@buaa.edu.cn

15. Title Polyvinyl Alcohol (PVA) Fiber-Reinforced Rubber Concrete
Presenter: Jiaqing Wang

Advisor: Qingli Dai
University: Michigan Technological University
Email: jiaqingw@mtu.edu

16. Title: The thermal storage stability of asphalt binder modified by bio-oil generated from waste wood resources
Presenter: Ran Zhang
Advisor: Zhanping You and Hainian Wang
University: Chang'an University; Michigan Technological University
Email: shaozhang11@163.com

17. Title: Modeling the Effect of Rail Infrastructure and Rolling Stock Failure on Performance of an Integrated Urban Rail-Bus Transit Network
Presenter: Wen Hua
Advisor: Dr. Ghim Ping Ong
University: National University of Singapore
Email: huawen@u.nus.edu

18. Title: Influence of Calcium Hydroxide in Metakaolin-Based alkali-activated cement
Presenter: Ruizhe Si
Advisor: Qingli Dai
University: Michigan Technological University
Email: ruizhes@mtu.edu

19. Title: Microstructure-Based Random FEM Simulation of Frost Heave: Theory and Implementation
Presenter: Shaoyang Dong
Advisor: Xiong (Bill) Yu
University: Case Western Reserve University
Email: sxd405@case.edu

20. Title: A Framework for Real-Time Labor Productivity Reporting Using Worker Location Data
Presenter: Venkata Vemuri
Advisor: Dr. Lu Gao
University: University of Houston
Email: suryakumar4444@gmail.com

21. Title: Nano-TiO_2 Modified Cement Mortar with Durable Self-cleaning Performance
Presenter: Zhuoying Jiang
Advisor: Xiong (Bill) Yu
University: Case Western Reserve University
Email: zxj45@case.edu

22. Title: Evaluation of Hydroplaning Risk of Porous Asphalt Pavement using 3D Tire-Water-Pavement Interaction Model
Presenter: Yanming Ding
Advisor: Hao Wang
University: Rutgers University
Email: yangmin.ding@rutgers.edu

2018 IACIPANNUAL Workshop BANQUET

(Delicious Chinese Food, Wine, Raffle Draws, Karaoke, etc.)

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January 7, 2018
7:00 p.m. to 11:00 p.m.

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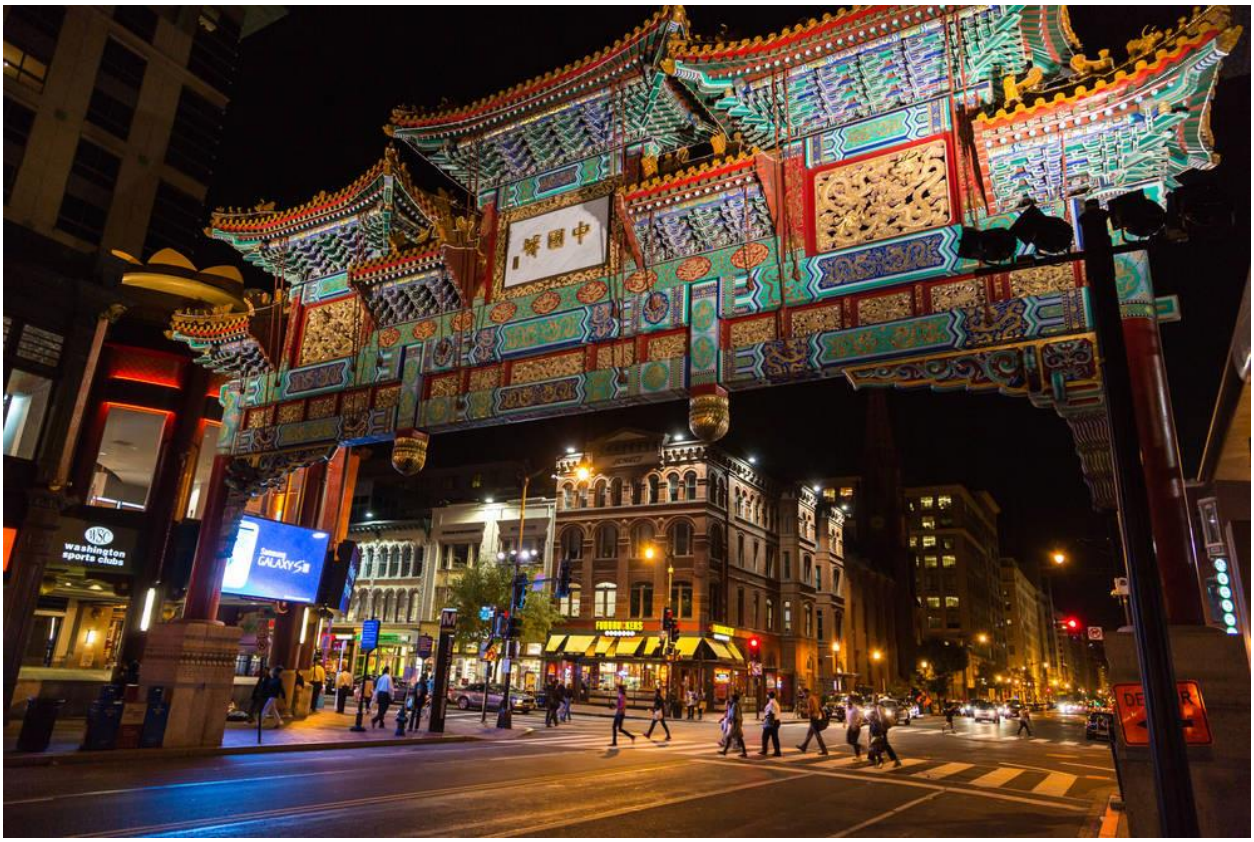

Directions:

1. **Take the subway Red/Green/Yellow line towards Washington, D.C. Downtown**
   乘坐前往Washington, D.C.市中心的地铁
2. **Exit at Gallery Place/Chinatown Station**
   在中国城站Gallery Place/Chinatown下車
3. **Take the 7th St./H St. Exit**
   从7th St./H St.出口出站
4. **The restaurant is across the intersection at 618H St**
   出站后过街(H St.)，龍之味饭店在 H 街 618 號