1st Asia Pacific Young Researchers and Graduates Symposium

Recent Advances in Structural Engineering and Construction

26-28 February 2009

Ocean Science Building,
Kunsan National University, Republic of Korea

Hosted, Organized and Sponsored by

BK21 지반환경통합관리 핵심인력양성사업팀 Advanced Geo-Environment Research Tean

of

군산대학교 KUNSAN NATIONAL UNIVERSITY

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1st Asia Pacific Young Researchers and Graduates Symposium

The aim of 1st Asia Pacific Young Researchers and Graduate Symposium is created a platform for young researchers and graduates to establish a collaboration research network between Asia Pacific and discuss of topics important to developing new knowledge in structural engineering and construction.

Topics of Symposium

General Topics

Topics include, but not limited to – all branches of structural, building, and concrete engineering; construction engineering and architecture; materials technology. However, all papers must relate to the civil, architectural and construction discipline.

Special Topics

These include but not limited to – structural analysis, nonlinear behaviour of structures, reinforced concrete structures, steel structures, bridges, precast systems, earthquake engineering, geotechnical engineering, tunnel and underground structures, damage assessment; reliability analysis; design uncertainties and stochastic variability, optimal design and smart structures.

Organizing Committees

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Yew-Chin Koay
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Program, 26 February 2009

16:30-18:00 Registration

18:00-20:30 Welcoming dinner and research exchanges

Program, 27 February 2009

09:00-09:30 Registration

09:30-10:00 Opening ceremony

10:00-12:00 First session presentation

- Dr. Chung-Che Chou
  Title : Rehabilitation of welded steel moment connections prior to 1996
- Dr. Chunwei Zhang
  Title : Recent advances on structural vibration control and blast resistance research in HITBRPE laboratory
- Dr. Janbing Chen
  Title : Stochastic response analysis of earthquake-excited nonlinear structures
- Dr. Jian-Guo Dai
  Title : Evaluation, modeling and optimization of interface bond in fiber reinforced polymer (FRP) strengthened concrete structures

12:00-14:00 Lunch

14:00-15:30 Second Session

- Dr. Hwa Kian Chai
  Title : Assessing surface opening concrete cracks by stress waves - Tomographic imaging for approximate investigation and Rayleigh waves for sizing
- Dr. Suchart Limkatanyu
  Title : Nonlinear frame model with tangential and normal interfaces : formulations and applications
- Dr. Yuxi Zhao
  Title : Study on concrete cracking due to reinforcement corrosion

15:30-16:00 Afternoon tea break

16:00-18:00 Third Session

- Dr. Yoshikazu Kobayashi
  Title : Three-dimensional seismic tomography for soundness evaluation of concrete structures
- Dr. Mihon Kwon
  Title : Prediction of nonlinear behavior for FRP concrete beam by multi-axial constitutive laws
- Dr. Dookie Kim
  Title : Modal Parameter Identification of Cabinets of Nuclear Power Plant
- Dr. Jeongyun Do
  Title : Required quantitative performance configurations and optimal Selection of patching repair materials
- Dr. Yew-Chin Koay
  Title : A current innovative solution to eliminate the past trip hazards on pedestrian concrete pavement

18:00-21:00 Gala dinner and closing ceremony

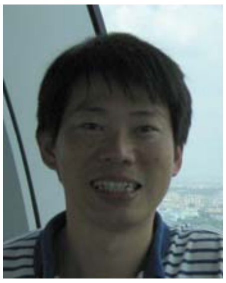
Program, 28 February 2009

Post symposium local tour

Presenter's statements, research titles and abstracts

Dr. Chung-Che Chou

(Nationality: Taiwan, Residency: Taiwan)



Personal Statement

Dr. Chung-Che Chou graduated his Bachelor of Civil Engineering and Masters of Civil Engineering degrees from National Taiwan University in Years 1992 and 1994. Dr. Chou received his Ph.D. degree from University of California, San Diego, USA in 2001. He is currently an associate professor at National Taiwan University. Prior to joining National Taiwan University, he was a Vice Dean of General Affairs at National Chiao Tung University, Taiwan. Dr. Chou's research interests are focused on earthquake-resistant design and dynamic analysis of bridges and buildings, post-tensioned steel structural systems and precast concrete segmental bridge columns, rehabilitation of steel building structures and earthquake demand assessment using attenuation relationship, etc. Besides that, Dr. Chou has an extensive research experience with large scale structural testing. The researches that he has conducted include shake table test of a one story, post-tensioned composite frame, cyclic test of a full scale, one-story post tensioned composite frame, full scale testing of post-tensioned beam to column connections, etc. Dr. Chou was won many research grants and sponsored projects in Taiwan. He holds ten patents in Taiwan and has published more than 50 technical papers and reports nationally and internationally.

Research Topic

Rehabilitation of welded steel moment connections prior to 1996.

Abstract

The study presents the seismic performance of rehabilitated steel moment connections using vertical stiffeners welded at the face of the column and inner side of the beam flange. The objecti9ve was to develop repair techniques to minimize interference from the composite slab and requirement of story height in existing steel buildings. A total of six large-scale exterior moment connection specimens were tested. Two moment connections with bolted web-welded flanges were removed from an existing 34-story steel building constructed before 1996 in Taiwan. Rehabilitated moment connections with different stiffeners were tested to validate the cyclic performance. Two of five rehabilitated moment connections showed excellent performance in experiencing the AISC (2005) seismic load twice, without welded joint fractures and significant strength reduction in excess of an interstory drift of 4%. Three rehabilitated moment connections failed due to insufficient reinforcement. The connection specimens were modeled using the non-linear finite element computer program to further verify the effectiveness of the stiffener in transferring beam moment to column.

Dr. Chunwei Zhang
(Nationality: China, Residency: China)

Personal Statement

In 2005, Dr. Zhang got his Ph.D. degree in Civil Engineering from Harbin Institute of Technology. Currently he is an associate professor within the Urban Disaster Mitigation and Bridge Engineering Discipline Group in the School of Civil Engineering in Harbin Institute of Technology (HIT), and the deputy director of Laboratory of Blast Resistance and Protective Engineering of HIT. Since 1999, he has participated in several important scientific research programs such as major and key projects from the National Science Foundation of China, discovery project from the Ministry of Science and Technology of China. He has published more than 50 journal papers and conference proceedings, and got three invention patents including one international PCT patent. He was awarded the Japan Society of Seismic Isolation exclusive student awards for International Idea Competition in 2004. He has visited several world famous universities in USA and Japan, such as University of Illinois at Urbana-Champaign, California Institute of Technology, University of California in San Diego, University of Houston, and Kyoto University etc. From 2007 to 2008, he worked in the University of Western Australia as a visiting academic. His research interests are mainly focused on: Structural Vibration Control, Blast Resistance and Protective Engineering, and Ocean Engineering.

Research Title

Recent advances on structural vibration control and blast resistance research in HITBRPE laboratory

Abstract

In this paper, several unique control systems developed for the vibration control of civil engineering structures subjected to various environmental excitations (such as earthquake, wind load, ocean waves and ice etc.) are briefly introduced, which have been studied by the Blast Resistance and Protective Engineering laboratory of Harbin Institute of Technology (HIT-BRPE) in the past several years. First, the dynamics of each innovative control system are summarized, such as active EMD system for building and offshore platform structural vibration control, active DDVC based AMD system for low frequency vibration and motion control, passive TRID system for rotation or swing motion control, semi-active MR dampers for vehicle suspension system control, and innovative hybrid EHMD system for energy harvesting with control abilities etc. Then, based on the formulations of each control system, thorough numerical analysis reveals the intrinsic behavior of AMD control force. Novel indexes will be proposed to quantify the homogeneous property of AMD control and pseudo reaction wall control system. Furthermore, some special aspects for the EMD control system, such as dynamical testing verification and control structure interaction effect are discussed, which show the EMD system to be an ideal active control system for structural seismic response suppression. At last, one of the challenging applications of structural active control is introduced, where the full scale EMD control system will be installed onto the 610m high Guangzhou New TV tower, which will be implemented by the end of this year and the building height will break the current world record.

Dr. Jianbing Chen

(Nationality: China, Residency: China)

Personal Statement

Dr. Jianbing Chen specializes in the area of earthquake engineering and stochastic mechanics. Specifically, he is working on the development of a family of probability density evolution method for respond analysis and reliability evaluation of structures involving randomness both in the system parameters and excitations. Dr. Chen received a Ph.D. in Civil Engineering from Tongji University China in 2002. He is currently an associate professor at Tongji University in the School of Civil Engineering and the State Key Laboratory of Disaster Reduction in Civil Engineering. Dr. Chen has received awards including the First-class National Natural Science Award Nominated by the Ministry of Education in 2005, Nominated National Excellent Doctoral Thesis in 2005, Excellent Young Teacher in Shanghai City in 2006, and was selected to the Program of Excellent Scholars in New Century by the Ministry of Education in 2007. He is the Principal Investigator (PI) of two projects granted by the National Natural Science Foundation in China, and a project of '863' Plan. Dr. Chen is the author of a monograph and the co-author of over 60 technical publications. He is currently a fellow and serves as the Treasurer of the Random Vibration Committee of Chinese Society of Vibration Engineering.

Research Title

Stochastic response analysis of earthquake-excited nonlinear structures.

Abstract

Response analysis of structures exhibiting nonlinearity subjected to random ground motions has long been an important but challenging problem. In the present paper, the probability density evolution method (PDEM), which is capable of capturing the instantaneous probability density functions of the stochastic response of nonlinear structures, is first outlined. In this method, based on the random event description of the principle of preservation of probability combined with the uncoupled physical equation, a family of generalized density evolution equation which establishes the ties between the stochastic dynamical system and the deterministic dynamical system is set up. Then the representation of stochastic ground motion acceleration through a double orthogonal expansion, where the Hartley basis functions and the correlation matrix decomposition are employed, is introduced. Incorporation the orthogonal expansion of stochastic excitations into the PDEM can carry out stochastic response analysis of nonlinear structures. A numerical example is illustrated. Some features of the stochastic seismic response of the structure are observed. The problems need further investigations are pointed out.

Dr. Jian-Guo Dai

(Nationality: China, Residency: Hong Kong)

Personal Statement

Dr Jian-guo DAI was born in Jiangsu Province, China in 1974. He graduated with his BSc degree from Dalian University in 1994 and obtained his PhDs from Dalian University of Technology and Hokkaido University in 2000 and 2003, respectively. After his graduation, he worked as a Post-Doctoral Research Fellow for the Center of Excellent (COE) project “System for Sustainable Infrastructure” in Hokkaido University for two years, and then as a researcher in the Life Cycle Management Research Center, Port and Airport Research Institute, Japan for two and a half years. He is currently an Assistant Professor of the Department of Civil and Structural Engineering, The Hong Kong Polytechnic University. Dr. Dai’s research interests and main experienced fields are FRP external bonding for repair and strengthening of concrete structures, durability repair of port concrete structures using innovative materials, and fiber reinforced concrete. Dr Dai has authored and co-authored more than 70 peer reviewed journal papers, international conference papers and technical reports in the above-mentioned research areas. He is the recipient of several academic awards including the ‘’Best Research Paper Award’’ from ASCE, Journal of Composites for Construction in 2005. He is a member of JCI, JSCE, IIFC, ICCMC, IALCCE, ISO/TC71 etc. and has served some of these international committees actively. He is also a local Editorial Committee member of the Journal "Advances in Structural Engineering" and has been a referee for 8 other international journals.

Research Topic

Evaluation, Modeling and Optimization of Interface Bond in Fiber Reinforced Polymer (FRP) Strengthened Concrete Structures.

Abstract

Debonding of FRP from concrete substrates is a predominant failure mode in FRP sheets/plates-strengthened reinforced concrete (RC) structures. Hence the effectiveness of most of upgrading technologies developed for concrete structures using externally bonded FRP sheets/plates highly depends on the properties of the interface bond between the FRP sheets/plates and the concrete substrates. This paper provides a holistic review on the author’s recent research work in the field of interface bond between FRP and concrete substrates. The contents cover the evaluating methods for the interface bond under different loading conditions, the newly developed interface bond models for describing the fracture properties of the FRP to concrete interfaces under different stress conditions, and the optimization of the bond to improve the structural performance of FRP-strengthened concrete members. The bond and fracture properties of the FRP to concrete interfaces under Mode I, Mode II and Mix-mode failure are evaluated and analyzed through development of theoretical models, which applications for practical designs are also addressed. A discrete model for predicting the tension stiffening behavior of FRP-strengthened RC tensile members is introduced. Moreover, the optimization of the structural performance of FRP-strengthened RC members in terms of their serviceability and ultimate limit states is discussed by relating them to the local bond-slip behavior of the FRP to concrete interfaces.

Dr. Hwa Kian Chai
(Nationality: Malaysia, Residency: Japan)

Personal Statement

Dr. Hwa Kian Chai received his Ph.D. in civil engineering from Osaka University, Japan in 2006. He worked as a post-doctoral research fellow in the same university before joining Tobishima Corporation Research Institute of Technology in 2008. His research interests include nondestructive instrumentation and testing as well as repair and strengthening of deteriorated concrete structures.

Research Topic

Assessing surface-opening concrete cracks by stress waves- Tomographic imaging for approximate investigation and Rayleigh waves for sizing

Abstract

In assessing large-scale concrete structures, effective soundness evaluation procedure requires an approximate investigation to identify the problematic spots, followed by detailed investigation for characterizing defects. In this study, the feasibility of using tomographic imaging technique as a macro, approximate method for detection and R-waves for local, detailed sizing of surface opening cracks in concrete structures are studied. The aim is to contribute towards a methodology for effective crack detection and sizing. Experiments were carried out on concrete block specimens with artificial vertical cracks of varying depths. In tomographic imaging, three-dimensional velocity structures were constructed to visualize the location and depths of cracks. Comparisons with the actual locations and depths are made and the difference is discussed. In the sizing of cracks using R-waves scattering and attenuation characteristics, processing of signals is discussed and the relation between amplitude decay and cracks depth are investigated.

Dr. Suchart Limkatanyu

(Nationality: Thai, Residency: Thailand)

Personal Statement

Dr. Suchart Limkatanyu was born in Songkla, Thailand on July, 7, 1974. He received a Bachelor of Engineering (B.Eng.) Degree with second class honors in Civil Engineering from Prince of Songkla University in 1996. Dr. Limkatanyu has joined the Department of Civil Engineering, Prince of Songkla University since 1996. In 1997, he was awarded the Royal Thai Fellowship to enter the graduate program in the Department of Civil, Environmental, and Architectural Engineering at the University of Colorado, Boulder. He received a Master of Science (M.S.) Degree in Civil Engineering in May 1999. From 1999 t0 2002, he was a research assistant at University of Colorado, Boulder where he continued his study toward the Doctor of Philosophy Degree in Civil Engineering under supervision of Professor Enrico Spacone. Now, he holds the Assistant Professorship at the Department of Civil Engineering Prince of Songkla University. His research interests include analysis and design of reinforced concrete structures subjected to earthquake loads, soil-structure interaction, and retrofitting techniques using FRP materials.

Research Topic

Nonlinear frame model with tangential and normal interfaces : formulations and applications

Abstract

This work presents the theory and applications of nonlinear frame models with tangential and normal interfaces. It starts with the governing differential equations of the problems (strong from) and then the displacement-based formulation derived from the virtual work principle is employed to represent the strong form of the problems. The resulting models are implemented in a general-purposed finite element software. Two applications are used to show the efficiency and accuracy of the proposed models. The first application addresses the problem of modeling bond-slip in the response of reinforced concrete structures under static and dynamic loads. The slips of the reinforcing bars and deterioration of the bond-interfaces above the foundations and in the beam-column connections and plastic hinge regions play a crucial role in describing the behavior of reinforced concrete frames under earthquake excitations. These effects result in the reduction of stiffness and hysteretic energy dissipation, leading to the characteristic pinched hysteretic loop. The second applications discuss the importance of modeling soil-pile interaction in the response of reinforced concrete(R C) piles. The proposed model is simple, computationally efficient and capable of representing the salient features of the soil-pile interaction including dragging force and gap formation along the pile-soil interfaces as well as hysteretic responses of piles and surrounding soils. Two examples are presented to illustrate the model characteristics to show the model capabilities and to discuss the importance of modeling the pile-soil system.

Dr. Yuxi Zhao

(Nationality: China, Residency: China)

Personal Statement

Dr. Yuxi Zhao received her Ph.D. in Structural Engineering from Zhejiang University, China. She did her postdoctoral research in College of Materials Science and Chemical Engineering, Zhejiang University. Dr. Zhao was titled as an associated professor in 2002 and a professor in 2008. Her current research interest is durability of concrete structures and is funded by Chinese Government and Local Government continuously. She has authored and co-authored more than 20 publications in refereed journals and conference proceedings, co-authored on book entitled "Durability of concrete structures" and co-edited 1 conference proceeding. She won the National Award for Science and Technology Progress in 2008 and the Science & Technology Award of Zhejiang Province in 2006.

Research Topic

Study on concrete cracking due to reinforcement corrosion

Abstract

Cracking of the concrete cover due to reinforcement corrosion is generally regarded as a serviceability limit state for reinforced concrete structures. Considerable research work has been undertaken to develop analytical and numerical models to predict the time to cover cracking due to corrosion. This paper tries to contribute to quantify the amount of steel corrosion at the cracking of concrete cover. During the time elapsed between steel depassivation and concrete cover cracking. A concrete cracking model is proposed to estimate the total amount of steel corrosion at the on-set of cracking of concrete cover. This model is applied to some examples, which were tested and reported by other researchers. The amount of steel corrosion at the cracking of concrete predicted by the proposed model is in agreement with the experimentally observed result.

Dr. Yoshikazu Kobayashi

(Nationality: Japan, Residency: Japan)

Personal Statement

Dr. Yoshikazu Kobayashi received his Bachelor, Maters Ph.D. degrees in civil engineering from The University of Tokyo, Japan. He joined Nihon University in 2001 as a research associate. Currently, he is assistant professor at the same University. Dr. Kobayashi received two research grants from The Ministry of Education, Culture, Sports, Science and Technology in 2005. His research interests are nondestructive testing and deformation analysis of liquefied ground.

Research Topic

Three-dimensional seismic tomography for soundness evaluation of concrete structures

Abstract

Soundness evaluation of concrete structures is one of the important topics in term of maintenance and retrofitting. Seismic tomography is one of the methods of identification and has been applied for various field of engineering that includes soundness evaluation of concrete structures. This is typically conducted on two-dimensional models; however, three-dimensional tomography is required due to the consideration of three-dimensional extent of damaged area.

This paper presents a three-dimensional identification algorithm that is represented by combination of the ray-trace algorithm and SIRT (simultaneous Iterative reconstruction technique) for the three dimensional seismic tomography for concrete structures. The ray-trace algorithm is based on Huygens's principal and the space for the ray-trace is subdivided into hexahedron elements. The shape of each element is described by first-order isoperimetric element that is commonly used by finite element analysis. This feature enables that pre-processor for finite element analysis can prepare the mesh data for ray-trace. The presented method is applied for an existing concrete structure to check the feature and applicability of the presented method.

Dr. Minho Kwon

(Nationality: Korea, Residency: Korea)

Personal Statement

Dr. Minho Kwon worked at Korean Highway Cooperation as an engineer. He received his Ph.D. degree at University of Colorado, Boulder. He visited University of California, San Diego as a visiting scientist with post-doctoral program. Dr. Kwon conducted a joint project with BART. He has published more than 15 international journals and conference papers over past 8 years. His research interests are constitutive modeling of RC structures, computational mechanics, finite element modeling, FRP confined concrete, concrete filled tube, earthquake engineering.

Research Topic

Prediction of nonlinear behavior for FRP concrete beam by multi-axial constitutive laws.

Abstract

This study focuses on a predictive model of the flexural behavior of FRP-confined concrete structural members. A hypoelasticity-based constitutive law of concrete is presented on the basis of a three-dimensional stress state in order to model the compressive behavior of confined concrete wrapped with FRP jackets. The strength enhancement of concrete was determined by the failure surface of concrete in a triaxial stress state, and its corresponding peak strain was computed by the strain-enhancement factor also proposed in this study. The behavior of FRP jackets is modeled using two-dimensional orthotropic lamination theory. Therefore, the newly proposed model is a nonlinear load path-dependent confinement model of FRP-confined concrete. To model FRP-confined concrete bending members, a procedure is presented for the prediction of the flexural behavior of FRP-confined concrete structural members using a nonlinear fiber cross-sectional approach. Also the developed constitutive model is implemented for hybrid finite beam element. The developed model is validated with test results obtained from several bending experiments. The results demonstrate that the proposed model is able to capture the flexural behavior of FRP-confined concrete structural members as well as the axial and lateral strains of the sections.

Dr. Dookie Kim

(Nationality: Korea, Residency: Korea)

Personal Statement

Dr. Dookie Kim is a licensed professional engineer in Korea and California, United State. He was born in Donghae, Gangwon, Korea. He graduated his Bachelor degree in Civil and Environmental Engineering form Korea University in 1993. He received his Master and Ph.D. degrees in Civil Engineering from Korea Advanced Institute of Science and Technology (KAIST) in 1995 and 1999 respectively. He spent almost three and half years (September 1999 - February 2003) as a post doctoral researcher and at Korea Atomic Energy Research Institute (KAERI), University of California, Irvine (UCI) and as a senior researcher at UNISON Co. Ltd. Since March 2006, Dr. Kim has been teaching, researching, and consulting at the Department of Civil Engineering, Kunsan National University (KNU), Jeonbuk, Korea. He has published several books and over 20 SCI international journal papers. His research interests are: (a) structural dynamics based researches such as vibration protection/control, seismic analysis/design, system identification, and dynamic interaction. (b) soft computing theories such as (probabilistic) neural network, support vector machine, and other artificial intelligence algorithms and (c) probability based engineering application such as reliability analysis/design, LCC analysis, etc.

Research Title

Modal Parameter Identification of Cabinets of Nuclear Power Plant.

Abstract

Safety-related equipments of nuclear power plant must be seismically qualified to demonstrate their ability to operate as required during ground motion. In order to determine seismic qualification of electric cabinets of nuclear power plants, usually using by dynamic analysis and shaking table tests is required. The modal parameters of electrical cabinet have been identified by shaking table tests. In this study, with respect to a typical cabinet-type structure (instrumentation cabinet of nuclear power plant) a comparative study has been performed according to excitation level between numerical analysis and analysis of the experimental results based on stochastic subspace identification. In order to perform numerical analysis has been used three different type modeling techniques: lumped mass model, frame model, and FEM model.

Dr. Jeongyun Do

(Nationality: Korea, Residency: Korea)

Personal Statement

Dr. Jeongyun Do received his Ph.D. degree from Chonbuk National University in 2005. Presently, Dr Do is a research professor at Structural System Laboratory, Kunsan National University. He was awarded several prestigious prizes in Korea. He was awarded Best Paper Prize from Korea Concrete Institute in 2005, Encouragement Scholarship for New Young Researcher from Korea Research Foundation in 2004, University Doctoral Graduate Scholarship from Chonbuk National University between 2002 and 2004, etc. Dr. Do is a reviewer for several prestigious journals such as Computers and Concrete, Materials and Structures, Cement and Concrete Composites, Automation in Construction, ACI Materials Journal, etc. He has published more than 30 journal and conference papers nationally and internationally. His research interests include durability of concrete structures, concrete structures repairs, concrete technology, Reliability/LCC analysis, etc

Research Title

Required Quantitative Performance Configurations and Optimal Selection of Patching Repair Materials

Abstract

The durability of concrete repairs depends mainly on the correct choice and use of repair materials. Some studies related to the selection of repair materials are advocating as a fundamental principle, that is, repair like with like. This is, however, very illogical and not an engineering approach. This study is interested in configuring the minimum performance criteria and modeling the optimal selection of repair materials for chloride-deteriorated concrete structure. As the result of the study, the useful evaluation equation for optimal repair selection was formulated as below.

$$\begin{aligned}&[(0.034\times R21)+(0.142\times R22)+(0.240+R23)]\\&\quad+[(0.128\times R24)+(0.033\times R25)+(0.075+R26)+(0.01\times R27)+(0.01+R28)+(0.024+R29)]\end{aligned}$$

The variables in this equation are divided into two parts, the required chemical performance and the required physical performance, respectively. The former is composed of alkali-resistance, chloride permeability and electrical resistivity. The latter is composed of compressive strength, tensile strength, adhesive strength, drying shrinkage, elasticity and thermal expansion.

Dr. Yew-Chin Koay

(Nationality: Malaysia, Residency: Korea and Australia)

Personal Statement

Dr. Yew-Chin Koay completed his PhD in two and half years and was awarded a Ph.D. degree from RMIT University, Australia in 2006. Dr. Koay is currently a research professor attached to Structural System Laboratory, Kunsan National University, South Korea. Dr. Koay also works with the Victoria State Government, Australia and lectures at RMIT University, Australia. In 2008, Dr. Koay was won several prominent fellowships and awards. He was awarded Endeavour Australia Cheung Kong Research Fellowship by Department of Education, Employment and Workplace Relations (DEEWR), Australia Government and Post-doc Fellowship by Korea Science and Engineering Foundation (KOSEF). He was one of hundred invited delegates for Dragon 100 Young Chinese Leaders Forum by the Dragon Foundation, Hong Kong. He was a visiting fellow at Harbin Institute of Technology, China. Dr. Koay has been conducting extensive studies on experimental and analytical evaluation of stepping displacements of pedestrian concrete pavements. He invented and proved that the concrete shear connector is simple, low cost and effective shear connector use in pedestrian concrete pavements. His research has been published in several prestigious journals and conference papers.

Research Topic

A current innovative solution to eliminate the past trip hazards on pedestrian concrete pavement.

Abstract

Pedestrian concrete pavements are usually constructed of continuous slabs with simple control joints such as score lines or saw cuts at a specified interval. Simple control joints are provided to accommodate cracking of the concrete slabs. However, after the concrete slab cracks at the score line or saw cut, as normally happens, the two adjoining slabs are free to move up and down independently of each other. The differential vertical movement of adjoining slabs affects the serviceability of the pavement and creates tripping hazard to pedestrians. In order to overcome this problem, an innovation solution has been investigated to minimise the uneven displacement. Nonlinear finite element analysis has also been conducted for comparison and prediction.