The 2nd International Intelligent Construction Technologies Group Conference (IICTG 2019)

Speakers' Bios and Abstracts

1.Welcome

2. Development of IICTG

Dr. George Chang, Transtec Group, USA. President of IICTG.

Bio

Dr. George Chang works at the Transtec Group, USA. He is currently the President of IICTG. Dr. George Chang is recognized as the world expert on pavement smoothness and intelligent compaction technologies. His research, teaching, specification development, and software tools have helped make significant technology advancements in the above fields. The websites he develops and maintains, ProVAL and Veta, have evolved into the one-stop shop for pavement smoothness and intelligent compaction/construction. He has been leading the US national deployment effort of intelligent compaction with the FHWA since 2007.

Dr. Chang has been the first Chinese being at the leadership positions of many international organization: President for the International Intelligent Construction Technologies Group (IICTG), Chairman for Road Profile Users' Group (RPUG), Chairman and Emeritus Member of TRB AFD90 Pavement Surface Properties and Vehicle Interaction committee, and Chairman of ASTM E17.31 Profile Measurement subcommittee. He is a member of the TRB AFH60 Flexible Pavement Construction committee, AFH20 Pavement Rehabilitation committee, etc.

Abstract

President Chang will introduce the origins, missions, executive committee/technical committee organization, membership organization, sub-committee organization and fields, international conference, and future development of the IICTG.

3. Intelligent Construction for Railways in China

Lu Chunfang, Chairman of the China Railway Society

Bio

Lu Chunfang is an academician of the Chinese Academy of Engineering, also a railway construction management and technical expert. He was a former deputy director of the Ministry of Railways and deputy general manager of China Railway Corporation. Currently, he is the chairman of the China Railway Society.

Lu specializes in long-term management of railway construction and scientific and technological work. From 2005 to 2016, he is the coordinator of China's high-speed railway construction. He has served as the commander of major railway lines such as the Qinghai-Tibet and the Beijing-Shanghai high-speed railways.

He has overcome many construction technical problems for high-rise and long-span bridges, complex geological tunnels, permafrost and other large-scale and high-standard railway construction and management issues. He has received numerous awards including: Luban Award, National Science and Technology Progress Award Special Prize. He has written the articles: "The Construction and Management of Railway Engineering Platforms" and "Standardized Management of Railway Construction Projects". He has also published more than 40 articles in important newspapers such as People's Daily, World Management and China Railways.

Abstract

Intelligent construction is a new type of construction method, which integrates information and communication technology with advanced design and construction technology. It covers all stages of lifecycle of infrastructure planning, survey, design, construction, operation and maintenance. It has the functions of sensing, machine-learning, intelligent-decision-making and self-adaptation. The report systematically described the application goals, metrics and core technology system of railway intelligent construction, and introduces seven supporting technology systems: (1) Railway BIM standard system, design technology and life-cycle management system based on BIM (+GIS), (2) Broad intelligent sensing system, (3) Intelligent IoT system based on mobile communication, (4) Rail engineering construction intelligent management platform system based on Cloud Computing and Big Data, (5) autonomous operation system based on artificial intelligence, (6) Intelligent machinery and robotic technology, and (7) Intelligent operation and maintenance system based on BIM and PHM.

4. Intelligent Construction for Highways in China

Zhou Wei, Chief Engineer of the Ministry of Transportation

Bio

Prof. Zhou has successively served as Vice President of Xi'an Highway Transport University (now Chang'an University), Secretary of the Party Committee and President of the Scientific Research Institute of the Ministry of Transport. From July 2007 to July 2008, he was appointed Deputy Director of Chongqing Transport Committee. From July 2008 to March 2015, he served as President of Highway Science Research Institute of the Ministry of Transport. From March 2015 to now, he has been the chief engineer of the Ministry of Transport. He has been the director of the Policy Research Department of the Ministry of Transport since August 2017. Dr. Zhou is also a chairman of the Expert Committee of the Ministry of Transport and a member of the Policy Advisory Committee of the Minister of Transport.

He is an expert member of the Fourth, Fifth and Sixth International Cooperation Committee on Environment and Development of China and a member of the Advisory Committee of Experts on Strategic Environmental Assessment of the Ministry of Environmental Protection of China. He was a director of the Transportation Specialty Steering Committee of the Teaching Steering Committee of the Ministry of Education and vice-chairman of the sixth and seventh councils of the China Highway Society. Dr. Zhou has been elected to the 16th and 17th National Congresses of the Communist Party of China.

Dr.Zhou has mainly engaged in highway planning, policy research, highway hub planning, transportation economy and management, post-evaluation of highway engineering projects and sustainable development of transportation and other fields. He is one of the main founders of the theory of traffic control of highway network planning. He has participated in and presided over more than 50 national and provincial and ministerial and other scientific research projects, and has won 8 provincial and ministerial awards for scientific and technological advances. He has completed research project on China's future sustainable transportation development strategy and policy and was awarded the Outstanding Contribution Award in China's environment and development field by Vice Premier Zengpeiyan in November 2006. He has published more than 100 papers and 6 books in China and abroad.

Abstract

The report is a systematic account of the definition and characteristics of the transportation industry's high-quality development. It consists of a two-pronged analysis of the necessity and significance of promoting such development. The report also includes the different perspectives and potential undertakings related to this development. In conjunction with the

"Plan of Construction and Research for 'Safe Century Quality Project'" issued by Ministry of Transport last year, the report introduces its objectives and contents, and the basic principles and requirements of the research and construction with intelligent construction.

5. Intelligent Construction for Highways in US

Connie Yew, Team Lead of Construction Management, Federal Highway Administration (FHWA), USA, also a Steering Committee member of IICTG.

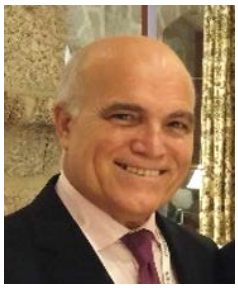
Bio

Connie leads national efforts to improve construction management practices and deploy innovative technologies in construction. Since joining FHWA in 1983, Connie has held leadership positions to strengthen Federal Highway's stewardship and oversight role by advancing management initiatives such as risk management and performance management. Connie holds a Bachelor degree in Civil Engineering from the University of Maryland and a Master degree in Public Administration from the George Washington University. Connie is a licensed Professional Engineer in the State of Maryland.

Abstract

Ms. Yew will introduce the application of intelligent construction in the practice of highway construction management in the United States. The goals are to strengthen federal road management and oversight responsibilities by advancing programs such as risk management and performance management.

6. Intelligent Construction for Highways in Europe



António Gomes Correia: Professor University of Minho, Portugal. Also, Vice President and an Executive Committee Member of IICTG

Bio

Prof. Correia Engaged in geotechnical and pavement engineering research, Prof. Correia has been teaching and consulting work for more than 35 years. His research includes transportation geotechnical engineering, especially soil and pavement geotechnical materials performance and modeling, compaction, soil improvement, foundation, geotechnical design

and management. He has more than 360 technical papers and 240 reports on these topics. Guided 116 graduate students, including 30 doctoral students.

From 1998 to 2001, Professor António Gomes Correia served as International Society of Geotechnical Engineering (ISSMGE) - Chairman of the European Technical Commission - ETC 11 Geotechnical Engineering on the Design and Construction of Sidewalks and Orbits. In 2001 he became chairman of the Geotechnical Committee TC 3 Pavement Geotechnical Engineering Committee of the ISSMGE Technical Committee, which in 2009 was renamed TC 202 - Geotechnical Transportation. He is also the Chairman of the Portuguese Geotechnical Society from 2004 to 2008. Professor António Gomes Correia is an expert in intelligent compaction in Europe and is the editor-in-chief of the EU Intelligent Compaction Standard. He is also the Vice President of the International Intelligent Construction Technologies Group(IICTG).

Abstract

Prof. Correia will introduce the application and practice of intelligent construction in European highway construction.

7. Improve the Intelligence of Construction Machinery and Promote the Intelligence of the Construction Industry

Zhou Xianbiao, Publisher & editor of Construction Machinery Technology & Management magazine.

Bio

Zhou Xianbiao is the publisher & editor of Construction Machinery Technology & Management magazine. Vice Secretary-General of China Construction Machinery Society, CEO of Road Surface and Compaction Machinery Bureau of CCMA, Secretary-General of Information Working Committee of CCMA. Worked in Harbin University of Technology, China Academy of Building Research. Studied in Jilin University , Harbin University of Technology, Tongji University.

Abstract

Intelligent construction is inseparable from intelligent construction equipment. The vibrating density meter is a milestone in the intelligence of compaction machinery. The remote operation and maintenance system with the use of GPS system and GSM technology is an important milestone in the intelligent process of construction machinery. At present, intelligent assisted driving of construction machinery and unmanned mining vehicles have entered the practical application stage. The report will briefly introduce the achievements and problems of intelligent construction machinery (excavators, cranes, road rollers, concrete machinery, etc.) in China, and make some suggestions for future work.

8. Framework of Intelligent Construction for Infrastructure

IICTG：XU Guanghui，George Chang，Antonio Correia ，Wang Dongshen，Soheil Nazarian

Bio

Prof. Xu Guanghui, Ph.D., has worked in design institutes, research institutes, Harbin Institute of Technology and Southwest Jiaotong University, and is one of the founders of the International Intelligent Construction Technology Group (IICTG) and concurrently the first Secretary-General. Prof. Xu has been engaged in research on road and railway engineering dynamics theory, testing and information analysis technology research. With the support of many scientific research projects such as the three northeastern provinces, the Ministry of Communications, the Ministry of Railways and the Natural Science Foundation, Prof. Xu has led a multi-disciplinary project team to conduct long-term independent research and development on intelligent construction (IC) monitoring technology, fundamental theory, testing technology, and industry standards.

Prof. Xu has produced numerous engineering applications and hold the intellectual property rights. He presided over the first national industry construction standards for intelligent compaction control technology in China's railway and highway fields.

He is the main advocate and promoter of China's intelligent compaction technology. Taking the intelligent construction technology as the core, Prof. Xu has developed the overall architecture of the intelligent construction technology of transportation infrastructure covering intelligent design and intelligent maintenance. He is currently writing a book on “Introduction to Intelligent Construction Technology of Transportation Infrastructure” (in both English and Chinese) in cooperation with key Chinses and the United States IC experts. He has also published IC monograph for both the Science Press and China Railway Publishing House.

Abstract

The construction of transportation infrastructure has entered the era of intelligence, and conventional construction techniques need to be integrated with modern technology. The purpose of this paper/presentation is to establish the framework of the transportation infrastructure intelligent construction technology for reference of future development. Firstly, the definition of intelligence is clarified and the role of artificial intelligence technology in the construction of transportation infrastructure is characterized. Secondly, the main content of intelligent construction technology is presented. The article/presentation stressed that intelligent construction shall possess the technical characteristics of active “perception, learning, analysis, decision-making and action”, and proposes technical solutions for machine learning and expert systems using Big Data. Finally, based on the current application of intelligent technology in engineering construction, with the intelligent design, intelligent compaction and intelligent decision-making as the framework of the intelligent construction

technology of transportation infrastructure is established. It is also combined with the application process of “perception, learning, analysis, decision-making and control” in intelligent compaction.

9. Architecture and Recent Development of Smart Runway for Airport

Jianming Ling, dean of College of Transportation Engineering, Tongji University. Jiake Zhang：Tongji University

Bio

Dr. Jianming Ling is a professor in road and airport engineering, and the dean of College of Transportation Engineering, Tongji University. He is the director of Key Laboratory of Infrastructure Durability and Operation Safety in Airfield of CAAC, and the director of Key Laboratory of Road and Traffic Engineering of the Ministry of Education, China. He is also an executive editor-in-chief of Frontiers of Structural and Civil Engineering”, and an associate editor-in-chief of “International Journal of Transportation Science and Technology”.

Prof. Ling received his Ph.D. degree in civil engineering from Tongji University in 1993. His Primary research interests are Subgrade Design Theories and Technologies, Airport Infrastructure Design and Management. In the past two decades, Prof. Ling led the research projects on dynamic behavior and design index of subgrade for MEPDG in China.

He also developed the first management system for airport pavement (CAPMS) in China, and a pavement design method for New General Large Aircrafts. Prof. Ling won the second prize of National Science and Technology Progress Award for 4 times. He was the chief editor of “Code for Design of Urban Road Subgrades”, and “Technical Specifications of Airport Pavement Evaluation and Management” of China.

Abstract

Smart runway of airport consists of various intelligent sensors to collect real-time information of the runway, and a data management program to sort and analyze the collected information for life-cycle maintenance and safe operation of the runway. The component of smart runway includes pavement condition sensing, real-time data transferring, data selecting and saving, pavement condition evaluation, and decision making support. Pavement information self-sensing, multiple resource data analyzing, and intelligent forewarning decision are the key characteristics of smart runway. The first performance and condition sensing system of runway in China was constructed on the 4th runway of Shanghai Pudong International Airport, which automatically measures strain, dynamic movement, temperature, moisture, and wheel track distribution of the runway. Both pavement structure response and performance evolution were investigated on this runway. The first smart runway in China is the 1st west runway on

Chengdu Tianfu International Airport under construction. It includes the subgrade settlement monitoring module, pavement structure information sensing module, and smart runway facility management module, which can intelligently monitor and predict the life-cycle performance of the runway.

10. Intelligent Compaction Research for Highways in US

Soheil Nazarian , professor at the University of Texas at El Paso, USA, also Chair of Technical Committee and an Executive Committee Member of IICTG

Bio

Prof. Soheil Nazarian is a professor at the University of Texas at El Paso and director of the Transportation Infrastructure Systems Center at McKinsey & Co. - a division of McKinset & Associates, Inc. He has over 25 years of experience in geotechnical and transportation infrastructure materials and non-destructive testing. He has led more than 100 research projects at the U.S. Federal and State DOT. He has advised more than 80 masters and doctoral students, most of whom are working in the Texas Department of Transportation or related business.

Soheil Nazarian is currently working with Dr. George Chang to lead the intelligent compaction research and implementation plan in the United States, including the NCHRP24-45 Soils IC research and is expected to make breakthrough in 2018.

Abstract

Based on more than 25 years of research and work experience in geotechnical and transportation infrastructure materials and non-destructive testing, Professor Nazarian will present the current status and trends of multiple intelligent compaction research projects at US FHWA, NCHRP, and State DOTs.

11. Intelligent Construction for Precast Pavements

Tian Bo, Researcher at Research Institute of Highway, Ministry of Transportation. Also, a Technical Committee Member of IICTG.

Bio

Dr. Bo Tian was born in China in 1973. He holds the B.S. and M.S. degrees from Harbin Institute of Technology and Ph.D. degree from Tongji University. He has been working on concrete pavement-related issues in Research Institute of Highway, Ministry of Transportation in China since 2001. He was a visiting scholar at Technische Universität München during 2008 to 2009. Currently, Dr. Bo Tian is an active participant in International Society for Concrete Pavements (ISCP), Portland Cement Concrete Pavement Construction Committee (AFH50) and the PIARC Technical Committee. He also serves as a doctoral advisor (part-time) in Harbin Institute of Technology.

Dr. Bo Tian devotes himself in the developing of concrete pavement technologies in China through research, consulting and organizing professional conferences and seminars.

Ha has over 100 publications in the area of sustainable, durable concrete materials and pavement. He has hosted over 50 projects from NSFC, Ministry of Transportation, and DOTs in many provinces. His research interests also extend to functional concrete pavements, modified cement concrete pavement and ballastless track plate in high-speed rail engineering recently.

Abstract

Precast cement concrete pavement developed in the rapid maintenance of distressed road and runways. There are great advantages to precast concrete slabs in closed and controllable conditions. It has extremely broad application prospect to apply precast concrete slabs in the future smart-road, achieving the self-sensing, road-vehicle communication and unmanned redundancy management. Adopting high-strength concrete above C80 can reduce the gravity of slab. Precast in factory can decrease the discreteness to insure the quality of concrete. Also, the necessary sensors can be encapsulated in the slab and tested to satisfy the survival requirements. After these works, the precast slab will be transport to project section to accomplish installing, leveling and grouting process and the open to the traffic.

12. The Application of Digital Technology of Airport Engineering

Han Li Ming, Engineering Technology Research Center of CAAC Airport Construction Group Co., Ltd.

Bio

Han Liming，Doctor of Engineering，Senior Member of the China Urban Science Research Association, is currently working at the Engineering Technology Center of China Civil Aviation Airport Construction Group Co., Ltd. He has hosted and participated in several engineering designs and scientific research projects. Participated in the research and preparation of a number of technical specifications. Received a number of science and technology awards and a number of national patents, published dozens of academic papers.

In recent years, Han Liming has mainly devoted himself to the research of airport engineering

digitization technology and green airport, and has been promoted and applied in the construction of airports such as Beijing, Chengdu and Kunming, and has achieved remarkable engineering benefits and social benefits.

Abstract

Since the 21st century, with the rapid progress of computer and modern information technology, especially the development of wireless sensor network technology, intelligent technology with digitalization as the core has gradually entered a good situation, and has attracted wide attention in the field of airport engineering. This report introduces the system structure, classification, function and standard of airport engineering digitization technology, as well as its application in the process quality monitoring of airport engineering. Challenges and countermeasures of airport engineering digitization technology are discussed. Finally, the wide application of digital airport in airport engineering is prospected.

13. Analysis Method of Intelligent Monitoring Data for the Full-Scale Track in China

Lei Zhang; Xudong Wang; Xingye Zhou; Qian Xiao; Wei Guan, Research institute of highway, Ministry of Transportation, PRC

Bio

Dr. Lei Zhang, Research Fellow of Research Institute of Highway, MOT. Main research area: highway asphalt pavement structure and material design. The member of International Intelligent Construction Technologies Group (IICTG) and Youth Expert Committee of China Highway Society. Finished more than 10 research projects as principal investigator, authored one book, and edit 4 specifications & guidelines as main editor, authorized more than 10 patents, published more than 20 papers.

Abstract

This paper report the data analysis method and structure response characters which captured from the full-scale testing track of research institute of highway(RIOHTrack). The data are captured from the gauges including stress, strain and temperature gauges installed in the pavement structure. In this study the Kalman filter method is used to filter the data and capture the peak value, and the Birgauss model is used to fit the temperature field and to extract the characteristic values. The result shows: for two type pavement structures which have same thickness (the one has asphalt base layer and the other has semi-rigid base layer), because of the different thermal conductivity of asphalt mixture and the cement stabilized mixture, the two pavements have significant different temperature field and corresponding characteristic values; the strain data analysis shows, the base layer thickness, strength and the

asphalt layer modulus value are all the factors to affect the strain level of the bottom the asphalt layer, and the effect level will significant increase with the temperature increasing. For some pavement structure, the strain value is much less than 70με even if it is in summer.

14. Study on Artificial Intelligence Visual Recognition of Marine Transportation Infrastructure

Jiao Shuangjian, Zhang Junpeng: China Ocean University

Bio

Abstract

To improve the intelligence of the marine transportation infrastructure, artificial intelligence computer vision methods were used, identify sea surface wind, wave, flow intensity and structural type of sea bridges were studied. The characteristics of sea surface wind, wave, flow were analyzed and divided into five intensity grades. The appropriate weather and sea conditions were chosen to sail out to sea to take pictures. The types of sea bridge were analyzed and divided into eight categories according to the structure. The images were obtained from photos taken at the scenes and pictures downloaded via the internet. The images were preprocessed and datasets were made. The classification models were established by using deep convolutional neural network, and the network parameters were optimized. The preferred parameters of batch size, training epoch and data augmentation were obtained. The optimized models were used to detect the images. It can accurately identify of wind, wave, flow and types of sea bridge, and deploy it in the terminal for real-time detection. The visual identification method of marine transportation infrastructure can provide reference for intelligent construction.

15. Countermeasures to Causative Faults for Bridges in Sichuan-Tibet High-speed Railway

Guo Xun：Institute of Disaster Prevention, China

Bio

Xun Guo was born in September 1, 1967, he holds a B.S. in Civil Engineering (Southwest Jiaotong University, Chengdu, China, 1987), M.S. and Ph.D. in Structural Engineering (Institute of Engineering Mechanics (IEM), Harbin, China, 1993, 1996). He joined the faculty of the department of Structural Engineering at IEM in 1993. Dr. Xun Guo served as an Associate Professor and Professor at the Institute of Engineering Mechanics from 1993 to

2000 and from 2000 to 2012 respectively, and served as Professor and Head of Civil Engineering Department in The Institute of Disaster Prevention, China Earthquake Administration from 2012. He worked in Hong Kong Poly U as a research fellow from 1998 to 2000; he also worked as a visiting scholar at the University of Illinois at Urbana-Champaign from 2005 to 2006.

Dr. Xun Guo gave courses to postgraduate students in structural dynamics, structural seismic design, structural experiment methods, and vibration measurement techniques since 1999. He has published more than 70 journal papers and two books. Dr. Xun Guo has research interests in the areas of earthquake engineering, structural damage detection and health monitoring. From 2003, Dr. Xun Guo was nominated as the Director of Structural Engineering Division and Earthquake Simulation Laboratory of IEM in 2003.

During the past twenty years Dr. Guo contributed a lot on post-earthquake reconstruction. In July 2003 he was dispatched to Algeria as an earthquake engineering expert and made quite useful suggestion on reconstruction. In April 2013 he proposed a complete set of drawings related to the retrofitting of damaged houses. In November 2017 he was invited to give lectures on reconstruction after Jiuzhaigou earthquake.

Abstract

The Sichuan-Tibet railway or highway will inevitably run across many active faults, such as Xianshuihe fault, Anninghe fault, etc. These active faults are the most difficult challenges for design of bridges. The movement of fault will cause bridge vibration and relative displacement. Damping can effectively inhibit vibration, but relative displacement has to be controlled by Lock-up devices and beam falling down will not happen. These two kinds of countermeasures are proved to be effective in previous strong earthquakes.

16. Dynamic Roller Characteristics and CCC Using Automatic Frequency Control

Carl Wersäll, KTH Royal Institute of Technology, SE-10044 Stockholm, Sweden.

Fredrik Åkesson and Andreas Persson, Dynapac Compaction Equipment AB, Industrivägen 2, SE-37146 Karlskrona, Sweden

Bio

Dr. Carl Wersäll is a researcher at the Royal Institute of Technology in Stockholm, where he also obtained his M.Sc. and Ph.D. degrees. He more than 10 years of experience in research and consultancy, mostly in the fields of compaction, soil dynamics, transportation geotechnics and deformation properties of soil. He is a research coordinator of high-speed railway topics for the Swedish Transport Administration, a member of the Swedish Ground Vibration Committee and a member of ISSMGE committees TC202 “Transportation Geotechnics” and TC203 “Earthquake Geotechnical Engineering and Associated Problems”.

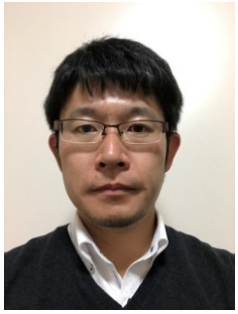
Abstract

A new intelligent compaction method for vibrating soil compaction rollers, utilizing automatic frequency control (AFC), has been developed recently. The method implies automatic adjustment of the vibration frequency to obtain resonance in the roller-soil system. Full-scale tests, both in the field and in a controlled environment, have shown that AFC can increase the compaction efficiency and create more evenly compacted fill layers while reducing the number of passes, energy consumption, machine wear and environmental impact.

This paper describes results from integrated dynamic roller measurements during compaction on a number of trial embankments, consisting of rock-fill with varying thicknesses. Half of the embankments were compacted using AFC while the other half was compacted conventionally with a fixed frequency. Measurements with an integrated accelerometer show how AFC influences the dynamic characteristics of the roller, such as frequency and amplitude, as well as how double-jump of the drum can be avoided using AFC.

The paper also analyses three Continuous Compaction Control (CCC) quantities and how they are affected by the frequency setting. The quantities analyzed are the Compaction Meter Value (CMV), the loading modulus Evib and the unloading modulus Evib2. All CCC values are compared to static plate load tests, which show that Evib2 is the quantity with greatest correlation to static tests. The field tests result in recommendations for how CCC should be used together with AFC.

17. New Attempt to Implement IC as Compaction Quality Control Method for Highway Embankment Construction in Japan



Dr. Hirotake Nakamura, Ph.D., Chief researcher, NEXCO Highway Technical Research Institute

Bio

Abstract

IC technology was introduced in embankment construction for highway since end 1990s in Japan. The highway agency named as Nippon Expressway Company “NEXCO” approved it as one of the quality control methods for soil compaction in road bed and subgrade, and the proof rolling method for subgrade as well. However, the pass-count method by using GNSS has been implemented as actual quality control method. Because it has been believed that Intelligent Compaction Measurement Value (ICMV) based on accelerometer installed on vibrating drum should be affected strongly by soil type, the moisture contents and layer

thickness that are often used in road beds and subgrades, it's less reliable than the pass-count method. In this study, to implement the ICMVs as the compaction quality control method for highway embankment construction, basic factors for soil, the stratums and their mechanical properties affecting ICMV are reviewed and a set of comprehensive tests are conducted. For example, three different soils such as crusher-run, screenings, and silty soils prepared under two ranges of moisture contents are layered on solid concrete base. A total of three layers with 30cm thickness each are leveled. Two different ICMV sensors such as Alfa-system by Obayashi-Maeda and CCV by Sakai are installed on two different vibratory rollers; a 2.5ton tandem and a 10ton single drum rollers. GNSS is also installed on the both rollers to measure the settlement. Over the test sections on every three layers, ICMV, the compaction density, LWD, and the surface settlement by a leveling rod and GNSS are also measured. It was confirmed that the both ICMVs are capable for evaluating the stiffness of those soils accurately and can be implemented as the useful quality control method for soil compaction, if right compaction equipment can be used according to soil type and their conditions.

18. Hot Issues and Future Development of Intelligent Compaction

IICTG：XU Guanghui，George Chang，Soheil Nazarian，Gao Hui，Antonio Correia

Bio

(see above)

Abstract

Intelligent compaction has been in development for more than 40 years. Up to now, there are still many problems that need to be clarified. For example, why there are many methods for intelligent compaction, why do we need technical classifying, whether it can detect compaction factor, why the test results of different rollers are different, and the difficulty of intelligent compaction technology What are the other ones. Based on the definition of what is intelligent compaction, this article will answer these existing questions one by one. On this basis, we discuss the expansion and application of intelligent compaction. If intelligent compaction is considered a dynamic test, then this technology can be extended. This technology can be developed into standardized continuous inspection using advanced technology of intelligent compaction. In addition, the extension of this technology into data-aware means in road engineering virtual reality is also a very good development direction. This paper will discuss these issues.

19. The Management and Application of Intelligent Construction Based on BIM Technology

Yu Dehu, Vice President of Qingdao University of Technology

Bio

Ph.D, Professor, doctoral supervisor, vice-president of University of Qingdao Technology. The member of the International Intelligent Construction Technology Group, member of Branch of masonry Structures, China Association for Engineering Construction Standardization, the executive director of Shandong Architecture and Civil Engineering Society. He mainly works on theory and practice of smart city, building information technology, seismic resistance of structures, construction mechanics, etc.

He presided over 35 projects on the General Program of National Natural Science Foundation of China, the Major Sub-projects of Instruments of the National Natural Science Foundation of China, the Shandong Province Outstanding Young and Middle-aged Scientists Award Program and Enterprise Entrust Key Technical Projects.

He edited the seismic design code for performance-based seismic design of building in Shandong province, participated in compiling one industry standard, published one academic monograph and more than 110 academic papers, applied for 18 authorized patents and software copyrights, and completed 32 appraisals of scientific and technological achievements. He has won one first prize, three second prizes for scientific and technological progress and one first prize for teaching achievements at the provincial level in Shandong Province. The relevant research results have been successfully applied to the "Olympic Sailing Center", "Qingdao International Airport expansion project", "Qingdao International Exhibition Center" and other major projects, and have achieved good social benefits.

Abstract

Building Information Modeling (BIM) refers to integrating the various information into a 3D model, and the information database including the data came from processes of the design, construction, operation and even the end of the whole life cycle of the building. We can share and transmit the building information by digitization, informatization and 3D (Three - Dimensional) visualization in the whole life cycle process of project planning, operation and maintenance, which further can provide a broader function for Intelligent Construction. This paper based on our existing researches and some practical applications on three aspects: engineering technology, project management and business management. We mainly focused on the secondary development of BIM software, the intelligent construction and management platform in the whole life cycle based on BIM technology. The application of BIM technology can provide a practical reference for engineering depth application in the future.

20. Application of BIM Technology in Highway Design

Cao Lizhi，Xie Xiong, Heilongjiang Provincial Highway Survey and Design Institute

Bio

Cao Lizhi, Director of BIM Center, Heilongjiang Provincial Highway Survey and Design Institute. For more than 20 years, he has been at the forefront of various road and bridge survey and design work. He has participated in dozens of national and provincial key highway engineering survey and design work, led the team to successfully complete more than 20 large-scale BIM projects, and won the domestic BIM contest. He has been invited to participate in the review and compilation of Heilongjiang Provincial Building Information Model Technical Design Guidelines. He is the professional backbone of BIM technology of Heilongjiang Provincial Highway Survey and Design Institute.

Abstract

This report mainly elaborates from the following aspects

(1)GIS+BIM application in design. The GIS basic model is provided by means of laser point cloud, positive photographic image, oblique photography and the like. Based on this, the virtual reality is realized by combining the BIM model.

(2) parametric modeling. Through the independent research and development of Civil3D plug-in in our hospital to realize fast road modeling, and through the development of Dynamo software node package to realize automatic modeling of bridge model, traffic signs and other models. The model can be used later in the project construction management platform.

(3)Application of BIM technology in highway intelligent construction. Digital road construction is realized through BIM model combined with precision measuring equipment and construction equipment. While improving quality and shortening the construction period, the project cost is reduced. BIM technology provides reliable technical support for digital construction.

21. Research and Development of BIM Technology and Its Innovative Application in Intelligent Construction of Large-scale Engineering

Liu Zhansheng, Beijing Technology University

Bio

Liu Zhansheng, doctor, associate professor of Beijing University of Technology, deputy director of Institute of Intelligent Construction, master's supervisor, Beijing science and technology star, 100 young people of Beijing University of Technology, first-class registered builder, member of 93 Society. He is Mainly engaged in intelligent construction and BIM technology research.

He is Vice Chairman of Technical Innovation Working Committee of China Technological Entrepreneurship Association, Chairman of Intelligent Construction Group, Vice Chairman of Beijing Green Building Alliance, Director of BIM Special Committee of China Architectural Society, and Member of BIM Special Committee of China Graphics Society.

In recent years, he has presided over or participated in more than 20 national and provincial scientific research projects, with a total funding of nearly 20 million yuan. He has published more than 70 papers, applied for more than 10 patents and published 12 books. He has won nearly 20 awards for science and technology, such as "Beijing Second Prize for Scientific and Technological Progress" and "China Second Prize for Scientific and Technological Progress in Construction". As the project leader, he completed BIM technical consultation and R&D of more than 80 projects, including the 500m radio telescope (FAST), Beijing New Airport, APEC Convention and Exhibition Center, Winter Olympic Training Hall, Harbin Railway Station, Shijiazhuang Metro Line 1, Beijing Changping South Extension Line, Shenzhen Metro, Xuzhou Olympic Sports Center Stadium, Changsha Convention and Exhibition Center, Panjin Stadium, Qatar Doha Bridge and Beijing Government Service Center.

Abstract

With the continuous advancement of urbanization in China, higher and higher requirements are put forward for the application of information technology in the whole life-cycle of large-scale engineering. How to accelerate the implementation of technology and achieve intelligent construction and collaborative management have becomea series of severe problems urgently. Relying on major and complex engineering projects and cross-integrating BIM technology, Internet of things, big data,mobile communication, cloud computing, structural analysis theory, and monitoring technology, the comprehensive information management method integrating BIM technology, Internet of things technology, and Internet

technology is proposed for the first time. It provides theoretical support for its application. A multi-level management software system based on BIM is developed to expand the use of BIM from microtechnology management to medium project management and macro enterprise management; The fine construction method system based on BIM is constructed, which provides an essential basis for the concrete construction of large complex projects. BIM - based building information and intelligent management system is developed to form the critical technology of intelligent management application. A 3d visual dynamic monitoring system based on BIM, a BIM data monitoring system and a security system are developed to realize real-time display and early warning of monitoring data.Completed the Beijing new airport project, FAST radio telescope, The winter Olympics ice events training hall, Harbin railway station housing renovation and expansion project, Doha bridge and other dozens of large projects at home and abroad applications. A series of BIM system software has been developed and successfully applied in the practice of large-scale public building projects, and the overall scientific research achievements have reached the advanced international level. Promoting the capital construction industry informatization development has played the application demonstration role for the whole country.

22. The Intelligent Development Direction of Road Machinery

Xue .Lige
Master, Chief engineer of XCMG Intelligent Control department

Bio

Xue .Lige graduated from HUST, focus on the intelligent control technology of construction machinery research for many years .Taken Responsible for intelligent control research and development of road machinery in XCMG. Research directions include electro-hydraulic control technology of construction machinery, intelligent compaction technology, intelligent sensing technology of road construction quality, and big data mining technology .Led the team to carry out a number of industry-leading core technology research projects, organized and carried out the fifth generation of intelligent roller, the fifth generation of high-end paver intelligent control system, GPR paver thickness measurement system, asphalt construction visual identification technology, full hydraulic drive system energy conservation and other technical research projects .Participated in the national natural science foundation project, and applied for 5 invention patents and more than 10 software Copyrights.

Abstract

This paper is based on the characteristics of road construction process, talk about the development trend of road construction machinery in the direction of intelligent throughout the construction process, and how to play the potential added value of road machinery in the road construction process through data service. These include data acquisition, big data

analysis and data mining. By studying the asphalt thickness radar technology, asphalt segregation visual identification technique, flatness sensing technology, intelligent compaction technology, the model of temperature field simulation and so on many intelligent sensing technology to multi-dimensional quality of road construction process parameters through the acquisition of engineering machinery, and formed the road construction of multi-dimensional data. This represents the arrival of the construction big data era. While developing the intelligent sensing technology, data visualization analysis will be carried out simultaneously, and the construction quality evaluation model based on continuous construction data will be formed through the big data algorithm. Guide the mechanical users to adopt the optimal operation strategy to complete the construction, and form a closed loop for road construction from “multi-dimensional intelligent perception of construction data” to “quality evaluation model based on big data” and “adaptive dynamic optimization of mechanical parameters” .Meanwhile, the construction big data formed at the same time can serve as an important data basis for road maintenance, form an intelligent solution for the whole life cycle of road, give play to the role of road machinery in the value chain of road construction, and provide services for the road construction industry.

23. Standard Research and Engineering Application of Intelligent Compaction System for Asphalt Pavement

Cao Dongwei, Zhao Lidong , Highway Research Institute of the Ministry of Transportation

Bio

Cao Dongwei is a researcher and doctoral supervisor. His main research interests include new asphalt pavement materials, new asphalt pavement structures and new asphalt pavement technologies. He is currently working in Beijing Highway Technology Co.Ltd. of the Highway Science Research Institute of the Ministry of Transportation.

He presided over more than 20 projects of the National Natural Science Foundation of China and provincial and ministerial scientific research projects, and was responsible for more than 20 projects of major engineering technical consultation and demonstration and application of science and technology. and has developed high modulus asphalt for heavy traffic roads, large void drainage pavement asphalt, warm mixing and low temperature asphalt, waste rubber-plastic composite TPE asphalt, dry epoxy asphalt, water-borne macromolecule asphalt, pyrolytic biomass asphalt, coal-based new asphalt for new road materials.

He has been engaged in the research of drainage asphalt pavement for a long time, and has developed a set of technical achievements of durability drainage asphalt pavement suitable for heavy-duty expressway. He has developed carpet Prefabricated Asphalt Pavement technology, new structure of steel bridge deck pavement, new anti-skid pavement technology, asphalt

fingerprint identification technology and modifier content determination technology. He has obtained more than 80 authorized patents, one second prize of National Technology Invention Award, more than 20 provincial and ministerial science and technology awards, published more than 70 papers and one monograph of drainage asphalt pavement. He has formulated more than 10 industry standards and won honorary titles such as the National "Ten Thousand People" Program and the China Youth Science and Technology Award.

Abstract

Compaction technology is a key process affecting the construction quality of asphalt pavement. Traditional pavement compaction technology is mainly based on engineering characteristics, material type and weather factors, etc., through the test section to determine the compaction machinery combination, rolling through the number, compaction temperature, roller speed and other key parameters, it cannot monitor the compaction quality and uniformity in the process. The method of random sampling borehole coring is used for compactness detection, which has few test data and limited representativeness. Moreover, this method is a kind of damage test. Because it is a kind of post-test, if the unqualified section is found, it needs milling and repaving, resulting in a waste of funds and affecting the progress of the project. Asphalt Pavement Intelligent Compaction technology is the use of modern advanced wireless communication, sensors, computers and other technologies, real-time on the road compaction process of material compaction, temperature, mileage, speed and other key indicators of real-time collection, processing, analysis and transmission, while the collected data processing for a variety of intuitive charts, So that operators and managers can understand and dynamically control the compaction of the road surface, improve the construction efficiency, reduce the after-action rework and other issues.

Relying on the research project of standard measurement quality of the Ministry of Transportation, intelligent compaction system of asphalt pavement is studied in several aspects, such as system hardware and software, roller standard, compaction target value, etc. This paper analyzes the law of the control index CMV and the rolling number of the intelligent compaction system, establishes the correlation between CMV and the actual pressure effect fruit (traditional detection index compaction degree, bending sinking, EVD), and puts forward the method of determining CMV target value of the control index of the practical engineering intelligent compaction system. Based on a large number of CMV data on site, the compaction uniformity of asphalt pavement is analyzed, and the application effect of intelligent compaction in practical engineering is checked and evaluated. Relevant achievements have been verified and applied in the demonstration project of science and technology.

24. Summary of Vertical & Oriented Vibration Technology and Its Application

Huang Fangquan , Hefei Greenland Machinery

Bio

Huang Fangquan, a private entrepreneur from Wenzhou, Zhejiang Province, founded the first company in 1988, and the company continued to grow and develop. In 2005, he had started devoted himself to the research of the vertical vibration technology of road rollers. He worked on the same topic for 15 years and obtained more than 50 patents for vertical and directional vibration technology, and established the vertical vibration roller machine products of China. He has produced the first single-drum and double-drum vertical/directional vibration and oscillatory rollers in China. Huang Fangquan has established himself as the leader of vertical vibration technology research in China and promote such technology all over China. It is in his persistent pursuit that China's vertical vibratory roller technology has been ranked among the best in the world.

Abstract

This report systematically describes the connotation and characteristics of the roller vertical & directional vibration technology, and analyses the essential difference between the roller vertical vibration technology and the traditional vibration roller technology. This report introduces in detail the application results of the technology in road construction, RCC dam, bridge surface and other construction operations through case studies. Combining the characteristics of vertical & directional vibration technology, such as "linear vibration" and more stable vibration parameters, this report also prospectively lay out the roadmap for future development of vertical vibration technology with intelligent compaction technology, continuous monitoring of road compaction, and green energy application, etc.

25. AI in the Intelligent Transportation

Wang Jinqiao, Professor in National Laboratory of Pattern Recognition, Institute of Automation, Chinese Academy of Sciences, Chairman of ObjectEye Technology Co., Ltd.

Bio

Jinqiao Wang received the Ph.D. degree in pattern recognition and intelligence systems from the National Laboratory of Pattern Recognition, Chinese Academy of Sciences, in 2008. He is currently a Professor in National Laboratory of Pattern Recognition, Institute of Automation, Chinese Academy of Sciences, director of the Joint Laboratory of Intelligent Media Analysis, director of the Joint Laboratory of Cloud Video Recognition, deputy director of the Technical Innovation Committee of China Technological Entrepreneurship Association and chairman of ObjectEye Technology Co., Ltd. His research interests include pattern recognition and machine learning, image and video processing, mobile multimedia, and intelligent video surveillance.

He has published over 280 journal and conference papers in these fields, and has widely published at highly ranked international journals, such as IEEE Transactions on Image Processing (TIP), IEEE Transactions on Multimedia (TMM), ACM Transactions on Multimedia Computing,

Communications and Applications (ACM TOMCCAP), and Pattern Recognition (PR), and leading international conferences, such as ACM Multimedia (ACM MM), Computer Vision and Pattern Recognition (CVPR) and International Conference on Computer Vision (ICCV).

Abstract

Artificial intelligence has been born for more than 60 years, and has experienced two breakthroughs. With the progress of deep learning, artificial intelligence ushered in the third climax, and bring about the fourth industrial revolution. The widespread application of big data and artificial intelligence technology has made our life more convenient and faster. Through the carprint recognition technology, the vehicle can be accurately identified, and the self-service charging service for smart parking can be realized. By vehicle classification and identification, we can realize the fine classification of traffic data; intelligent scheduling and control of urban traffic can be realized through traffic behavior analysis and traffic path optimization; unmanned driving of vehicles can be realized through road scene understanding, traffic sign recognition and intelligent control; The target is to create a management mode of intelligent transportation and safe driving. With reasonable allocation of resources, diversion of traffic, and large-scale traffic linkage scheduling of airports, railway stations, bus stations, and commercial districts can effectively solve the current traffic congestion problem. It is critical to create a city traffic brain, and enable transportation sector to achieve standardize development and improve management efficiency in transportation.

26. The State Monitoring Technology and Application of High-Speed Railway Catenary in Complex Environment

Li Jing, China Railway First Survey and Design Institute

Bio

Li Jin, with Engineering Master's Degree, is a Professor, Senior Engineer, National Registered Electrical Engineer, Deputy Chief Engineer of China Railway First Survey and Design Institute Group (FSDI). He is one of the first batch members of "railway engineering and technical experts' database" in Ministry of Railways of China. He is also the member of China Voltages Current and Frequencies Standardization Committee, Vice-Chairman of Shaanxi Electrical Power Saving and Quality Society, Chairman of Shaanxi Construction Industry Association in Electrification Discipline, Part-Time Professor of Lanzhou Jiao Tong university.

He has served as the chief engineer and general manager of a number of key railway construction projects, and has conducted and organized a number of scientific research projects of China Railways Corporation (CRC)and China Railway Construction Corporation Limited (CRCC) at provincial and ministerial levels. He has published more than 10 papers.

He actively organized and carried out technological breakthroughs in high-speed railway power supply and distribution technology, plateau electric power engineering technology, intelligent electrical technology, industry design standards and other aspects. He has won the highest prize of national science and technology -- The National Science and Technology Progress Award (Special Prize), and the most influential prize in railway industry --Zhan TianYou Prize, as well as many awards of science and technology from Ministry of Railways and China Railway Construction Corporation Limited.

Abstract

Catenary is an important part of the high-speed railway system, which is responsible for the transmission of electric energy from the traction network to high-speed trains. The open air layout of the catenary, environmental factors and vibration and impact caused by long-term operation will affect the stability of the catenary system in service. If not handled in time, it will threaten the operation safety of high-speed trains.

This technology uses intelligent sensing technology, advanced wireless transmission technology, big data system technology and deep learning algorithm technology to build the system platform of Real-time condition monitoring and comprehensive evaluation of the catenary operation. Based on real-time data collection, this system platform uses existing data resources to mine the internal relations between data.

This system will coordinate the change trend of all kinds of data so as to realize the fault

alarm and hidden defect warning of catenary system, complete the formation of comprehensive evaluation index of operation state, propose the operation and maintenance strategy of equipment and build an intelligent operation and maintenance system.

After technical application, combined with (RCM) reliability theory, it will greatly enhance the level of research and development and manufacturing of catenary components in the industry, and broaden the application scope of new materials and new processes in catenary systems. Meanwhile, the service status and dynamic operation rules of the equipment revealed by the catenary state monitoring system can be used to supplement, improve or revise the basic theory of catenary design and rapidly improve the engineering design concept.