

Pengcheng Shangguan

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EDUCATION

University of Illinois at Urbana-Champaign (UIUC), Urbana, IL GPA: 3.90/4.0
PhD Candidate in Civil Engineering Jan. 2011-Aug. 2014 (expected)
Advisor: Professor Imad Al-Qadi
Dissertation Topic: Asphalt Pavement Compaction Monitoring Using Ground Penetrating Radar (GPR)
Master of Science in Civil Engineering Jan. 2010-Dec. 2010
Advisor: Professor Imad Al-Qadi
Developed algorithms and guidelines for GPR applications on railroad ballast contamination quantification
Southeast University (SEU), Nanjing, China Aug. 2004-Jun. 2008
Bachelor of Science in Transportation Engineering GPA: 4.0/4.0

RESEARCH EXPERIENCE

Illinois Center for Transportation, UIUC Rantoul, IL
● **Research Assistant** Jan. 2010-present
Project: Asphalt Pavement Compaction Monitoring Using Ground Penetrating Radar
Sponsor: Illinois Center for Transportation
This project aims to develop an innovative tool to monitor the compaction status during asphalt pavement construction using ground penetrating radar. The technique offers monitoring density change after each compaction pass in real-time and provide feedback to compactor operator so the compaction parameters such as vibration amplitude, frequency, rolling pattern can be adjusted accordingly, which makes the compaction operation “intelligent”.
Project: In-Place Hot Mix Asphalt Density Estimation Using Ground Penetrating Radar
Sponsor: Federal Aviation Administration
The goal of this project is to develop density prediction model to estimate the asphalt pavement density using GPR. The research work I have conducted include laboratory experiments, field data collection, data processing and interpretation. The outcome of this project is a state-of-art density model which allows highly accurate density measurement using GPR continuously, quickly and non-destructively.
Project: Railroad Ballast Condition Assessment Using Ground Penetrating Radar
Sponsor: Association of American Railroads
In this project, I have developed algorithms based on content based image retrieval procedure and wavelet techniques for GPR ballast data interpretation, which allows the GPR data to be processed automatically to generate ballast fouling profile. In addition, guidelines for implementing GPR in railroad ballast contamination detection is also developed.
Project: Fractionated Reclaimed Asphalt Pavement as a Coarse Aggregate Replacement in a Ternary Blended Concrete Pavement
Sponsor: Illinois State Toll Highway Authority
My research work in this project is the characterization of reclaimed asphalt pavement material. I have conducted asphalt binder extraction from reclaimed asphalt pavement and binder content quantification. I have used dynamic shear rheometer and bending beam rheometer tests to obtain binder properties. I have also characterized the viscoelastic properties of ternary blended concrete using dynamic modulus test.
Highway and Railway Engineering Research Institute, SEU Nanjing, China
● **Research Assistant** Jun. 2008-Aug. 2009
Project: Research of Freeway Pavement Structure Combinations in Soft Soil Area
Sponsor: Jiangsu Province Freeway Construction Headquarters
I have applied finite element method to analyze the displacement, stress and strain of different pavement structures under various loading conditions.

TEACHING EXPERIENCE

UIUC-CEE 504 Infrastructure NDE Methods (*Prof. John Popovics*) Spring, 2014

Introduce the GPR system and guide students to collect GPR data in the lab sessions.

UIUC-CEE 498 SAM Sensor and Measurements (*Prof. Joshua Peschel*) Spring, 2014

Guest lecturer on implementation of GPR on asphalt pavement and railroad ballast.

UIUC-CEE 508 Pavement Evaluation and Rehabilitation (*Prof. Imad Al-Qadi*) *Fall, 2011 and Fall, 2013*

Demonstrate the GPR system and explain the principles of GPR system to the whole class.

SEU-Pavement Engineering (*Prof. Xiaoming Huang*) Fall, 2008

Teaching assistant of the class. In addition, I led a student team to develop an online open course website based on the course contents. It was awarded “National Excellent Online Open Course in China” in 2008.

PUBLICATIONS IN REFEREED JOURNALS

Pengcheng Shangguan and Imad Al-Qadi (2014). Calibration of FDTD Simulation of GPR Signal for Asphalt Pavement Compaction Monitoring, submitted to *IEEE Transactions on Geoscience and Remote Sensing*.

Pengcheng Shangguan and Imad Al-Qadi (2014). Texture Retrieval of Ground Penetrating Radar Images Collected from Fouled Railroad Ballast, submitted to *Construction and Building Materials*.

Pengcheng Shangguan, Samer Lahouar, and Imad Al-Qadi (2014). Pattern Recognition Algorithms for Density Estimation of Asphalt Pavement during Compaction: A Simulation Study, *Journal of Applied Geophysics*, Vol. 107, pp. 8-15.

Pengcheng Shangguan, Imad Al-Qadi, Zhen Leng, Robert L. Schmitt and Ahmed Faheem (2013). Innovative Approach for Asphalt Pavement Compaction Monitoring with Ground-Penetrating Radar, *Journal of the Transportation Research Board*, Vol. 2347, pp. 79-87.

Pengcheng Shangguan, Imad Al-Qadi and Zhen Leng (2012). Development of Wavelet Technique to Interpret Ground-Penetrating Radar Data for Quantifying Railroad Ballast Conditions, *Journal of the Transportation Research Board*, Vol. 2289, pp. 95-102.

Zhen Leng, Imad Al-Qadi and **Pengcheng Shangguan**, Songsu Son (2012). Field Application of Ground-Penetrating Radar for Measurement of Asphalt Mixture Density: Case Study of Illinois Route 72 Overlay, *Journal of the Transportation Research Board*, Vol. 2304, pp. 133-141.

Yuhong Jiang, Tao Ma, **Pengcheng Shangguan** (2009). Study on Extraction and Recovery Experiments of Stone Matrix Asphalt, *Journal of Hefei University of Technology (Chinese)*, Vol. 32, Iss. 2, pp. 252-255.

Min Yang, Wei Wang, Xuewu Chen, Tao Wan and **Pengcheng Shangguan** (2009). Activity Pattern Choice of Work Commuting Trip by Workers, *Journal of Southwest Jiaotong University (Chinese)*, Vol. 44, Iss. 2, pp. 274-279.

Tao Ma, **Pengcheng Shangguan**, Xiaoming Huang and Guoqiang Xue (2008). Research on the Equivalent Axle-number Coefficients on Asphalt Pavement with Rigid Base, *Journal of Transportation Engineering and Information (Chinese)*, Vol. 6, Iss. 3, pp. 36-40.

PRESENTATIONS AND PUBLICATIONS IN CONFERENCE PROCEEDINGS

Pengcheng Shangguan (2014). Implementation of Ground Penetrating Radar on Asphalt Pavement and Railroad Ballast, Presentation at Kent Seminar Series, Rantoul, IL.

Pengcheng Shangguan (2014). Applications of Ground Penetrating Radar on Assessment of Transportation Infrastructure. Invited talk to the Illinois Association of Highway Engineers, Schaumburg, IL.

Pengcheng Shangguan, Imad Al-Qadi, and Shan Zhao (2014). Simulation of Asphalt Pavement Compaction Monitoring Using Ground Penetrating Radar. Poster at 4th Annual Workshop for the International Association of Chinese Infrastructure Professionals (IACIP).

Pengcheng Shangguan and Imad Al-Qadi (2014). Development of Texture Retrieval Approach for Quantifying Railroad Ballast Fouling from Ground-Penetrating Radar Data. Poster at 2014 Transportation Research Board (TRB) 93rd Annual Meeting, Washington, D.C.

Pengcheng Shangguan and Imad Al-Qadi (2014). Finite-Difference Time-Domain Simulation of Ground-Penetrating Radar Signals and Its Applications on Asphalt Pavement Compaction Monitoring Using Ground-Penetrating Radar. Presentation at 2014 Transportation Research Board (TRB) 93rd Annual

Meeting, Washington, D.C.

Imad Al-Qadi and **Pengcheng Shangguan** (2013). Texture Retrieval Approach for Interpreting GPR Data to Quantify Railroad Ballast Fouling. Presented at European Geosciences Union General Assembly. Vienna, Austria.

Pengcheng Shangguan and Imad Al-Qadi (2013). Asphalt Pavement Density Prediction during Compaction from GPR Data Simulation Using Artificial Neural Network. Poster at the 2nd International Transportation Doctoral Symposium, Champaign, IL.

Pengcheng Shangguan, Imad Al-Qadi, and Aaron Coenen (2013). Non-destructive Monitoring of Asphalt Pavement Density Change during Compaction. Poster at 3rd Annual Workshop for The International Association of Chinese Infrastructure Professionals (IACIP) (1st prize).

Pengcheng Shangguan, Imad Al-Qadi, Zhen Leng, Robert L. Schmitt and Ahmed Faheem (2013). An Innovative Approach for Asphalt Pavement Compaction Monitoring Using Ground Penetrating Radar. Presentation at 2012 Transportation Research Board (TRB) 92nd Annual Meeting, Washington, D.C. and 2013 Kent Seminar Series, Rantoul, IL.

Pengcheng Shangguan, Imad Al-Qadi and Zhen Leng (2012). Development of Wavelet Technique for Railroad Ballast Fouling Condition Quantification Using Ground-Penetrating Radar Data. Presentation at 2012 Transportation Research Board (TRB) 91st Annual Meeting, Washington, D.C.

Zhen Leng, Imad Al-Qadi and **Pengcheng Shangguan** (2011). Monitoring of Asphalt Pavement Compaction Using Ground Penetrating Radar. Presentation at 2011 Annual FWD User's Group Meeting, Champaign, IL.

Fenglan Bian, Xiaoming Huang, **Pengcheng Shangguan** and Xiaofeng Yu (2009). Warning Model for Debt Risk of Toll Highway Based on Efficacy Coefficient Method, *Proceedings of the Second International Conference on Transportation Engineering*, Vol. 2, pp. 1182-1189.

Min Yang, Wei Wang, Xuewu Chen, Xianyao Hou, and **Pengcheng Shangguan** (2009). Simulation of Individual's Representative Activity-Travel Pattern Based on Cluster Analysis and Monte Carlo Method, *Proceeding of the International Conference on Engineering Computation*, pp. 139-142.

FINAL REPORTS

Alexander Brand, Jeffery Roesler, Imad Al-Qadi, **Pengcheng Shangguan** (2012). Fractionated Reclaimed Asphalt Pavement (FRAP) as a Coarse Aggregate Replacement in a Ternary Blended Concrete Pavement. Report No. ICT-12-008 sponsored by Illinois State Toll Highway Authority.

Pengcheng Shangguan and Imad Al-Qadi (2010), Guidelines of Using Ground Penetrating Radar for Railroad Ballast Fouling Condition Assessment. Report prepared for Association of American Railroads.

HONORS AND AWARDS

1 st Place in the Poster Competition at 4 th Annual Workshop for IACIP	2014
Runner-up of the Best Posters in the 2 nd International Transportation Doctoral Symposium	2013
Illinois Association of Highway Engineers (IAHE) Grant Shaw Memorial Scholarship	2013
1 st Place in the Poster Competition at 3 rd Annual Workshop for IACIP	2013
The Annual Innovative Research Award in the 52 nd Illinois Bituminous Conference	2011
First Level Master Student Fellowship, SEU	2008
Honored Graduate of Transportation College, SEU	2008
Honorable Mention in the Mathematical Contest in Modeling (MCM), USA	2008
Mao Yisheng Civil Engineering Education Student Award	2007
Outstanding Student Leadership Award of Jiangsu Province, China	2007
Prominent Student of SEU in Studying	2006
SEU President Award	2006
T.Y. Lin Award	2006
Honorable Student of SEU	2006
Outstanding Student Leadership Award of SEU	2005
Changzhou City Government Scholarship	2005
1 st Prize in C++ Programming Designing Competition, SEU	2005
2 nd Prize in National Physics Competition, China	2003

INTERNSHIPS

Jiangsu Province Transportation Planning and Designing Consulting

Changzhou, China

● *Assistant Engineer*

Dec.2006-Feb. 2007

Conducted feasibility study on two highway projects and finished geometric design for two highway projects in Changzhou city

Changzhou Municipal Engineering Consulting

Changzhou, China

● *Assistant Engineer*

May 2006-Aug. 2006

Analyzed traffic data as part of feasibility study of Changzhou loop expressway project and finished detailed geometric design for one highway project

UNIVERSITY SERVICES

Society of Pavement Engineers, Secretary

Sep. 2012-present

- Organized U of I engineering open house events and help the society involve in ASCE activities

JOIN Performing Art Troupe in SEU, Founder and President

Apr. 2005-Apr. 2007

- 300 members delivered over thirty musical and theatrical performances and won 12 awards