UNIVERSITY of HOUSTON

CULLEN COLLEGE of ENGINEERING

Department of Civil & Environmental Engineering

CIVE 6111 Graduate Seminar

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Transportation Infrastructure Health Monitoring in the Big (Actually SMART) Data Age – Activities in the Heartland

Friday, April 14, 2017
2:45 pm - 3:45 pm
CBB 120

Abstract: There is an urgent need to develop and deploy a highly reliable, robust, cost effective system for 'real-time' monitoring of our nation's infrastructure to protect human lives, save our capital assets, and ultimately ensure the stability and quality of our nation's economy and way of life.

The nation's infrastructure, including roads, bridges, dams and water treatment and distribution systems, continues to deteriorate at an alarming rate. In Nebraska alone, it is estimated that 25% of the State's bridges are structurally deficient or functionally obsolete and 59% of its roads are in poor or mediocre condition. It is further estimated that an investment of $4 billion is needed to address Nebraska's aging waste and drinking water infrastructure.

For many key assets, such as bridges, visual inspections are still the primary health monitoring method. In spite of advances in sensor and computing technologies, this process has not changed applicably since the late 60's. Similar approaches are used to determine condition of other infrastructure assets, such as pavements, dams and water and sewer systems. For the most part, this approach has been an effective method for identifying deficiencies. However, using humans to assess infrastructure and predict remaining functional life is a costly, dangerous and subjective enterprise that can be adversely affected by extraneous factors ranging from weather to accessibility to inspector fatigue.

Advances in high performance computing allow for greater modeling and prediction capabilities for complex engineering systems. In addition, advances in supporting technologies, from satellite imaging to nano-devices to wireless communications, are creating opportunities for unparalleled transformations in sensor development and infrastructure monitoring. Concurrent with these advancement is the emergence of Big Data as a powerful tool for understanding and controlling highly dynamic and non-linear systems. However, we are in an age where the amount of data produced far outweighs our ability to effectively digest and comprehend its content and quality, a phenomenon the National Science Foundation calls the 'data deluge,' and there is now intense focus on the development of Big Data technologies that make data, sensors and sensing systems "smarter."

The University of Nebraska system is involved with a number of efforts focusing on coupling advances in infrastructure health monitoring technology with Smart Data initiatives. This presentation will summarize a number of those efforts, with emphasis being placed on past and ongoing work involving the speaker that focuses on improving and automating bridge health monitoring techniques using various technologies, including Smart Data techniques. Efforts involving colleagues with the Department of Civil Engineering at the University of Nebraska-Lincoln, research that focus on various transportation infrastructure components and various condition evaluation and deficiency identification techniques, will also be highlighted.

About the speaker:

Dr. Daniel G. Linzell, P.E., F.ASCE, is the Voelte-Keegan Professor and Chair of the Department of Civil Engineering at the University of Nebraska-Lincoln. From 1999 until June of 2013, Dr. Linzell was a faculty member in the Department of Civil and Environmental Engineering at the Pennsylvania State University, most recently serving as the John A. and Harriette K. Shaw Professor of Civil Engineering and Director of the Protective Technology Center. He received his Ph.D. in Civil Engineering from the Georgia Institute of Technology in August of 1999, his M.S. in Civil Engineering from Georgia Tech in 1995 and a B.S. in Civil Engineering from the Ohio State University in 1990. He served as a visiting professor at TECNUN, the engineering campus of the University of Navarra in San Sebastian, Spain, during the 2008-09 academic year. Dr. Linzell has published nearly 60 peer-reviewed, archival structural engineering journal articles that have focused on research related to: monitoring and predicting the behavior of bridges during construction and under service loads; protective barrier systems; building and bridge systems and components under blast and impact loads; and ship structural components under static and dynamic loads. Prior to receiving his Ph.D., Dr. Linzell was employed by Burgess and Niple, Ltd. in Columbus Ohio where he performed condition and forensic structural inspections and rehabilitation designs of bridges, buildings and other infrastructure systems. He currently sits on the Structural Stability Council's Executive Committee, is a Member of the Transportation Research Board's Steel Bridge Committee and of the American Society of Civil Engineer's Composite Construction and Bridge and Tunnel Security Committees. Dr. Linzell is a licensed Professional Engineer in Georgia, Nebraska and Pennsylvania.