K-State Hosts 92nd Annual Kansas Transportation Engineering Conference

Since 1918 Kansas State University has been proud to offer the Annual Kansas Transportation Engineering Conference as an educational and technology transfer service to our friends and colleagues in Kansas and neighboring states. This year the 92nd Annual Conference, held April 13-14, 2010, brought over 450 representatives from local, state, and national transportation agencies to Manhattan for two days of technical presentations and networking opportunities. The K-State UTC is proud to be a sponsor of the Kansas Transportation Engineering Conference. We thank the tireless efforts of our other sponsors and the conference planning committee for another excellent conference. Complete conference details can be found at the conference website, www.dce.k-state.edu/conf/transportation.
Students in the News

Scholarships

The K-State UTC is pleased to announce the following recipients of UTC Scholarships for Spring 2010.

Paul Owings is a graduate student in Civil Engineering from Plainville, Kansas. He is currently undecided on what he will research, but his focus is environmental engineering. He currently is the grad school representative for the undergrad ASCE chapter and is administering Intro to Environmental Lab.

Quinn Stenzel received her B.S. degree in Mathematics from Washburn University in 2009. She is currently pursuing her MSCE degree under the supervision of Dr. Hayder Rasheed. Her research will focus on developing deflection equations for concrete bridge decks reinforced with Fiber Reinforced Polymer Bars. She will also work on preparing a database for concrete beams reinforced with non-metallic reinforcement to control corrosion due to deicing salts.

Wilson Smith received his BSCE from Kansas State University in December 2009. His MSCE research consist of an experimental study aimed at investigating the feasibility of using bio-fuel co-products for stabilization of sub-grade soils. Wilson’s M.S. thesis will be a proof-of-concept study addressing hydro-mechanical stability of bio-fuel co-products in Kansas soils. He will be performing permeability and leaching tests and obtaining soil water characteristics curves for these novel bio-composite geo-materials. His graduate work will be conducted under the supervision of Dr. Dunja Peric, Associate Professor of Civil Engineering. Wilson is from Independence, Missouri.

Brandon Bortz is a graduate student in Civil Engineering from Preston, Kansas. Brandon plans on graduating in May 2010 with a Master of Science in Civil Engineering with emphasis on concrete construction. He has built a concrete durability site at the Kansas State University Civil Infrastructure Systems Laboratory (CISL) while working with Dr. Kyle Riding. After he receives his master’s, Brandon will pursue his Ph.D. in civil engineering focusing on the use of geocellular confinement systems, geocells, in low volume paved roads. Brandon will work with Dr. Mustaque Hossain.

Kathryn Davis is a 5th year senior in the B.S./M.S. Industrial Engineering program from Manhattan, Kansas. She is working with Dr. Margaret Rys for her master’s research, which focuses on simulating an emergency evacuation on campus. Using ARENA simulation software, she will conduct sensitivity analysis on what roads and traffic rules to use if an emergency were to take place in which campus and the surrounding areas would need to evacuate. Kathryn is Vice President of the Institute of Industrial Engineers, part of Steel Ring Engineering Honor Society, and an Engineering Ambassadors Executive member.

Paul Bartley is a graduate student from Abilene, Kansas. He received his bachelor’s degree in Civil Engineering from Kansas State University in May 2009 and is currently pursuing his Master of Science in Civil/Geotechnical Engineering under the guidance of Dr. Dunja Peric. His master’s thesis will focus on the influence of grain size on stabilization of sandy and silty soils. The research is directed towards the improvement of sustainability of transportation lifelines through use of lignin, a bio-fuel co-product. The main goal of the research is to prevent the soil erosion from slopes and unpaved roads. Additionally, a possibility for use of lignin for subgrade stabilization of paved roads will also be explored.

Joey Holste Named K-State UTC Student of the Year

Joey was born in Atwood, Kansas and grew up on a farm near Ludell, Kansas. He graduated with a BSCE in Civil Engineering from Kansas State University in May 2008 and has been working on his master’s degree in the structures area for the past 1 ½ years. His research has involved the evaluation of light-weight concrete for use in Kansas prestressed concrete bridge girders. As a graduate student, Joey has been directly involved in the technology transfer from the K-State laboratory to the prestressing plant in Newton, Kansas. He has been instrumental in establishing new batching procedures and working directly with the Newton plant personnel in order to implement this technology. His specific work has focused on the determination of transfer-lengths and long-term losses (creep and shrinkage) that are vital to the successful implementation of this technology in Kansas bridges. The title of Joey’s thesis is “Evaluating the Time-Dependent and Bond Characteristics of a Lightweight Concrete Mix for Kansas Prestressed Concrete Bridges.”
Research Program Spotlight

ANN-BASED PROGRAM FOR 85th and 50th Percentile Speeds on Gravel Roads

Developed by: Yacoub Najjar (Professor) and Srikanth Renikunta (MS Student)
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Abstract:
In Kansas, the total length of the gravel roads is about 78,000 miles. Most of the gravel roads, in Kansas, regulated with the posted speed limit of 55 mph which is generally posted for paved roadways. Speed regulations for paved roadways may not be suitable for gravel and sandy surface roadways. Regression- and Artificial Neural Network (ANN)-based models to predict 85th-percentile and 50th (median) speeds on gravel and sandy roads were developed based on 41 field speed data sets. Those models indicated that the traffic speed strongly rely on road width, percentage of heavy vehicles, surface classification (G1, G2 or S) and posted speed limit. By utilizing the ANN approach, the prediction accuracy via ANN models was much improved over those obtained using regression-based method.

Description:
The developed ANN- and Regression-Based models are designed to predict 85th and 50th (median) percentile speed limits for gravel roads. These models were implemented as Microsoft Excel based models as shown in Figures I & II. Predicted 85th percentile and 50th (median) speeds are computed by providing the needed input variables such as road width, percentage of heavy vehicles, gravel surface classification (G1, G2 or Sand), and posted speed limit values. In these models, surface classification G1 is used as a code for a surface having smaller amount of gravel, G2 for a surface having large or moderate amount of gravel, and S is the code used for sand surface roads. All input values must be within the applicable ranges indicated in Figures I and II. The overall prediction accuracy measures of ANN- and Regression-based models are compared in Table I.

 Developed Models:

![Figure I. Excel Interface for the 85th Percentile Speed Models (Screen Shot)](image1)

![Figure II. Excel Interface for the 50th Percentile (Median) Speed Models (Screen Shot)](image2)

Table I. Accuracy measures of the developed models

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<thead>
<tr>
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<th>85th Percentile Speed Model</th>
<th>50th Percentile (Median) Speed Model</th>
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<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
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<tr>
<td>Accuracy Measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.424</td>
<td>0.644</td>
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<tr>
<td>Absolute average error, %</td>
<td>10.31%</td>
<td>8.52%</td>
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<tr>
<td>Standard Deviation of error, %</td>
<td>11.43%</td>
<td>8.67%</td>
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</tbody>
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Utilization:
Based on prediction accuracy measures obtained (see Table I), it can be noted that ANN-based models for 85th and 50th (median) speeds are more accurate than the regression-based models. Accordingly, the developed models can be used to reasonably predict 85th and 50th (Median) speeds as well as to establish speed zones on similar gravel roads in Kansas.

Acknowledgments: Kansas State University Transportation Center (UTC) for funding this research study and Dr. Sunanda Dissanayake for providing the database and the associated assistance.
Dedicated to Improving the Sustainability and Safety of Rural Transportation Systems and Infrastructure

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Clockwise from the left: Abhiteja Rallabandi, Farhana Rahman, Brian Geiger (former student and past UTC student of the year), Loshaka Perera, Ranjit Godavarthy, Chandra Manandhar.