In This Issue

THE BRIDGE

Newsletter for Students of Civil and Environmental Engineering
UMASS – AMHERST
November 2007

CEE News

UMass Project Eyes Bringing Trolley Back

From The Recorder, Thursday, September 13, 2007

SHELBURNE FALLS – The vision of extending existing trolley car operations through Shelburne Falls is taking its next step, with an engineering study of the proposed right of way. Fourteen Senior University of Massachusetts engineering students will conduct a comprehensive final project by evaluating the right of way for the Shelburne Falls Trolley Museum from the present museum to the Iron Bridge in Shelburne Falls. The return of the trolley car operations to downtown will be a historic moment, after ceasing almost exactly 80 years ago, when the last trolley operated over these sections to Colrain.

The engineering study will commence this month by four teams. The Shelburne Falls Trolley Museum hopes to expand the current abbreviated trolley ride with the planned expansion into Shelburne Falls. The museum already operates weekends and holidays on approximately one eighth of a mile of existing railroad tracks once owned by the Boston and Maine railroad in Shelburne Falls. The engineering survey starts the first steps of re-building the original right of way of the Shelburne Falls and Colrain Street Railway, which was abandoned in 1927 and paved the way for the Bridge of Flowers attraction when the tracks were lifted.

The University of Massachusetts engineering students plan to accomplish the following:

• Analysis of the retaining wall on Depot Street to ensure it can withstand light rail trolley operations. Depot Street was once the right of way of the original trolley line.

• Survey of the yard and Depot Street, tying in to existing surveys of the

Save the Date

11/22: Thanksgiving

11/26: Classes resume

12/14: Last day of classes

12/15-16: Reading days

12/17-22: Final exams

01/21/08: Martin Luther King Jr. Day

01/28/08: First day of classes

02/28/08: CEE Career Fair

adjacent land and streets.

• Engineering plans for a new route of railroad looping around the museum's visitor's center and continuing down the former Depot Street right of way to Shelburne Falls.

• Structural design for the proposed new car barn

Engineering Students Designing Homey Alternatives to FEMA Trailers

Excerpt from In The Loop, October 19, 2007

Emergency housing structures that could serve as temporary homes for people displaced by hurricanes, tornadoes, and other natural disasters are being designed by students as part of the "Senior Civil Engineering Construction Methods" course. The goal of the project is to design structures that could serve as homey replacements for the utilitarian and nondescript FEMA trailers. Nineteen students from the Department of Civil and Environmental Engineering make up the four teams participating in the project. "The challenge for the students is to have it feel like a home," says Alan Lutenegger, the Civil and Environmental Engineering professor who conceived the project for his course. "It might almost have the feel of a small cabin," he says. The project has received some outside interest from the building industry and could ultimately yield a marketable prototype. Lutenegger was inspired to create humanitarian habitats after watching a TV show on disaster relief that pictured refugees being housed for long periods of time in trailer parks.

The four teams are each working on a different type of construction: traditional "stick built" wood frame, timber frame, engineered lumber, and metal frame. Every design must include bedroom, bathroom, kitchen and living-room space, and each team must create its design with an emphasis on economy, sustainability and speed of assembly (students are allowed a maximum of five days, hopefully much shorter, for the construction on site). The student designs for these emergency houses may allow them to be prefabricated in two halves in a factory or other enclosed facility and then shipped to disaster sites by tractor-trailer and bolted together onto a prefab "instant foundation" composed of metal screw piles that simply screw into the ground at the site. The use of the screw-pile foundation will allow a safe foundation to be constructed in one day and will also allow the foundation to be unscrewed and taken to the next site where the houses are needed.

A committee of judges from academia and industry will review the designs and choose the best of the four designs during a competition at the end of the current semester. Meanwhile, each student team will have to create a floor plan, a materials list, a detailed summary of material costs, an estimate of labor costs, a list of equipment for the site work and an estimate of construction costs. In many respects, these structures will likely be safer than a traditional wood frame house. And the assignment is not just an academic exercise. The whole idea is to apply these designs to the real world, says Lutenegger. "I'm working with a builder right now who seems to be very excited about the project, especially the timber framing aspect of it," he says. "That company has expressed a willingness to perhaps assist us in building a prototype. If we have something that is very viable, economical, works well and is reusable, I'd like to take it to the next step and see if we can actually build one of the foundations and houses here on campus. Believe me, there will be a need for these emergency houses during the next major disaster, which won't be long."

Quote

"Engineering is the professional and systematic application of science to the efficient utilization of natural resources to produce wealth."
T. J. Hoover and J. C. L. Fish, 1941

Transportation Paper In Press: "Link Traffic Flow Optimization"

Kimberly Rudy, Undergraduate Research Assistant, Haizhong Wang, Graduate Research Assistant and Dr. Ni worked on the "Link Traffic Flow Optimization" paper which has been accepted by the 87th Transportation Search Board's (TRB) Annual Meeting to be held in Washington DC in January 2008. Below is the paper summary. Congratulations Kimbery, Haizhong and Dr. Ni!

Submitted by Kimberly Rudy

Congestion is a problem that is ubiquitous in systems, decreasing output and efficiency. While the components of systems or networks vary, efficient production is desirable. Often, congestion is due to competition for limited resources or capacities. Whether you are considering data packets through an internet path or vehicles along a section of roadway, their basic link performance is restrained by a limited capacity. Various link traffic flow models have been used in computer networks with limited bandwidth, energy conservation in wireless devices and in noise prediction in the field of acoustics. Once link performance is optimized, it may be possible to expand the optimization to a series of links or an entire network to reduce congestion. Given the Federal Highway Administration's (FHWA) estimate that vehicle miles of travel increased 89 percent while lane-miles of highways increased only 5 percent between 1980 and 2003 [1], congestion in transportation has become an important issue affecting most drivers, both directly and indirectly through opportunity costs and rising food prices.

This research intends to provide a link traffic flow optimization model that may be applicable to transportation as well as computer and industrial networks. Some assumptions made are the stochastic nature of traffic flow, Markovian traffic states and a non-linear decreasing service rate. Based on the expected traffic state from discrete Markov chain theory, an objective function for the optimal throughput was created with a new blocking probability distribution from stochastic traffic M/G/c/c state-dependent queuing theory [2-5]. The objective function with the blocking probability penalizes unstable flows. The optimal solution is a proposed flow at which the link throughput would be maximized based upon the present conditions. The blocking probability has been successful in random systems whose travel speed decreases non-linearly as a function of the traffic density in the system, which is the case for vehicular and pedestrian traffic flows.

Using the proposed blocking probability distribution, this paper presented a new mathematical model for the optimal throughput of a one-directional link. The mathematical model was compared with a simulation model with limited success. However, the mathematical model very closely follows the trend of the empirical data. In this sense, the mathematical model may be a more realistic prediction method. Under a Vehicle Infrastructure Integration (VII) scenario, this model may serve as the basis of link flow control in an effort to achieve the maximum link throughput in the long run.

REFERENCES
[1] FHWA, "Focus on congestion relief," vol. 2007: US DOT, 2006.
[2] R. Jain, Smith, J. MacGregor, "Modeling vehicular traffic flow using M/G/C/C state dependent queueing models," Transportation Science, vol. 31, pp. 324-336, 1997.
[3] F. R. B. Cruz, Smith, J. MacGregor, "Approximate analysis of M/G/c/c state-dependent queueing networks," Computers and Operations Research, vol. 34, pp. 2332-2344, 2007.
[4] F. R. B. Cruz, Smith, J. MacGregor, Medeiros, R.O., "An M/G/C/C state-dependent network simulation model," Computers and Operations Research, vol. 32, pp. 919-941,2005.
[5] J. M. Smith, "Application of state-dependent queue to pedestrian/vehicular network design," Operations Research, vol. 42, pp. 414-427, 1994.

Contact Us

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Geotechnical Graduate Student Research Symposium

On Friday, October 26, 2007 the UMass Amherst Geotechnical Engineering Group hosted the Northeast Geotechnical Graduate Student Research Symposium. The Symposium was Chaired by UMass Amherst Ph.D. student Hoang Nguyen and the Proceedings were co-edited by Hoang and UMass Amherst Ph.D. student Adriane Boscardin. The Symposium included participants from MIT, Tufts, Northeastern, URI, UMass Lowell, RPI, Clarkson, UVM, and UMass Amherst. Twenty-four presentations were given by students from these universities. Geosyntec Consultants sponsored an abstract competition with cash awards. UMass Amherst graduate students won three of the prizes including: 2nd Place to Jeffrey Lloyd for his presentation on "Evaluation of an Automated Early Warning System for Unstable Soil Slopes," and co-3rd place to Cody Jones for "High Quality Deep Water Geotechnical Sampling and Shear Wave Velocity," and Best Overall Presentation to Matt Ciuffetti for "Full-Scale Pilot Study to Reduce Lateral Stresses in Retaining Structures Using GeoFoam."

Pictured are participants at Northeast Geotechnical Graduate Student Research Symposium hosted by UMass Amherst. Pictured at lower left: UMass Amherst PhD student Hoang Nguyen, the Symposium Chair.

Geotechnical Student Research Project

UMass Amherst Geotechnical Engineering MS student Adriane Boscardin spent January to September 2007 conducting research at the Norwegian Geotechnical Institute (NGI) in Oslo, Norway. While there Adriane worked on studying the remolded undrained shear behavior of soft offshore sediments. Understanding the behavior of these materials are important to design and installation of offshore infrastructure and for prediction of the occurrence and fate of submarine landslides, which can damage offshore infrastructure and trigger catastrophic tsunamis. While at NGI, Adriane also went on an offshore site investigation to the Norwegian Continental Shelf and participated in the conduct of in situ tests and collection of soil samples from the seabed. Adriane completed her MS degree in May 2007 and is now a Ph.D. student in the Geotechnical Engineering Program conducting research on the National Science Foundation project on offshore geohazards.

UMass Amherst MS Student Adriane Boscardin conducting research in the Norwegian Geotechnical Institute (Oslo, Norway) laboratory using equipment (on the left) developed as part of her MS research at UMass Amherst. Pictured (from the left) with Tom Lunne (Technical Advisor, NGI), Farrokh Nadim (Director, International Centre for Geohazards) and Knut Anderson (Technical Director, NGI).

LAndslide Risk Assessment and Mitigation

UMass Amherst Geotechnical Engineering Ph.D. student Hoang Nguyen was selected from an international competition to attend the "LAndslide Risk Assessment and Mitigation" (LARAM) school in September 2007 at the Università di Salerno, Italy. The two week school brought together faculty, practitioners and graduate students from around the world to learn about and discuss technical issues associated with prediction, assessment and mitigation of landslides. http://www.laram.unisa.it

Pictured is Hoang Nguyen (in white shirt with stripes) leading a group discussion on site characterization and soil modeling.

AWARDS AND SCHOLARSHIPS

The Department of Civil & Environmental Engineering is now accepting applications for the **2007-2008 Honors Research Award**. Award recipients work with a faculty member on current projects. Past honors research projects include traffic safety, strength of cemented soil and drinking water treatment. If you are interested in applying for the award please complete the application located at the end of this Bridge and return to Dr. Ni no later than **December 10, 2007**.

The Department is fortunate in having a large number of scholarships that are available to our undergraduates. The generous support of our alumni over the years has made this possible. The awards of scholarships are coordinated by a faculty scholarship committee that solicits and reviews the nominations from the faculty and the student applications for those awards that are by application during the Spring semester of each academic year. The awards are given at the Annual College of Engineering Banquet. Students currently enrolled in the College of Engineering are invited to submit an application between October and the **application deadline of February 15th for College of Engineering scholarships.** For more information on College of Engineering scholarships, see the Director of Recruitment in Marston Hall. For more information or to fill out an application visit the Scholarship Website at http://www.ecs.umass.edu/index.pl?id=2356

FUNDAMENTALS OF ENGINEERING EXAM (EIT)

For information about the FE exam, you may access the Professional Credential Services, Inc. website at www.pcshq.com. The spring exam is scheduled for April 12, 2008 with an application deadline of March 1st. You may download applicant information and applications on-line, or you may telephone 1-877-ENG-EXAM.

STUDENT NEWS

Kate Mills, CEE student, is the featured player for the 2007-2008 Women's basketball schedule! Congratulations Kate!

RESEARCH NEWS

Conferences, Presentations and Publications

At the 2007 AWWA Water Quality Technology Conference which was held November 2007 CEE members had the opportunity to present a variety of papers.

- **Dr. Tobiason** presented "Control of Periodically Elevated Raw Water Manganese with Oxide-Coated Media" and "Innovative Membrane Treatment of Waste Filter Backwash"
- **Dr. Reckhow** presented "Understanding Natural Organic Matter: The Producer of Disinfection By-products"
- **Dr. Rosenfeldt** presented "Modeling UV/H2O2 Advanced Oxidation Processes in Water: The New ROH, UV Concept" and "Application of a Flow Cytometry Method to Quantify Bacterial Re-growth and Assailable Organic Carbon In Distribution Systems"
- **Kenneth Mercer,** Ph.D. student presented "Coagulation of Simulated High-Pressure Membrane Concentrates for Removal of Trace Pollutants".

Dr. Reckhow is one of the preparers of the "Characterization of Total Organic Halogen Produced During Disinfection Processes". This publication is distributed by the AWWA Research Foundation and EPA.

FACULTY NEWS

Dr. Rees Named Interim Director of Water Resources Research Center *Excerpt from In The Loop, October 5, 2007*

Dr. Paula L. Sturdevant Rees, Assistant Professor of Civil and Environmental Engineering, has been appointed interim director of the Massachusetts Water Resources Research Center and will oversee the center on a part-time basis. Dr. Rees will also help lead The Environmental Institute's interdisciplinary Water Working Group in engaging in water related research and educational activities. Dr. Rees has been teaching on campus since 1999. She received a Ph.D. (1997) and M.A. (1994) in environmental engineering and water resources from Princeton University and a B.S. in civil and environmental engineering from the University of Iowa in 1992.

The Water Resources Research Center supports research, education, and outreach on water resources issues of state, regional, and national importance as part of the national system of institutes authorized under the Water Resources Research Act of 1964. The center supports faculty research and training of graduate students and is a national leader in the use of volunteers for high quality water quality monitoring of surface waters. The center is a unit of The Environmental Institute. As interim director, Rees plans to build upon the ongoing work of the center to integrate researchers and students across both the Amherst and other UMass campuses. "Water is a key unifying element across diverse research focus areas. The center is thus in a unique position to provide a focal point for jumpstarting interdisciplinary efforts," she says.

Such efforts will build upon historical strengths at the Amherst campus while expanding into new areas. In particular, Rees hopes to promote interdisciplinary graduate education through research study groups and, eventually, to coordinate an interdisciplinary water education or certificate

program. In addition, she hopes to expand outreach activities of the center. Such efforts would involve work with K-12 students, regional volunteer groups, and local federal offices such as the Fish and Wildlife Service and Department of Agriculture. The center has several ongoing projects working across campuses and departments to develop effective Information Technology tools for dissemination of knowledge.

Student Engineering Groups

ASCE (American Society of Civil Engineers)

Faculty Advisors: Dr. Brena & Dr. Civjan

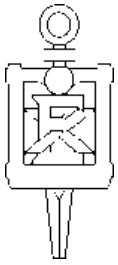
President: Michael Sullivan

- **December 4th** ASCE is sponsoring a fundraiser: **Dine to Donate at Applebee's** on Rt. 9 in Hadley. A portion of the dinner proceeds will be going towards the Whole Children Charity in Hadley.
- **December 5th ASCE Meeting is at 6:00 pm. Location TBA.**
- **December 7th** is **Fenway Park Construction Tour**. Interested students will be driving to Fenway Park in Boston to get a tour of the upcoming construction projects.

Chi Epsilon

Faculty Advisor: Dr. DeGroot

President: Nyssa Lanzafame



Twenty-six CEE juniors and sophomores accepted an invitation to join the Chi Epsilon Civil Engineering Honor Society. The invitation is awarded to students whose GPA ranks within the upper one-third of their class. The initiation ceremony will be held in the Gunness Engineering Student Center on Thursday, December 13, 2007 starting at 5 pm. All faculty and current Chi Epsilon members are invited to join the ceremony. A reception will be held afterwards at Bertucci's in Amherst. Dr. Highter, CEE Professor is the current National President of Chi Epsilon.

Institute of Transportation Engineers

Faculty Advisor: Dr. Knodler

President: Heather Rothenberg

- **MAITE/NEITE Joint Meeting:** Members of the UMass ITE Student Chapter attended the Massachusetts ITE/NEITE Joint Meeting on September 13, 2007 in Needham, MA. Former Massachusetts Governor Michael Dukakis was the keynote speaker for the dinner session where students also had the chance to meet and network with professionals. At this meeting, student chapter member Arianna Mickee was presented with the Thomas Desjardins

Memorial Scholarship. The Scholarship is given to students of high moral character and with high academic achievement who have also been involved in extracurricular activities.

- **UMass ITE Website:** The UMass ITE website continues to be updated regularly. The website includes information and photos on past events, announcements of upcoming events, PDF versions of the Chapter's newsletter and more. Check it out at www.ecs.umass.edu/ite.

Locate and Name This Bridge!

This bridge was the first in the world to be made entirely of cast iron. The bridge's arch spans 100 feet and has five arch ribs, each cast in two halves. All the major parts were put together in three months without a single accident or the least obstruction to the boats in the river. When it was finally complete, artists, writers, and engineers came from all over the world to marvel at the unique design.

Email your answer to nofio@ecs.umass.edu by December 7, 2007 for a chance to win a University of Massachusetts travel mug. September's bridge was the Chesapeake Bay Bridge. Congratulations to Adam Butler who was September winner!

Department of Civil & Environmental Engineering
Honors Research Award

Application for 2007-08 Academic Year

First Name: _____ **Middle Initial**:____ **Last Name**:_____

Address:_____

City:_____ **State**:_____ **Zip**:_____

Telephone:_____

Email address:_____

Student I.D.#: _____

Academic Information:

Current Class: Fresh. ☐ Soph. ☐ Junior ☐ Senior ☐

GPA: _____ (attach unofficial transcript or Spire Print Out)

Honors Courses Taken

List any honors you have received, such as scholarships, fellowships, election to honor societies, etc.

If you have any research experience, please indicate.

Faculty/Project Requested:	**Faculty Signature**
_____	_____
_____	_____
_____	_____

Application Deadline: December 10, 2007

Contact information:
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