UNIVERSITY OF MINNESOTA CENTER FOR TRANSPORTATION STUDIES

Transportation Education E-News

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The *Transportation Education E-News* is a semiannual electronic newsletter from the Center for Transportation Studies at the University of Minnesota. It's designed to inform university faculty of tools, initiatives, and activities for improving transportation education, especially in the field of transportation engineering. This newsletter is sponsored by the Center for Transportation Studies, the Intelligent Transportation Systems Institute, and the STREET (Simulating Transportation for Realistic Engineering Education and Training) project.

IN THIS ISSUE:

Students balance costs, experience real-world challenges in online game

Students who play the online ROUTE Optimization game encounter some of the real-world issues faced by transportation officials when designing roadways. Developed by Minnesota Traffic Observatory education systems engineer **Chen-Fu Liao**, ROUTE is an interactive simulation program that allows students to design a route based on reducing construction costs, driver costs, or both combined.

Students begin by choosing one of several landscape maps to work from. They are then given a map with a designated start and end point and asked to design a route connecting the two. Several types of roadway segments, both straight and curved, may be used. The route segments are placed within the map's grid-like sections, each with an associated construction cost for building the roadway. Each segment of roadway used to form the route also has a related driver cost.

Construction costs depend on the object located in each grid section. The cost is higher where there are homes and buildings or ecological constraints: one unit for empty squares, three units for those containing trees, five units for homes, eight units for wetlands, etc. Straight road segments have a driver cost of two units, and curved segments cost three units. This reflects the relative costs of travel time, vehicle operation, crash risk, and other such factors for road users. On the side of the map, three counters keep track of the total construction, driver, and cumulative costs. Depending on the identified goal, students attempt to minimize one or all of the cost amounts as they lay out a roadway.

ROUTE provides an effective method for students to obtain a hands-on understanding of the challenges of roadway design. It is currently used by **David Levinson**, associate professor at the University of Minnesota's Department of Civil Engineering. Levinson says that ROUTE helps his students gain a better understanding of roadway design both intellectually and spatially, "as the road meets the ground."

- Play the ROUTE Optimization Game on the STREET Web site

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ROAD module offers roadway design alternative to engineering students

When studying roadway geometry design, transportation engineering students traditionally use a pencil and paper to map lines and curves on a contour map. This time-consuming process necessitates iterative computations of stopping sight distances, curve alignments and other factors to meet design criteria and project constraints. Although commercial software packages utilizing digital maps and 3D models are available, their high level of complexity and excessive cost often make them unsuitable

for classroom use.

To make the process less cumbersome for students studying roadway design, **Chen-Fu Liao**, educational systems manager at the Minnesota Traffic Observatory, and Associate Professor **David Levinson** of the University of Minnesota's Department of Civil Engineering developed a simple online simulation module. ROAD (Roadway Online Application for Design) allows students to easily and efficiently design and modify a roadway within a set of given parameters. The module was originally tested in an introduction to transportation engineering course at the University of Minnesota in 2006.

The ROAD module works by allowing students to import a digital contour image into the software as a starting point. Users can then enter design criteria such as speed limit, maximum cut and fill, maximum grade, road width and other factors into a settings screen. After students identify the start and end location of roadway construction on the map, they begin horizontal and vertical design by using line and curve construction tools, identifying landmark stations, and entering elevation information.

Once the roadway design is completed, ROAD can produce design reports and mass diagrams for earthwork estimation. A 3D geometry model can also be generated based on the completed design, allowing students to "drive" the roadway at the maximum design speed. This ability to view the design from a driver's perspective is just one of the ways ROAD enhances students' learning experience. Because the module makes the process less complicated and time-consuming for students, they are also able to spend more time considering such factors as the environmental and economic impacts of their roadway design.

- View the ROAD module
- Read more about ROAD at http://nexus.umn.edu/Papers/ROAD.pdf

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STREET project featured in Webcast presentation

STREET (Simulating Transportation for Realistic Engineering Education and Training) is a project focused on developing a set of Web-based simulation modules and other learning tools designed for use in introductory undergraduate transportation engineering courses. The modules are also suitable for upper-division transportation courses and cover a variety of topics fundamental to the practice of transportation engineering, including travel demand modeling, geometric design, traffic flow, and traffic signal control.

Henry Liu, assistant professor in civil engineering at the University of Minnesota, provided an overview of the STREET project at a September 16, 2010 Center for Transportation Studies seminar, which was broadcast live and recorded for later viewing.

Simulation has proven to be a powerful tool in encouraging active learning. The Web-based interface allows easy access for users without the high cost associated with commercially available simulation products. The simulation-based materials form an active textbook, which offers an interactive learning environment to undergraduate students.

The STREET project is funded by the National Science Foundation with matching support from the Intelligent Transportation Systems (ITS) Institute at the University of Minnesota.

- Watch the STREET Webcast

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Other transportation education activities

- Summer ITE meeting session on the beginning transportation engineering course (learning outcomes, knowledge tables) (from Michael Kyte)
- Summer meeting of TRB's Signal Systems Committee (July 18-20) in Moscow, ID with a one day workshop (July 19) on education (from Michael Kyte)
- Upcoming TRB Education Committee activities, if any

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Comments

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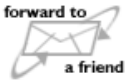

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