STREET: Simulating Transportation for Realistic Engineering Education and Training

http://street.umn.edu

David Levinson, Henry Liu, Chen-fu Liao
University of Minnesota
Department of Civil Engineering
STREET Curriculum
Objectives

To develop and refine a suite of web-based simulation modules that can be easily incorporated in the undergraduate transportation courses.

The simulation-based teaching material will become an "active textbook", which offers an interactive learning environment to students.
STREET Components

ROAD: Roadway Online Application for Design
ADAM: Agent-based Demand and Assignment Model
SOFT: Simulation of Freeway Traffic
SONG: Simulator of Network Growth
OASIS: Online Application of Signalized Intersection Simulation
wikibook Fundamentals of Transportation
To provide students with a web-based design tool that they can perform roadway geometry design from a broader perspective.

To better understand roadway geometry design process and its challenges.

To enrich students’ learning experience in roadway geometry design.
To provide platform for students to learn travel behavior, travel demand modeling and be able to test and evaluate alternative network designs.

Evaluation Criteria:
Understanding of travel demand modeling process
Stimulating new ways of thinking about the travel demand modeling beyond the traditional procedures
Developing problem-solving skills and judgment in infrastructure investment decision-making
SOFT: Simulator of Freeway Traffic

<table>
<thead>
<tr>
<th>Start</th>
<th>1: Ring Road</th>
<th>3: Lane Closing</th>
<th>5: Traffic Lights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop</td>
<td>2: On-Ramp</td>
<td>4: Uphill Grade</td>
<td>6: Lane Changes</td>
</tr>
</tbody>
</table>

**Time 5:37**

- **Main Inflow**: 3300 Vehicles/h
- **Ramp Inflow**: 400 Vehicles/h
- **Ramp p_Factor**: 0.0
- **a_bias.onramp**: -2.0 m/s^2
- **Time Warp Factor**: 6.9 times

**Car Truck**
SONG

To support the learning of the transportation network development process

Allow users to adjust different parameters and test the effects of these factors on the resulting network forms

Allow students to visualize speeds or volumes on network links represented by different colors and thickness of the links.
To help students better understand actuated signal control logic.

To enrich students’ learning experience in intersection signal timing and control.
Fundamentals of Transportation

From Wikibooks, the open-content textbooks collection

Fundamentals of Transportation

- About
- Introduction
- Economics
- Geography and Networks

Planning

- Trip Generation
- Destination Choice
- Mode Choice
- Route Choice
- Evaluation

Operations

- Queueing
- Traffic Flow
- Queueing and Traffic Flow
- Shockwaves
- Traffic Signals

Design

- Sight Distance
- Grade
- Earthwork
- Horizontal Curves
- Vertical Curves

Other Topics

- Pricing
- Conclusions
- Analogs
- Decision Making


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STREET – Dissemination Plan

Disseminate the results, online teaching materials and help others to adopt the materials and taking steps toward self-sustained distribution

Recruit faculty from other schools across the country and help them integrate the simulation modules in their curriculum

To date 17 faculty members outside UMN have expressed interest in the simulation modules, and are willing to use these modules in their course offerings.

We are looking for more, see me or Chen-Fu during conference for information.
STREET – Evaluation Plan

Hypotheses:

The simulation modules will improve students’ understanding of critical concepts in Transportation Engineering and lead to student learning better than in a course without these simulation tools.

The simulation modules will improve student motivation toward transportation engineering and improve student retention.
STREET – Evaluation Plan

Evaluation of Learning

Control students’ background differences and other confounding factors

Compare learning outcomes between the two groups

Pre and post-assignment survey, coursework, and final exam.

Evaluation of Motivation and Retention

Do students find transportation engineering engaging?

Do students take more transportation courses?

Do students become transportation engineers?
STREET - Potential Impact

Engage computer simulation and create interactive teaching materials for effective learning in transportation engineering education.

Help improve the transportation curriculum beyond University of Minnesota and help to educate the public on the transportation issues. State Fair Deployment.

Results of this effort will be disseminated through TRB annual meeting and national American Society for Engineering Education conference and through publication in engineering education journals.
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- $500,000 NSF Grant (PIs Liu, Levinson)
- [http://street.umn.edu](http://street.umn.edu)
Thank you

Questions? http://street.umn.edu