STREET

Simulating Transportation for Realistic Engineering Education and Training

Where Simulation meets Reality

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www.street.umn.edu

Motivation

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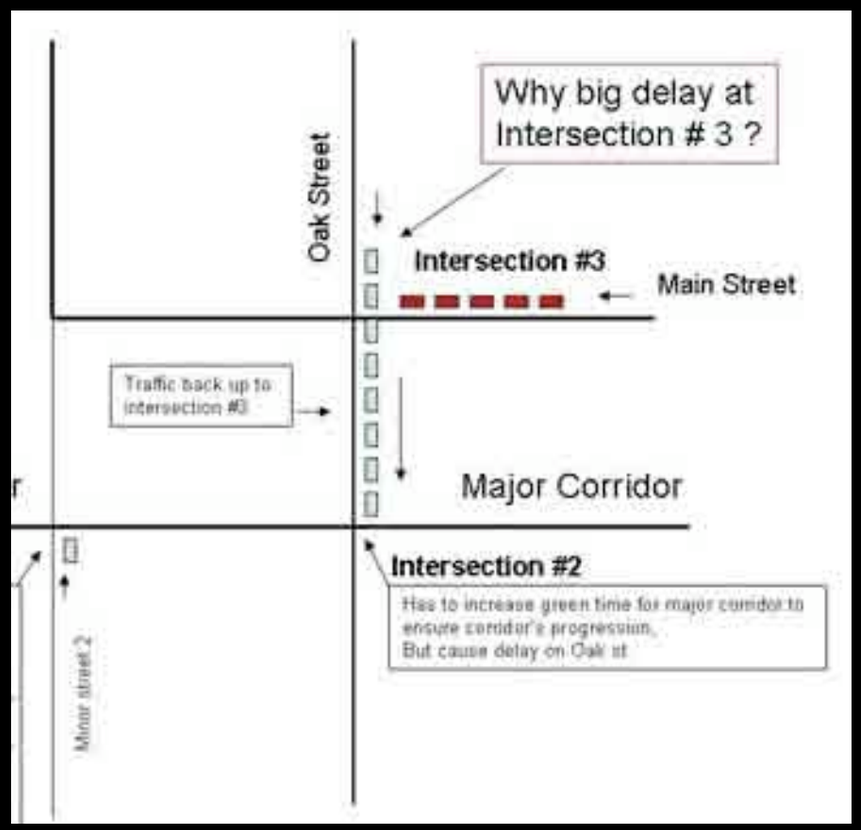
Why big delay at Intersection # 3 ?
Oak Street
Intersection #3
Main Street
Traffic back up to intersection #3
Major Corridor
Intersection #2
Has to increase green time for major corridor to ensure corridor's progression.
But cause delay on Oak st
Minor street 2

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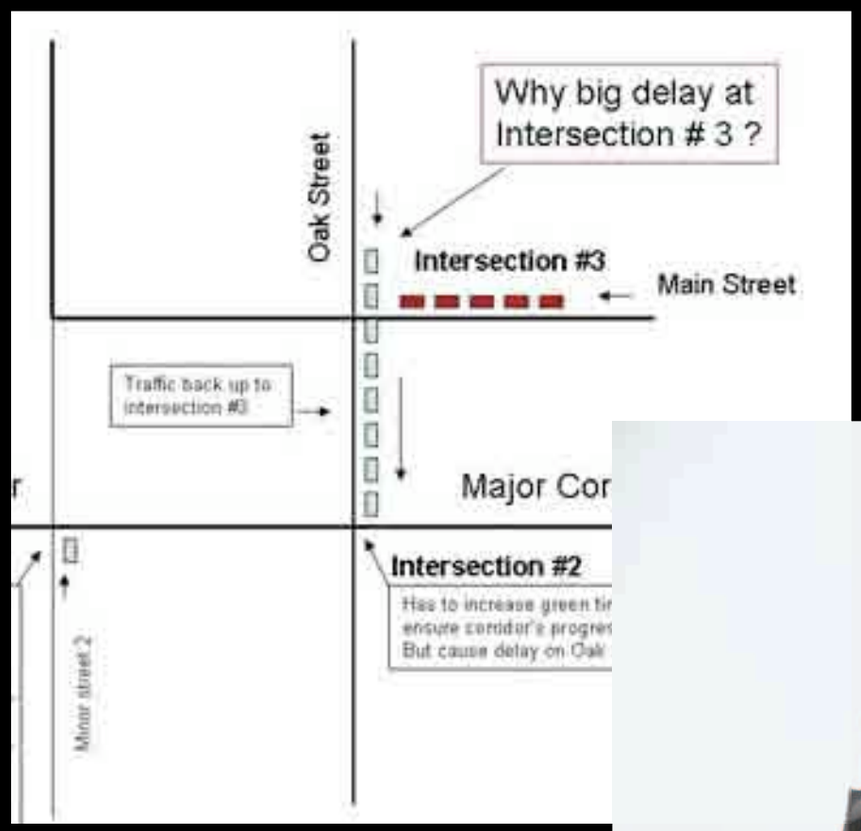
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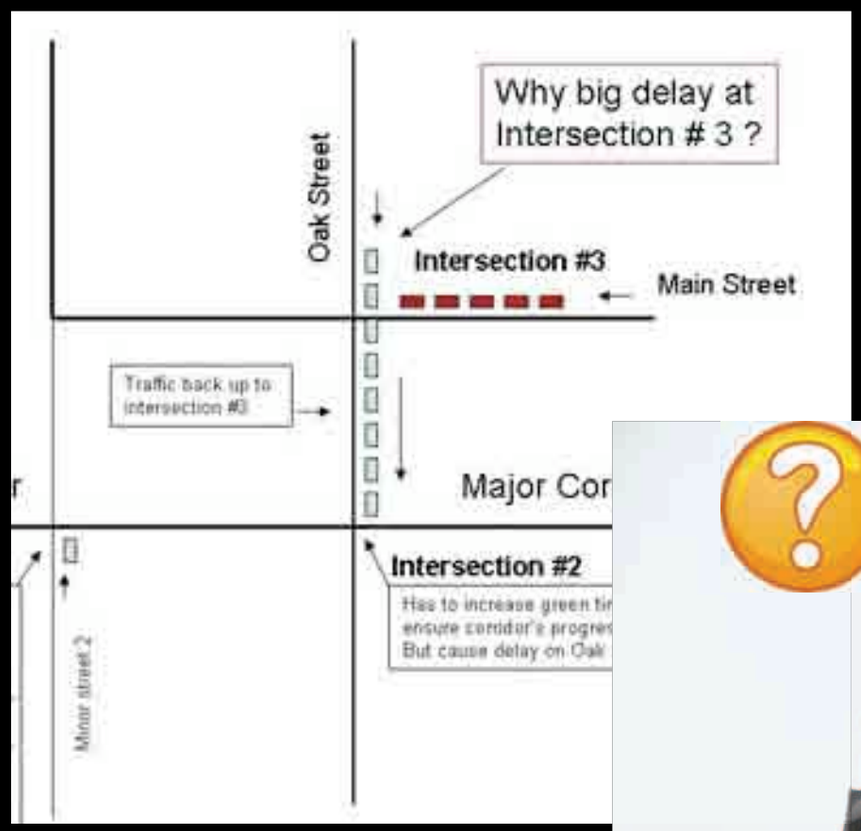
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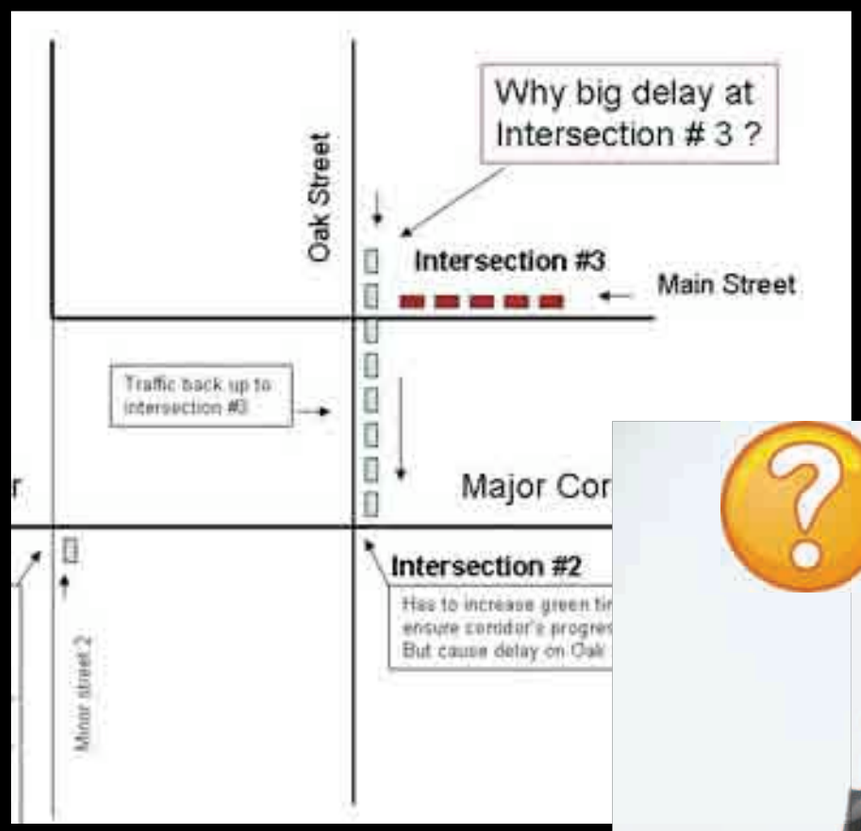


STREET: Simulating Transportation for Realistic Engineering Education and Training

Funding

National Science Foundation's Division of Undergraduate Education

Match support from the ITS Institute at UMN

Seed grants from the Digital Media Center at UMN

Principal Investigators

Professors Henry Liu and David Levinson

Modules

ROAD (Roadway Online Application for Design)

OASIS (Online Application for Signalized Intersection Simulation)

ADAM (Agent-based Demand and Assignment Model)

SONG (Simulation of Network Growth)

SAND (Simulation and Analysis of Network Design)

SOFT (Simulation of Freeway Traffic)

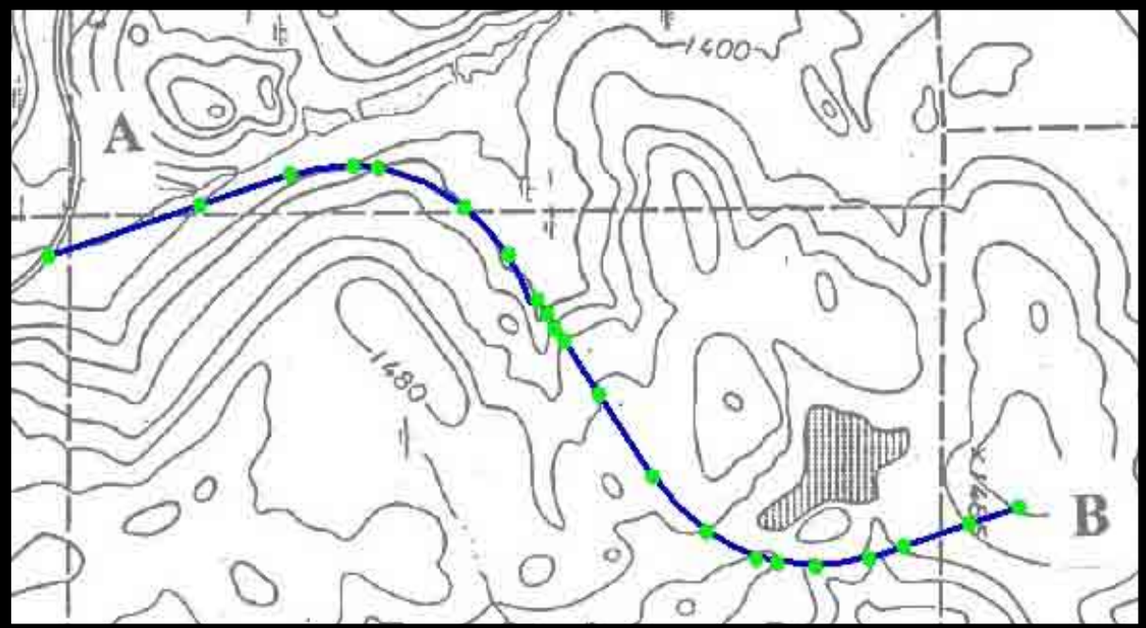
CLUSTER (Clustered Locations of Urban Services, Transport, and Economic Resources)

ABODE (Agent Based Model of Origin Destination Estimation)

ANGIE (Agent-based Network Growth with Incremental Evolution)

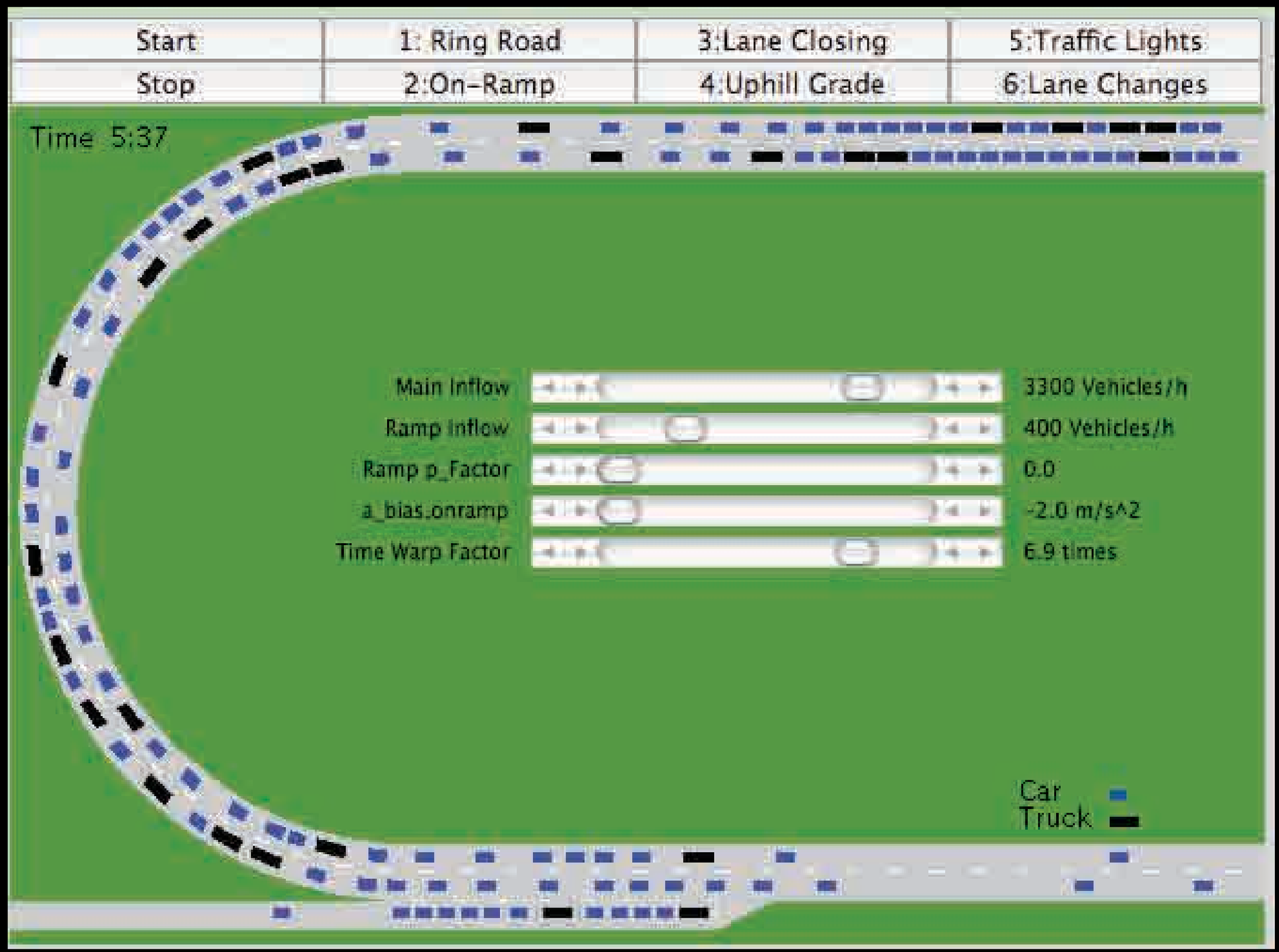
ROAD

Roadway Online Application for Design



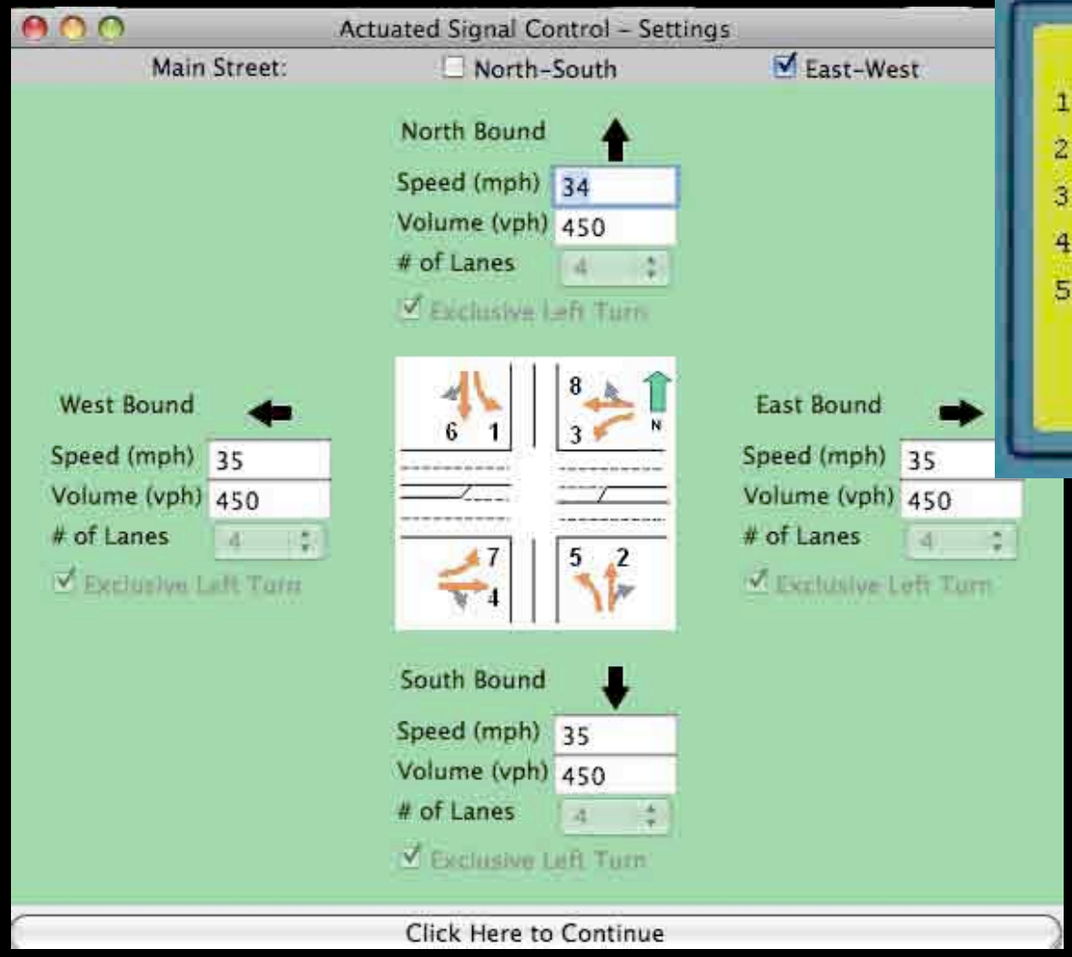
SOFT

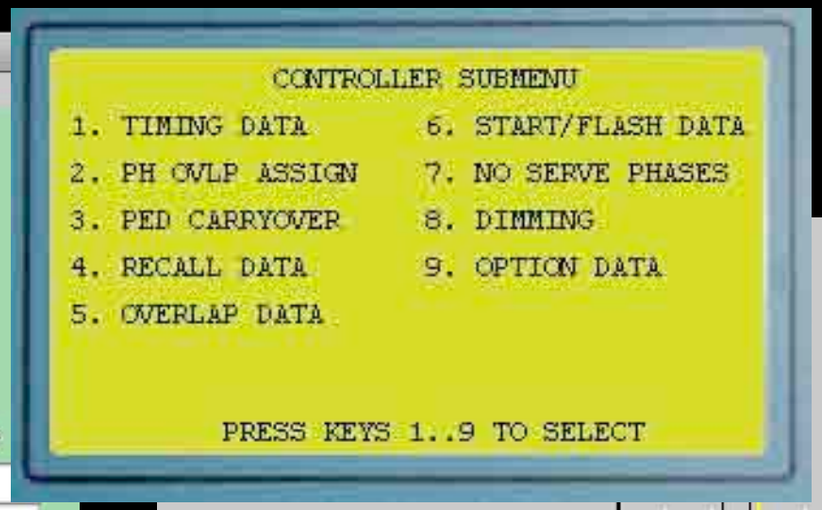
Freeway traffic simulator

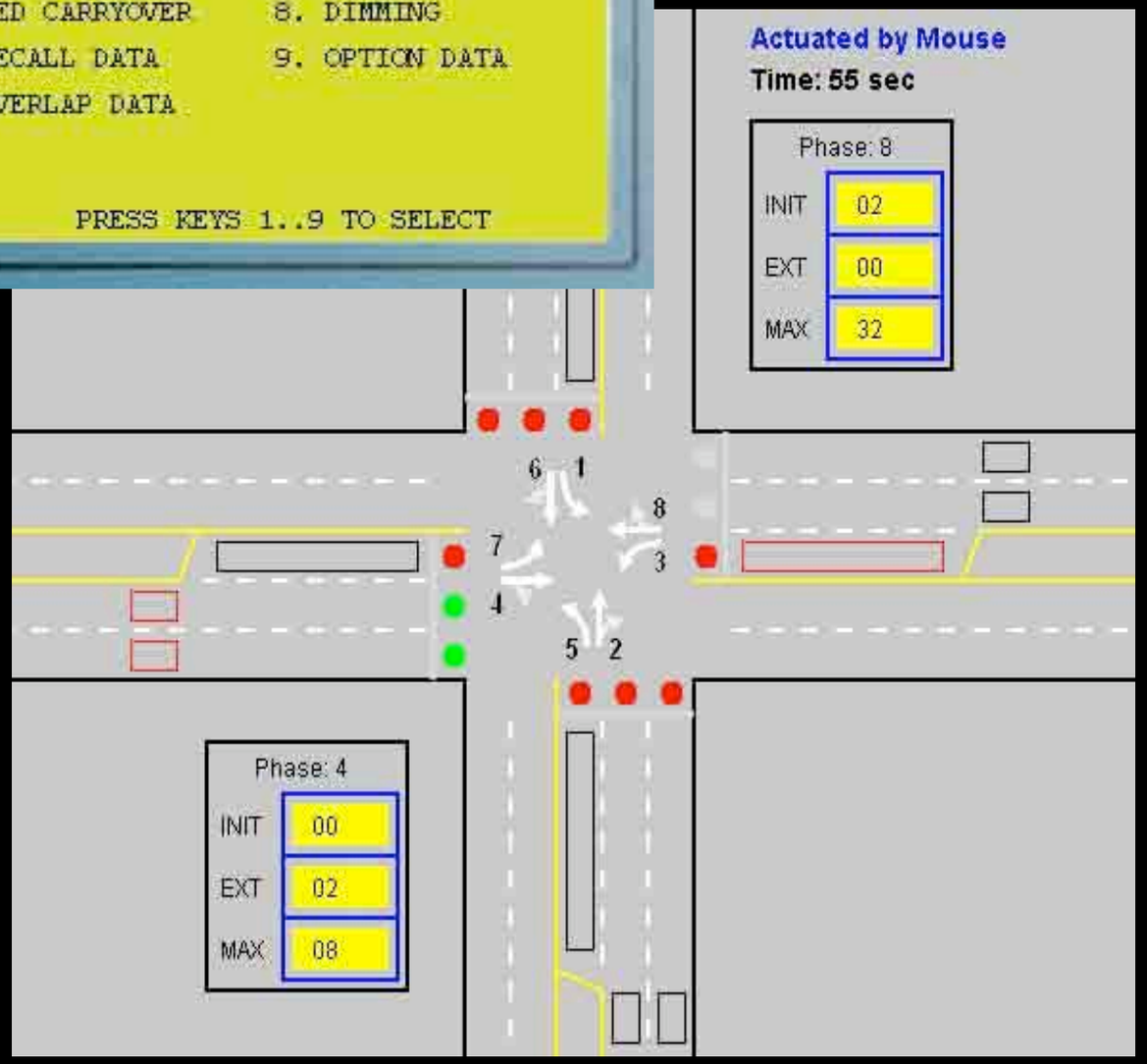


OASIS

Actuated Signal Control Module

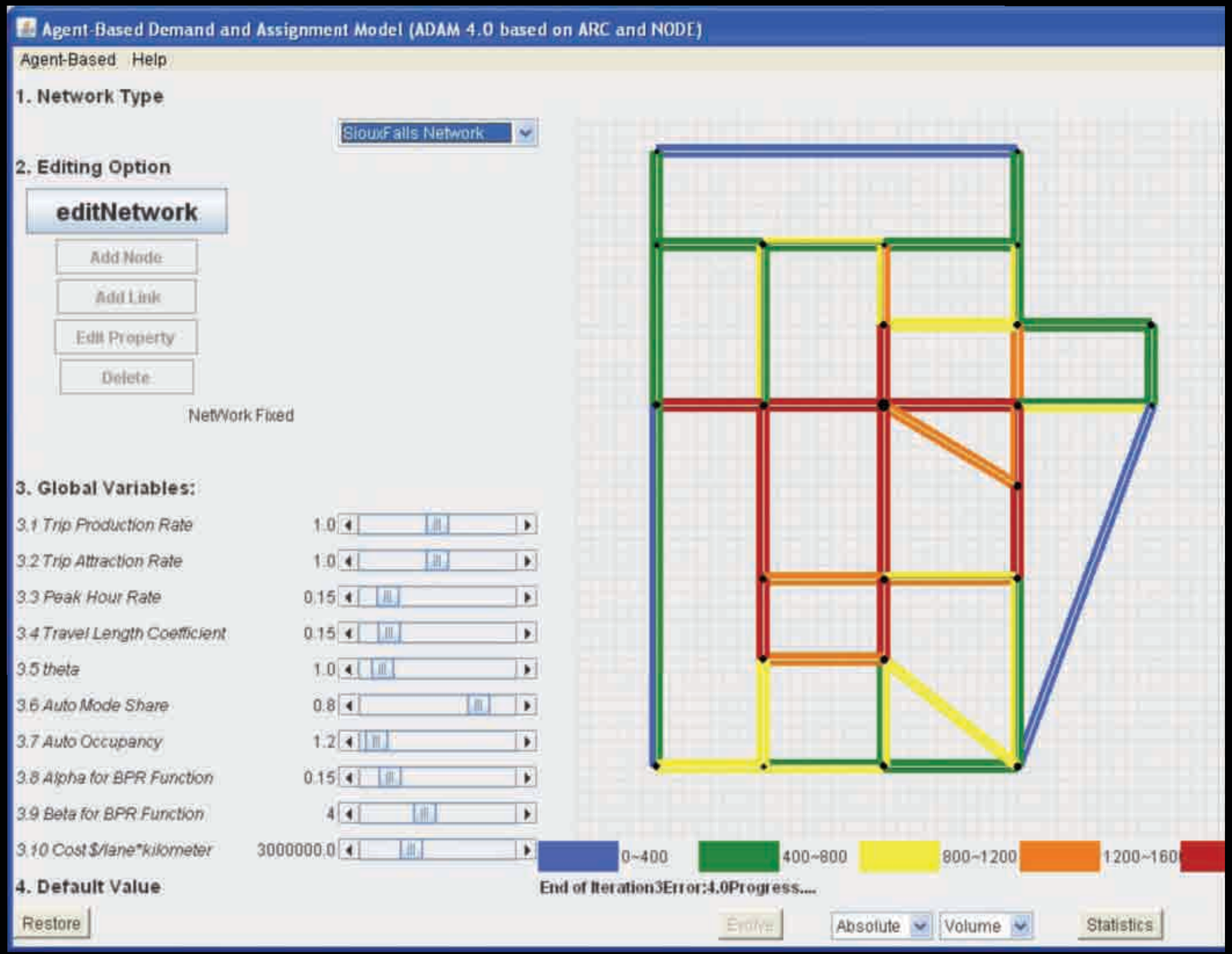






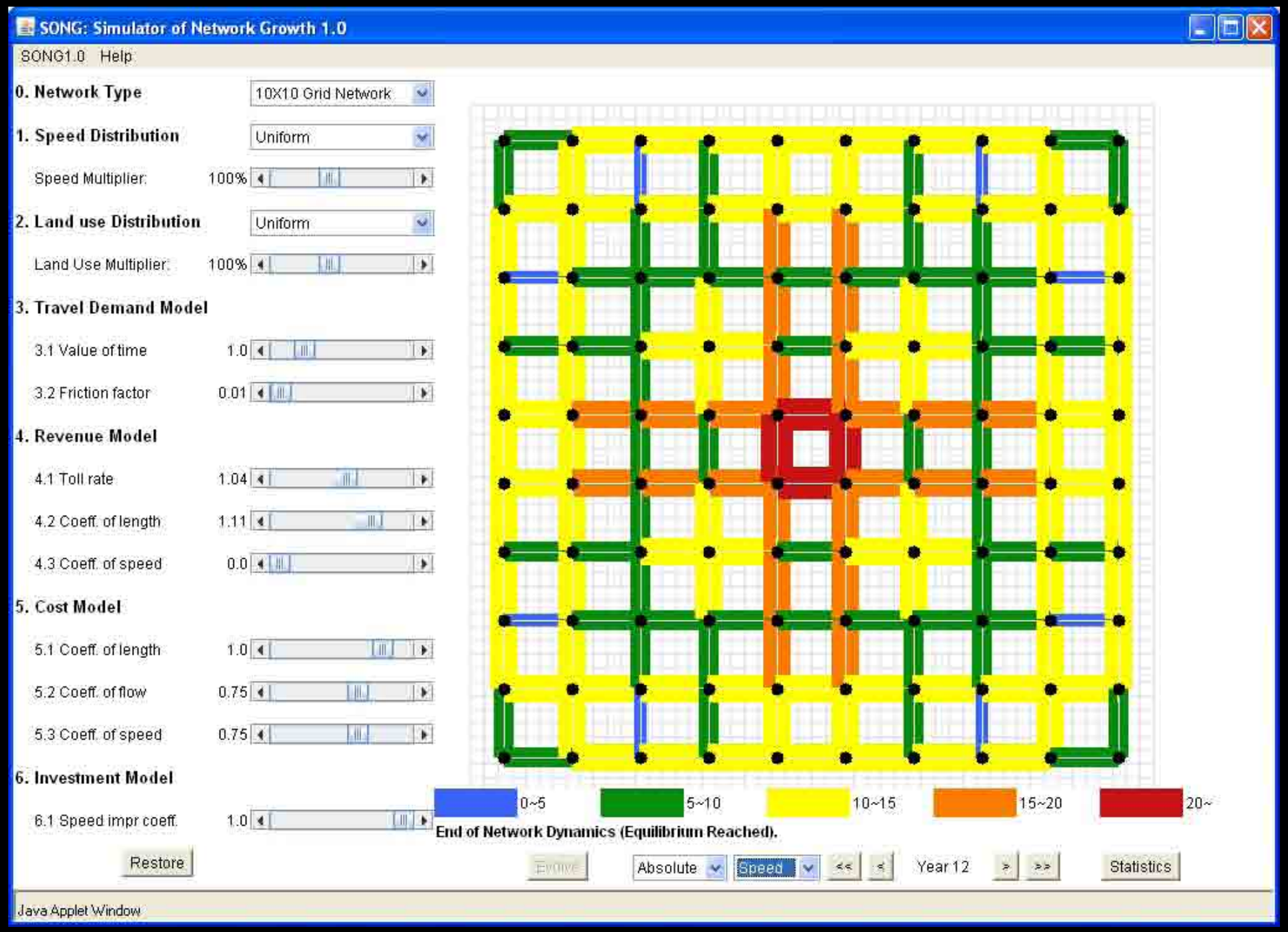
ADAM

Agent-based model of travel patterns



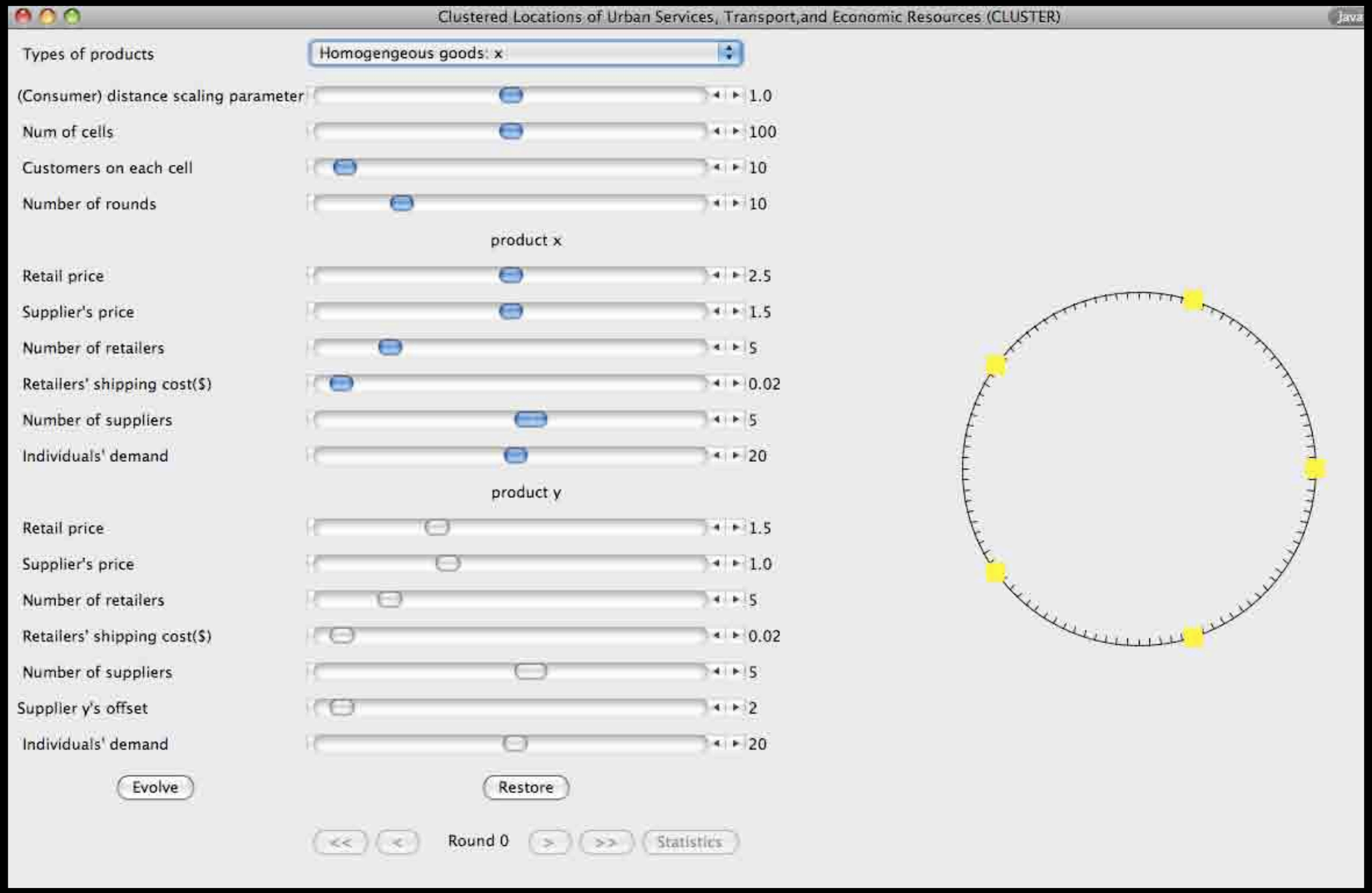
SONG

Simulating transportation network growth



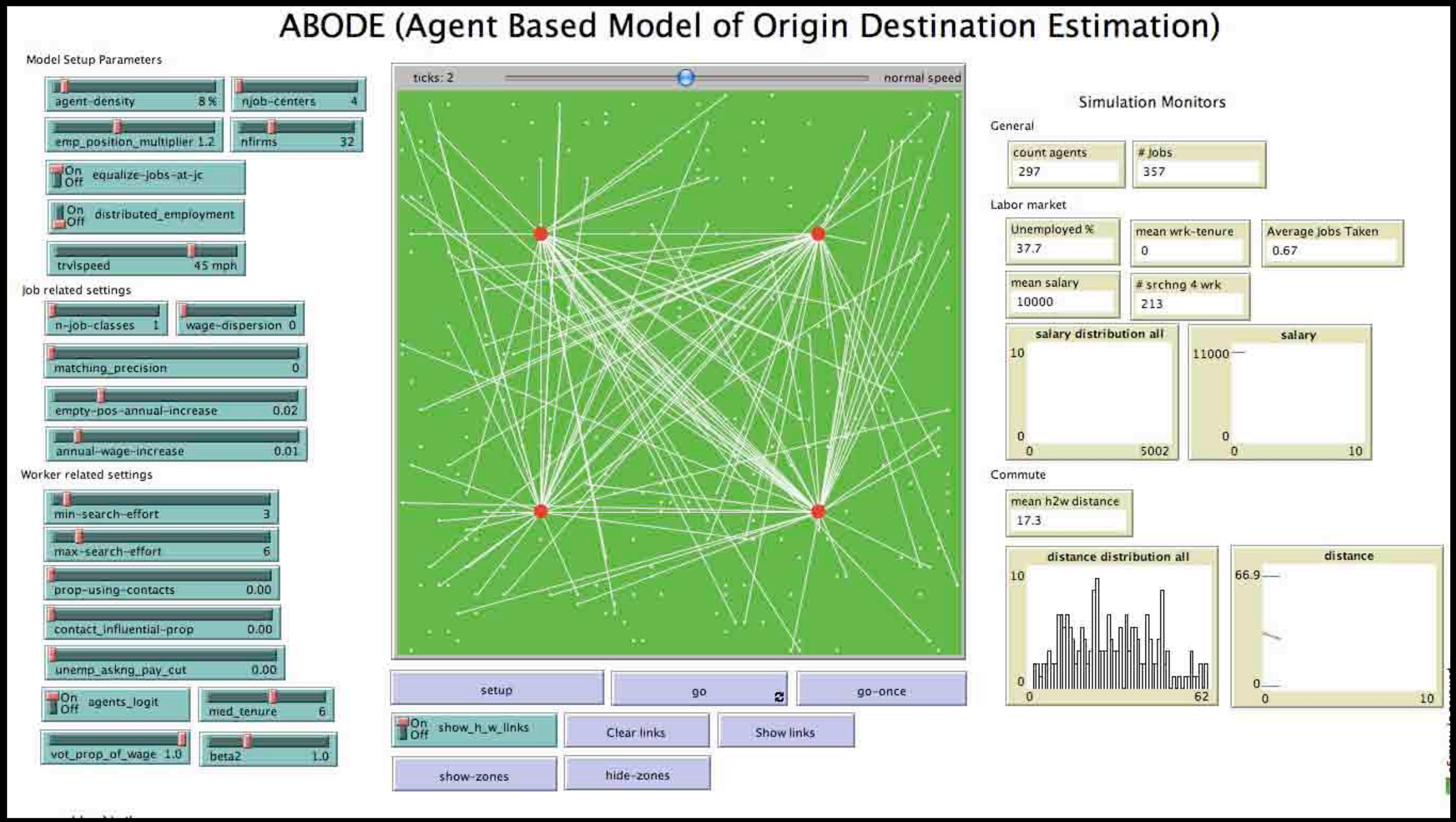
CLUSTER

Retail location choice on supply chains



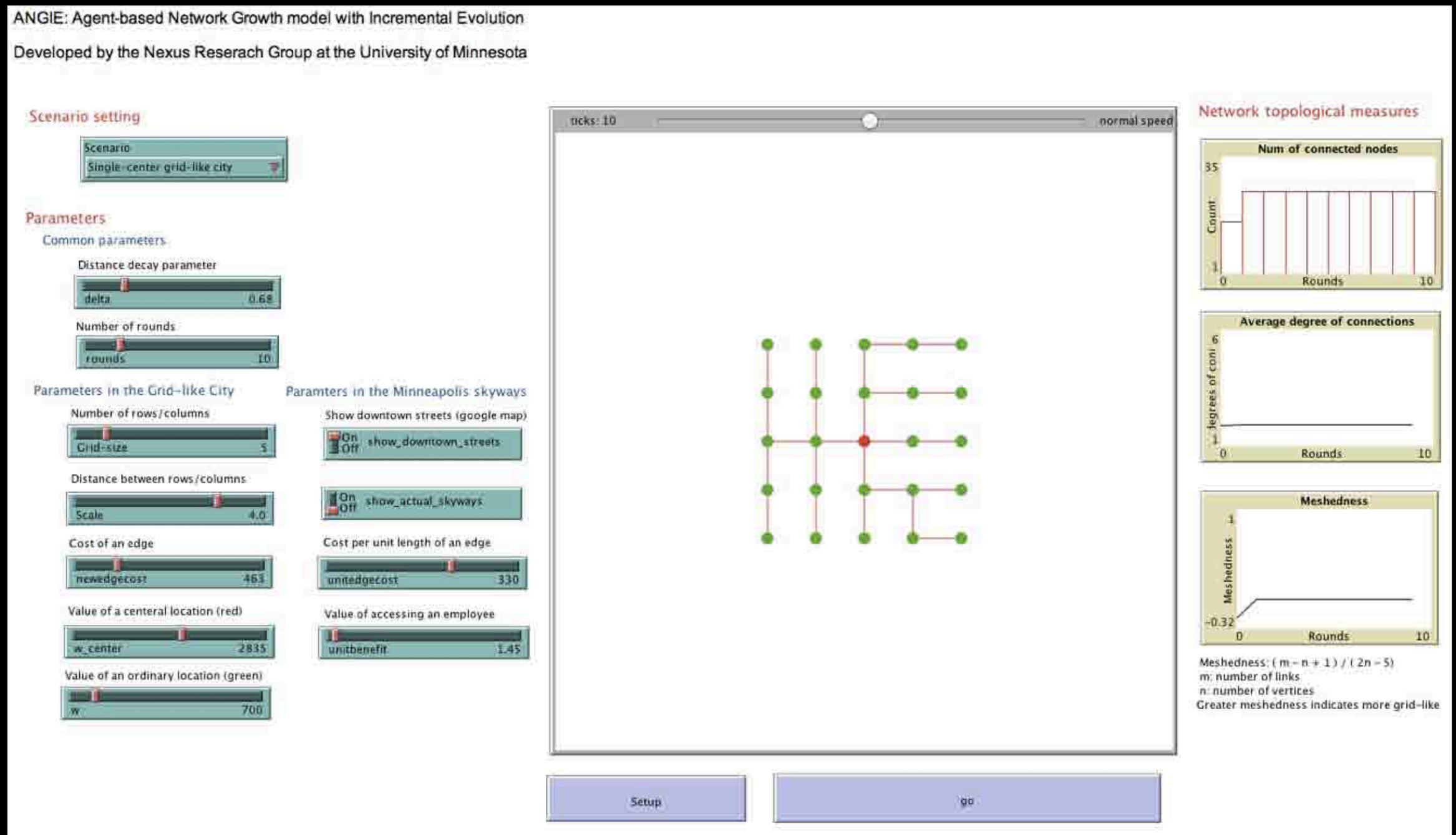
ABODE

Matching trips' origins and destinations



ANGIE

Urban road/skway network growth



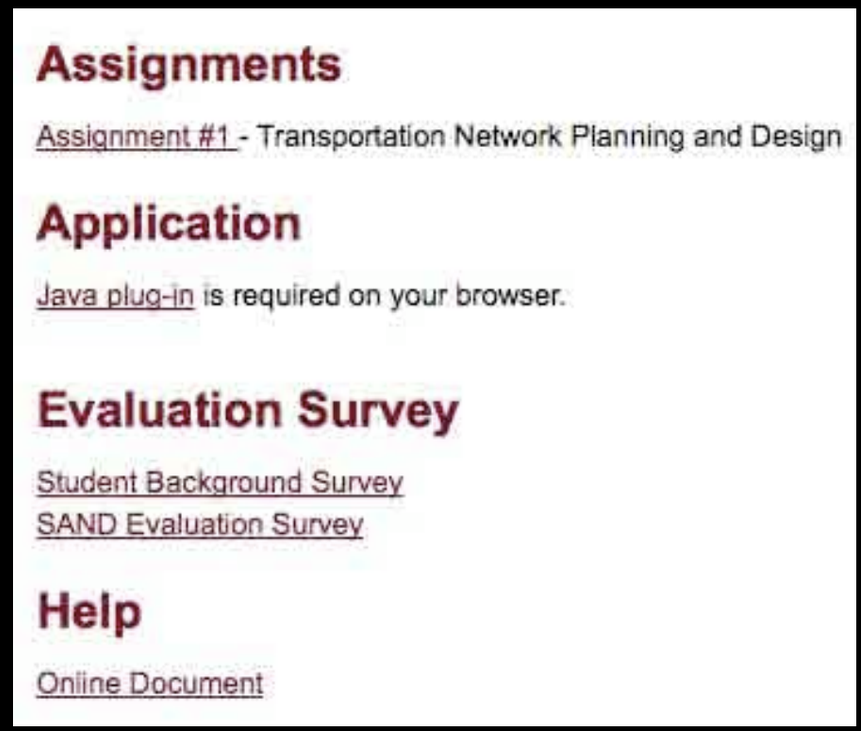
How to apply them in teaching?

Students fill out background survey

Students finish the assignment and submit a report summarizing the results

Students fill out the evaluation survey

Instructors evaluate the tool's effectiveness



Wikibook: Fundamentals of Transportation

Fundamentals of Transportation

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Planning

- Decision Making
- Modeling
- Geography and Networks
- Land Use Forecasting
- Trip Generation
- Destination Choice
- Mode Choice
- Route Choice
- Evaluation

Transit

Market Street, San Francisco

Source: http://en.wikibooks.org/wiki/Fundamentals_of_Transportation

Hypotheses

STREET will improve students' understanding of critical concepts in Transportation Engineering and enhance students' learning outcomes.

STREET will improve students' motivation toward transportation engineering and improve students' retention.

Effectiveness (ADAM as an example)

Class: CE 3201 (Introduction to transportation engineering)

Subjects: 37 students in spring 2006
38 students in fall 2006

Method: ADAM in Spring 2006
Traditional teaching in Fall 2006

Data: pre-simulation survey + post-simulation survey of self-evaluation of effectiveness + Students' scores in Quiz I

Findings:

(1) ADAM effectively improves students' learning outcomes;
(2) Visual and active learners benefit more from ADAM.

Ref: Zhu and Levinson (2011)

Dissemination

Web-based and open-sourced

Presented at the Minnesota State Fair and UMN Academic Technology Showcase

Faculty members from 17 universities have agreed to incoporate STREET into their curricula

6 research papers have been published or presented at TRB Annual Meetings

List of publications

1. Chen, W. and Levinson, D. (2006) *ASCE Journal of Professional Issues in Engineering Education and Practice*, 132(1):29-41.

2. Liao, C.F., Liu, H., and Levinson, D.(2009) *Transportation Research Record*, 2109:12-21

3. Zhu, S. and Levinson, D. (2011) *ASCE Journal of Professional Issues in Engineering Education and Practice*, 137(1):29-41.

4. King, D., Krizek, K. and Levinson, D. (2008) *Transportation Research Record*, 2046:85-93.

5. Krizek, K. and Levinson, D. (2005) Journal of Planning Education and Research, 24:304-316.

6. Liao, C.F., and Levinson, D (2010) Presented at TRB Annual Meetings, Washington, DC.

Future plans

Continue to develop online simulation modules related with ongoing research projects.

Apply the modules or derivatives for other educational purposes, such as educating the general public on traffic and planning and integrating modules into high school extracurricular activities to attract students into the transportation field.

Thank you!

Questions?

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