UNIVERSITY OF HOUSTON
Center for
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POLICY

Emergency Evacuations, Public Reactions, and the Boomerang Effect

Rice University

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Question

How do information asymmetries between policymakers and the public affect emergency evacuations?

Central Finding

Using some basic behavioral social science findings, we show that the public reactions to evacuation information can boomerang and confound policymaker coordination efforts.

Why?

- Policymakers ***must not*** assume a "robotic" public:
  - Non-compliance.
  - Unintended Consequences.
- Policymakers ***can*** assume the public has:
  - Expectations.
  - Ability to Learn.
  - Can be fooled or confused for a time.
  - Can assess credible information.
- Using the assumptions above, miscommunication of information by policymakers to the public can ***boomerang*** and influence the policymakers ability to forecast accurately.

Study Design

- Model Includes the following features:
  - ***Information Asymmetry***: Policymakers possess more information than the public.
  - ***Information Diffusion***: Public makes forecasts based on policymakers forecasts.
  - ***Heterogeneous Information Interpretation***: Public is not of one mind in interpreting policymaker information and forecasts.

Study Design (cont.)

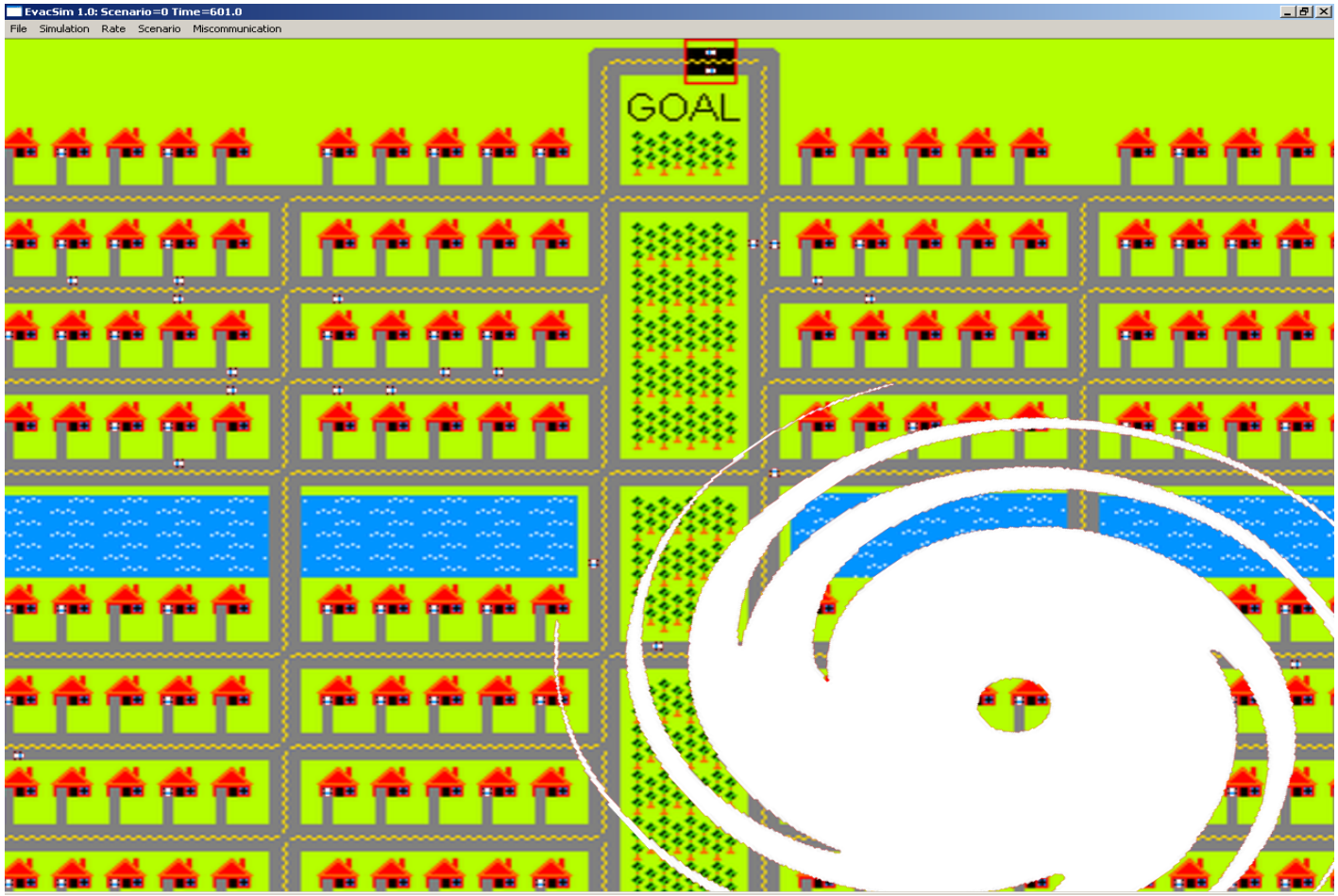
We link a behavioral model that contains expectations, learning, social interaction and use the equilibrium properties of this model to simulate various emergency evacuation scenarios.

Model and Simulation Framework

A visual simulation of hurricane evacuation was created to demonstrate the boomerang effect.

- The visualization is similar in function to particle based physics simulation with the exception that behaviors are modeled instead of mass properties, etc.
- Each iteration of the simulation evaluates these behaviors based on the current state and the equilibrium properties of the boomerang effect.

Visualization Example



Model and Simulation Components

The simulation has 4 components:

- A hypothetical geographic region similar in characteristics to a coastal residential community with only one major avenue of egress.
- A disaster model that simulates typical tropical storms with attributes such as speed, heading, and intensity.
- A policymaker model that uses storm and traffic information to forecast when and where regions of the community will be evacuated.
- An "intelligent" public model that weighs policymaker advice against their perception of storm and traffic state to either evacuate or ride out the storm.

Model Scenarios

- Scenario 1: Weak, slow-moving storm with no boomerang effect (successful).
- Scenario 2: Weak, slow-moving storm with boomerang effect (unsuccessful).
- Scenario 3: Powerful, fast-moving storm with no boomerang effect (successful).
- Scenario 4: Powerful, fast-moving storm with boomerang effect (unsuccessful).

Main Result

Generally speaking — and regardless of the accuracy of the policymaker's information — the central result of the simulations is that communication "noise" and "error" will seriously impair the evacuation.

Final Thoughts

The next step is to extend the simulation to account for new factors not yet accounted for.

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