Practical Guide to Building NetLogo Models

ICPSR 2009 ABM Workshop Day 15

Advanced Features of Netlogo

List of Some Useful Tools and Extensions

- Behavior Space: run experiments to sweep parameters
- Shapes Editor: create your own turtle shapes
- Sound: audio interaction with your model
- System Dynamics Modeler: Diff Eqs in Netlogo
- HubNet Models: human users can control turtles
- GoGo Board Interaction: Netlogo controls robots
- Java Extensions: import functionality from Java
- Mathematica Link: run Netlogo from Mathematica
- Netlogo 3D: same as 2D but with extra dimension
- GIS: import and manipulation geographic information

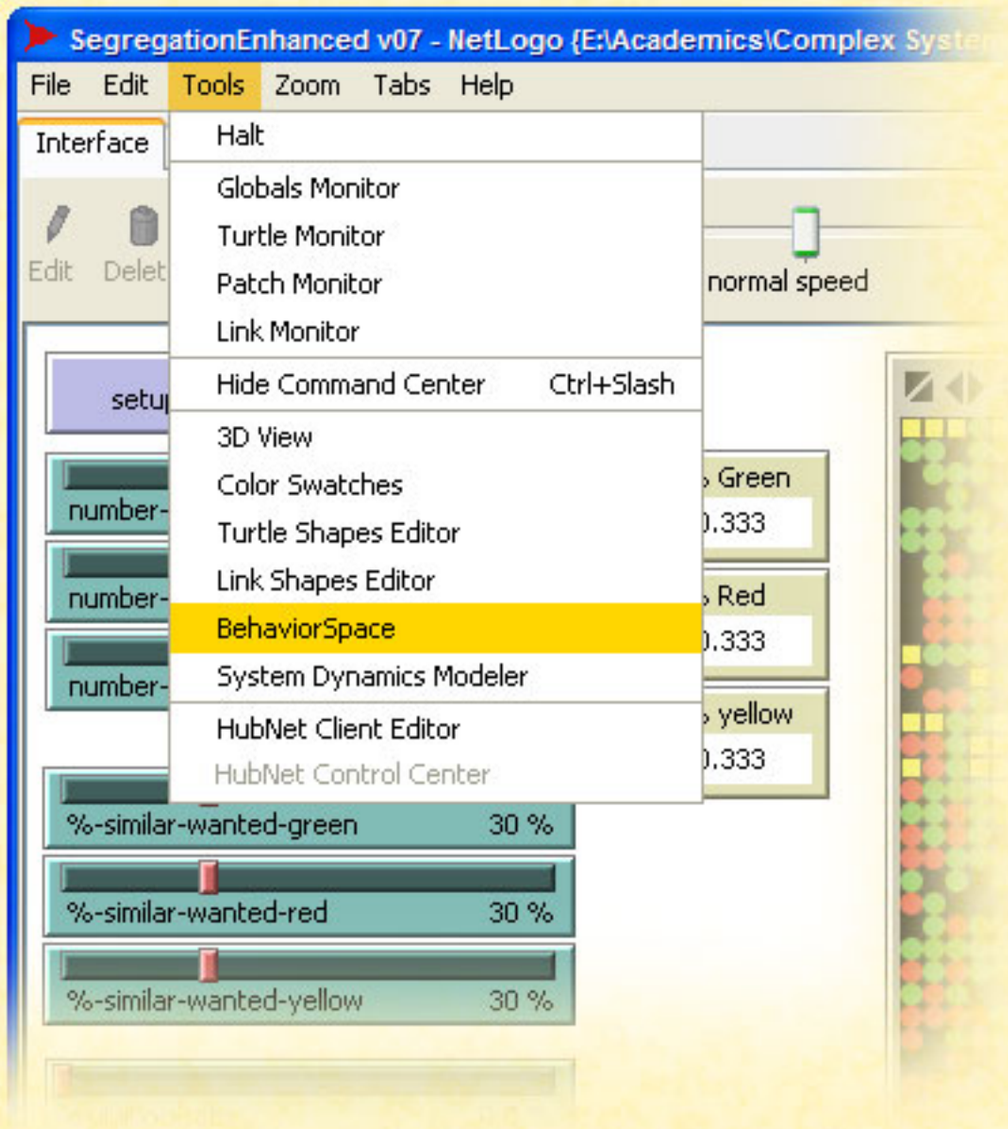
Behavior Space Tool

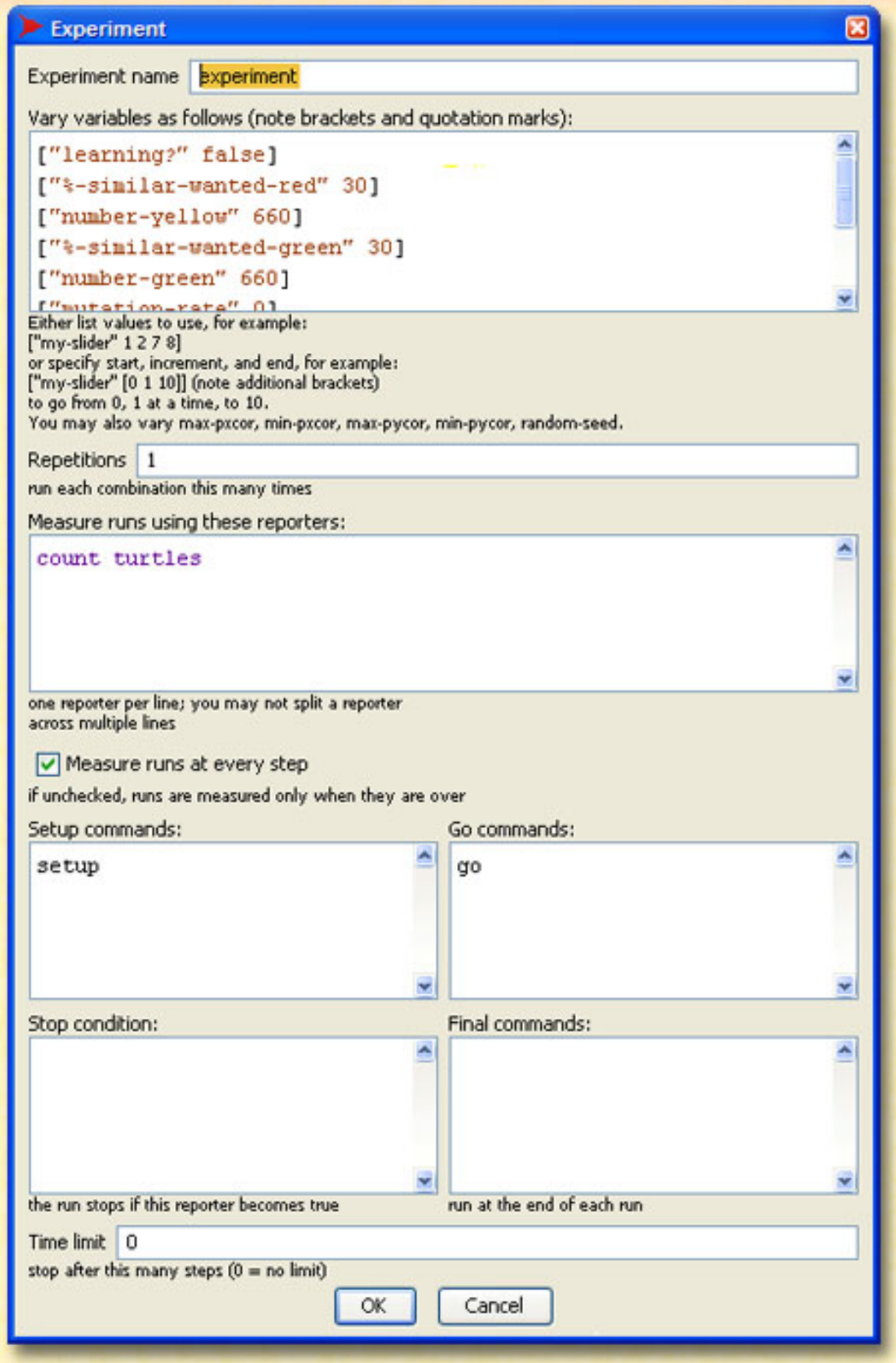
Drone Run Automation

- Sweeps Variables Setable from Interface
- Can Run Different Experiments on the Same Model
- Specify How Many Repetitions for each Variable Combo
- Specify Output Variables
- Specify Setup, Go, Stop and Post-Run Commands
- A Time Limit Can Be Specified Separately

- NOTE: for Excel specify "Table" format for output

Behavior Space Tool

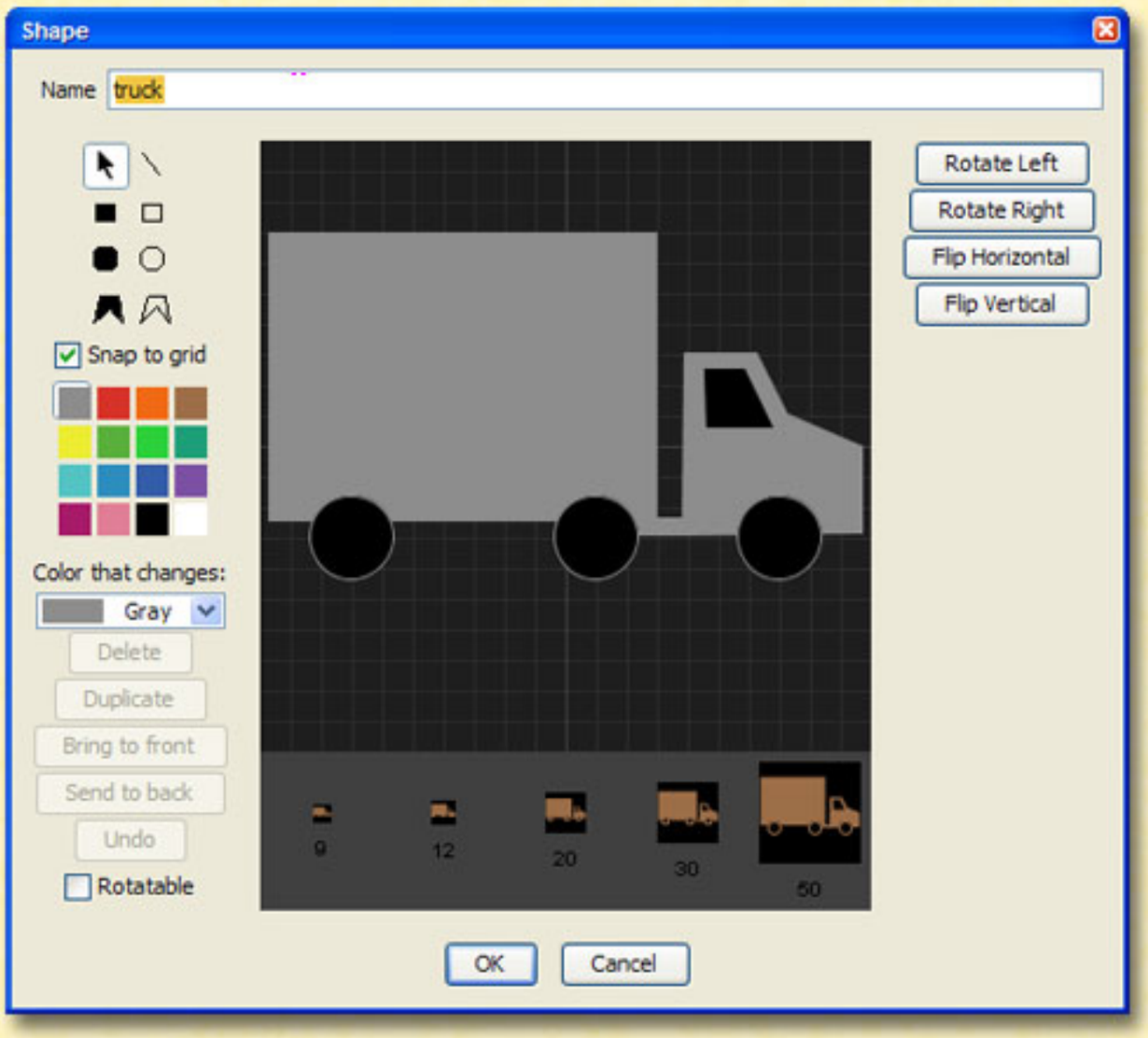




Turtle Shapes Editor

Customize Agent Shapes and Appearance

- Refer to user manual
- Vector driven
- Large shapes library
- Choose rotatable or not
- Only one color changes
- Simple shapes are best
- Limited, but good enough



Sound Extension

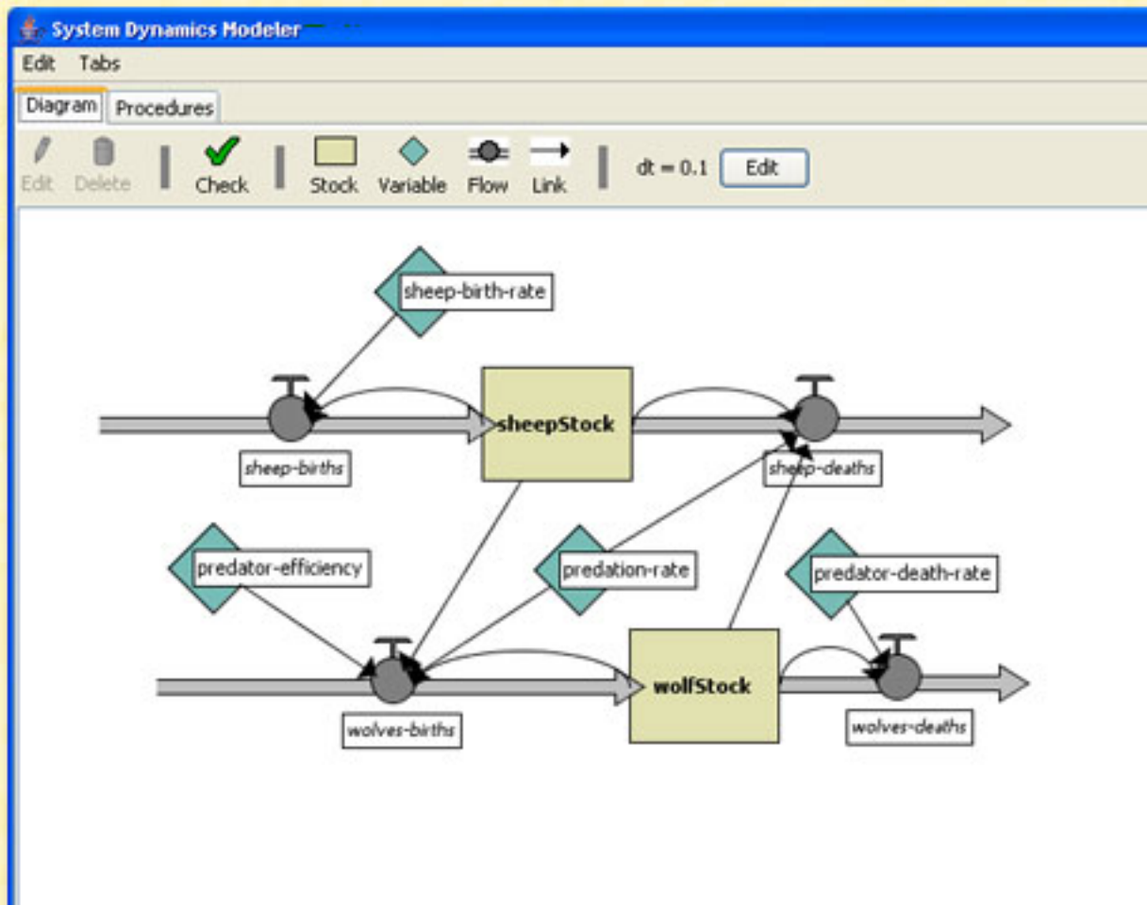
Audio Feedback from Model Behavior

- Create sound effects and alerts
- Auralization of data stream
- Preinstalled - see Extensions section of user manual
- MIDI method simulates a 128-key electronic keyboard with 47 drums and 128 melodic instruments
- Supports 15 instruments and one percussion channel
- Pitch and volume adjustable on 0 to 127 scales
- Plays a recorded sound file, e.g. your voice!
- It supports WAV, AIFF, and AU files.

System Dynamics Modeler

Differential Equations Simulations

- See user manual and example models
- Population-based dynamics; not ABM
- Define stocks, flows, variables, and links
- Intuitive Netlogo interface (variables and plots)
- Generates code for you
- Port and compare with ABM

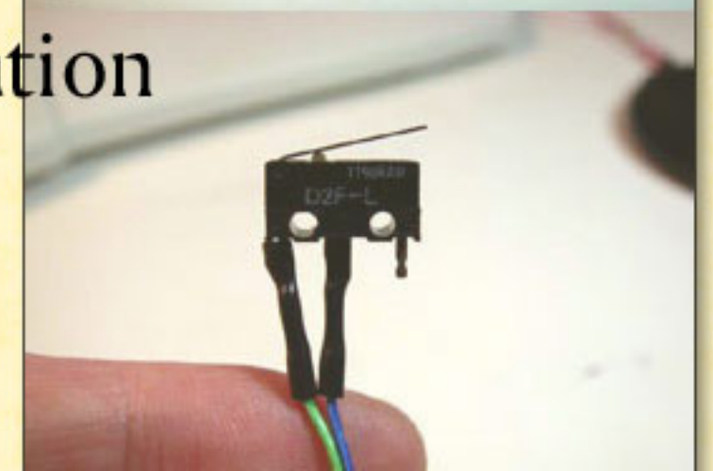


HubNet Participatory Models

Allow Humans to Control Agents

- Support for computers, calculators, cell phones, PDAs
- Run social science experiments
- Remote data collection and model integration
- Teach concepts on distributed action and emergence
- Still limited and somewhat difficult to set up and use
- Towards real-time simulations and world feedback

GoGo Board Extension



Interact with Robots and Sensors

- Built in GoGo Board support
- Connect Netlogo to the physical world
- Read sensor data and location
- Control LEDs and move motors
- Connect via Bluetooth
- Special primitives relay Netlogo code to and from the GoGo Board
- Combine with HubNet models to control robots in simulated environment
- Add evolution to achieve world domination
- More info at www.gogoboard.org

Java Extensions

Write Your Own Expanded Capabilities

- Netlogo API for writing Java interfaces (incomplete)
- Extensions now work in applet mode!
- Import existing java capabilities into Netlogo
- Use Netlogo interface for feedback of Java model
- Provide access to advanced analytics

Mathematica Link

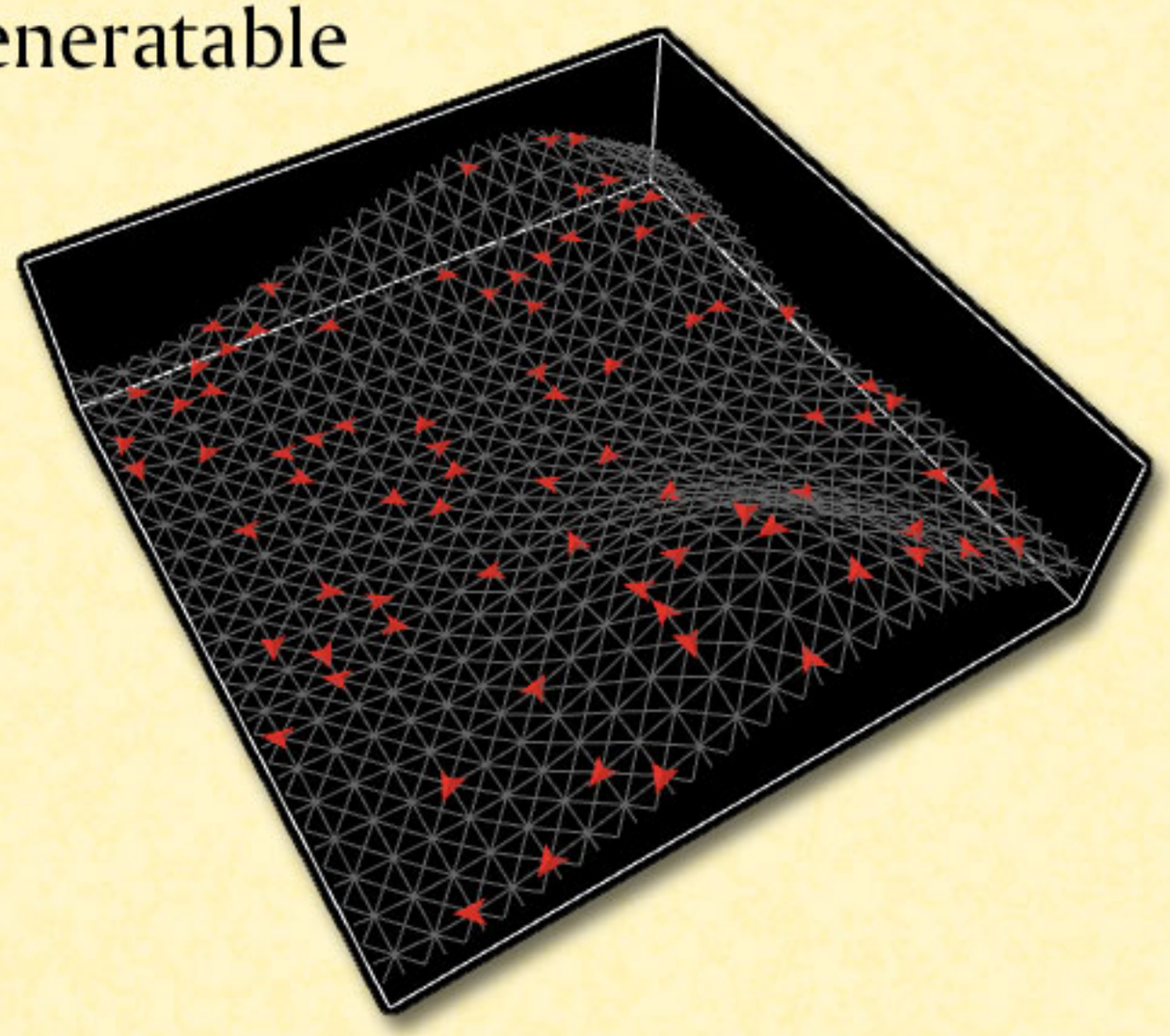
Real-Time Interaction between Applications

- Provides a highly interactive self-documenting workflow
- Replace the Behavior Space with adaptive sweeping
- Useful in model debugging
- Utilize Mathematica for:
  - data importing
  - statistical functions
  - network analysis
  - document creation
  - visualization
  - and much, much more

Netlogo 3D

Add another Spatial Dimension to Your Model

- Separate program: currently Netlogo 3D Preview 5
- 3D world and interface/procedure in separate windows
- Most commands are the same, but no real manual
- No shapes editor GUI, but generatable
- No transparency yet
- No applet support
- Full integration planned



Geographic Information Systems

Import and Interact with GIS Data

- Import real-world geographic and demographic data
- Supports ESRI .shp files to import vectors
- Supports ESRI .grd and .asc files for raster grids
- Not just converting to patch values (though that's possible)
- Maintain and manage vectors directly in Netlogo
- Extract features to assign values, create agents, etc.
- Still young, but quickly growing