

FABLES IME

Agent-Based Modeling environment

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Overview

- Context
 - The Multi-Agent Modeling Suite
- FABLES
 - Motivation
 - Integrated Modeling Environment
 - Demo



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Participatory Extension (PET)*

- WWW Interface
- Simulation Recoding & Playback
- Participatory / Experimental Modeling
- Multiple Users / Participants

Simulation Core

Multi-Agent
Core (MAC)*

Recast

- Directly Editable Java Source

Functional Agent-Based Language for Simulations (FABLES)

- Agents, Formulas and Schedules
- Charting and Visualization Wizard (No programming necessary!)
 - Integrated Modeling Environment
- Generates Java Source (cf. Simulation Core)
 - *Optimized Java Code Generation**

What is Fables?

- Functional programming language (with OO and sequential elements)
- Designed to support ABM
- Simple, clean syntax



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Why to create a new language?

- Previous ABM tools:
 - Swarm (1996)
 - MAML (1999)
 - NetLogo (1999)
 - Repast (2001)
- Mostly programming libraries



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Motivation

- Support for modelers, not professional programmers.
 - Save as much on programming as possible.
 - Appropriate language concepts/paradigms for each part/component of the model.
 - Syntax close to formalism used in publications
 - Functional approach:
most models are described by formulas



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Motivation

- Advanced Programmers are also Supported
 - FABLES compiles to Repast
 - And generates Java source
 - Enables further development by advanced users .
 - FABLES provides
 - Java-to-FABLES and
 - FABLES-to-Java interfaces.
 - Thus, advanced methods can be written in Java.



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Language Constructs and Paradigms in Support of the Modeler

- Separation of
 - the Model and the Observer
- Structure:
 - Constants, Variables, Objects/Agents
- Behavior:
 - A functional language
- Dynamics:
 - Discrete time, event-driven scheduler.



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Separation of the Model and the Observer

- Interactive *wizard* to add the visualizations
 - Advanced charting options (15++ graphs and displays)
 - Support for basic statistics operations.
 - Without programming.
- Advanced users may use small scripts as well.



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Type evaluation

- Fables is a strongly typed language
 - All identifiers (variables, functions, etc.) must have their types identified at compilation time.
- Yet, no type-declaration is required
 - All type information is deduced automatically from the type of constants and usage.



The Fables IME



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The Fables IME

- Fables Integrated Modeling Environment
 - Eclipse based framework for the Fables language with basic functionalities (wizards, editors, views, etc.)
 - Built upon Eclipse Europa (3.3)
 - For multiple platforms
 - Currently Mac OS X, Windows, Linux are supported



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The Fables IME

- Customized product
- Contains plug-ins, features
 - fables.plugin.ui
 - fables.plugin.core
 - fables.plugin.launcher
- Also, an update site is provided for the built-in plugins



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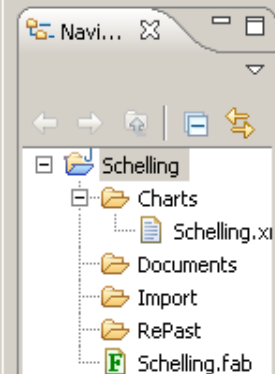
Demo



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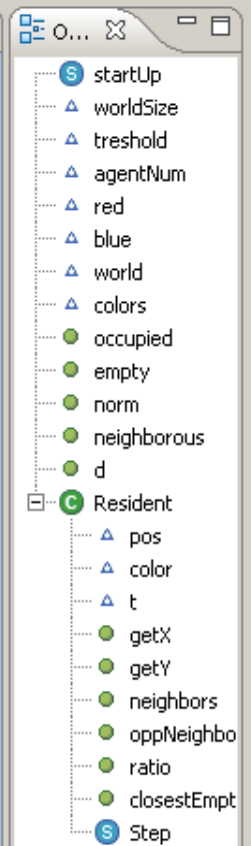




```

36 /** Schelling's model of spatial segregation. */
37 model Schelling {
38
39     /** The size of the world (simmetric). */
40     worldSize = 30; // PARAMETER
41
42     /** The level of threshold, when an agent will move away. */
43     treshold = 0.6; // PARAMETER
44
45     /** The number of agents in the world. */
46     agentNum = 895; // PARAMETER
47
48     /** Color 1. */
49     red = 1;
50
51     /** Color 2. */
52     blue = 2;
53
54     /** The world. */
55     world = [0..worldSize-1, 0..worldSize-1] ;
56
57     /** The set of available colors. */
58     colors = {red, blue};
59
60     /** Occupied territories. */
61     occupied = { a.pos : a is Resident };
62
63     /** Empty territories. */
64     empty = setMinus( world, occupied ) ;
65
66     /** Just to normalize x depending on the world's size. */
67     norm(xn) = xn mod worldSize ;
68
69     /** Give back the adjacent squares. */

```



Schelling - Repast

Simulation Actions Advanced Actions Help

Tick Count: 22.0
Run: 1

Model parameters

agentNum: 2300
 treshold: 0.6
 worldSize: 50

Repast parameters

CellDepth: 5
 CellHeight: 5
 CellWidth: 5
 PauseAt: -1
 RandomSeed: 1183977452734

Grid2D for model Schelling

Grid2D for model Schelling
Schelling's model of spatial segregation

Console



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Summary

- Advanced simulation platform (partially anchored in Repast) for
 - Easy model development,
 - Efficient execution,
 - Careful experiment design, and
 - Accurate result analysis.
- **FREE OF CHARGE!**
 - New version (1.45) is coming in December...



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THANK YOU!!

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