

Building Up a Simple Agent-Based Model via the AnyLogic Wizard

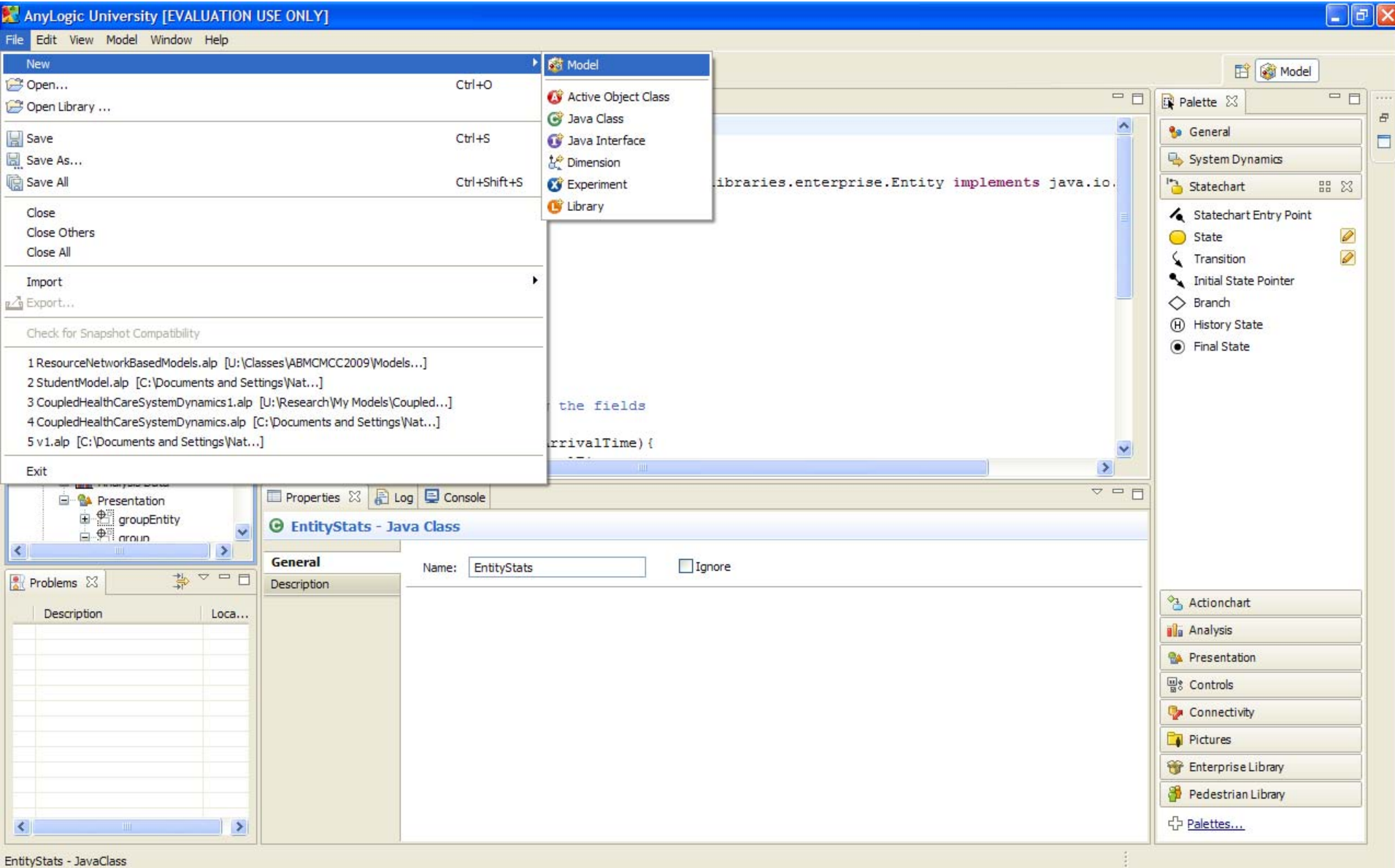
Nathaniel Osgood

10-27-2009

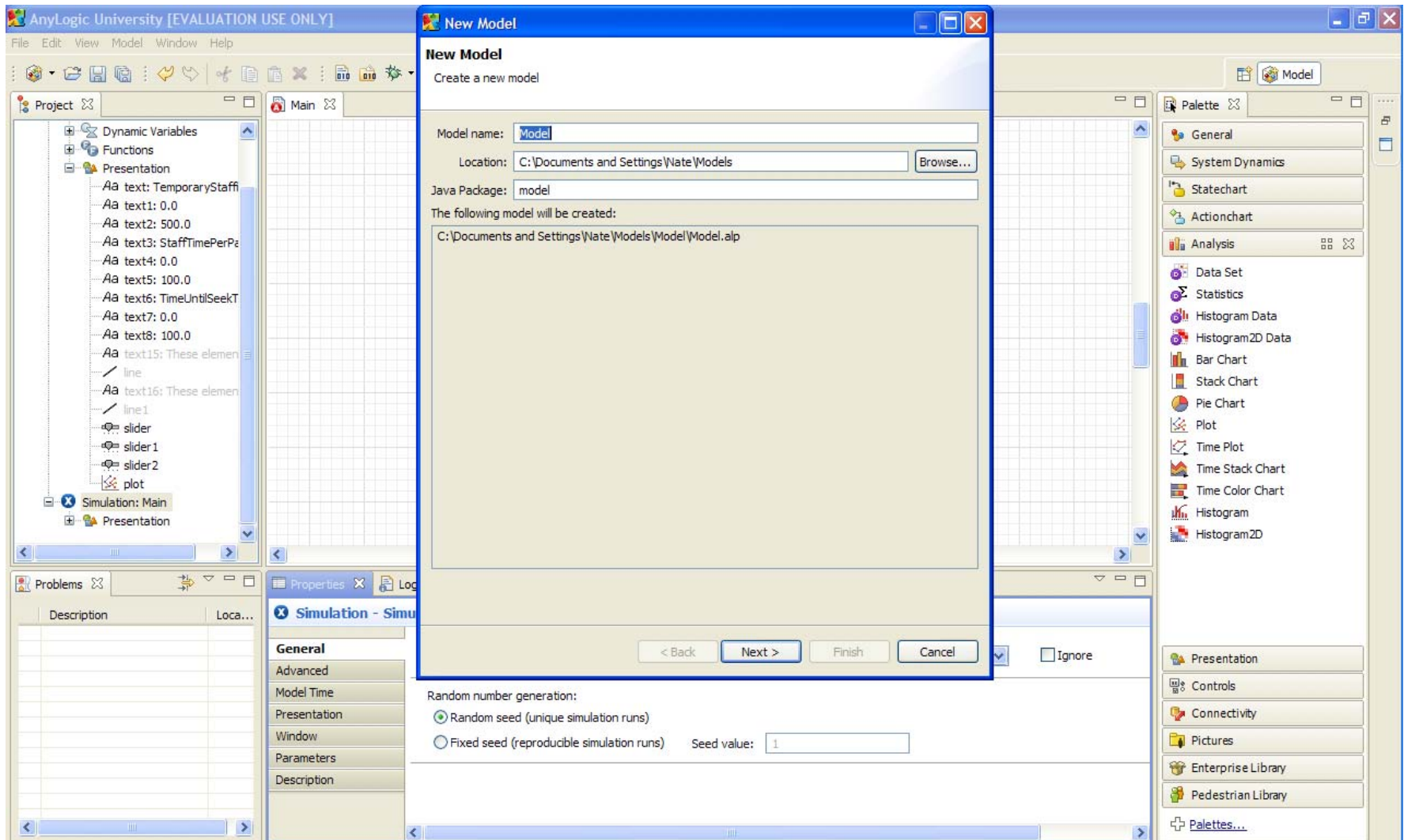
Incremental & Modification-Based Development

- Frequently the hardest part of an AnyLogic project is building up the basic structure
- Some of the most productive ways to use AnyLogic are by modifying existing models
- I would strongly recommend familiarizing yourself with
 - AnyLogic wizards (such as that shown here)
 - AnyLogic Samples
 - Any AnyLogic code that we can provide
- Incrementally develop applications

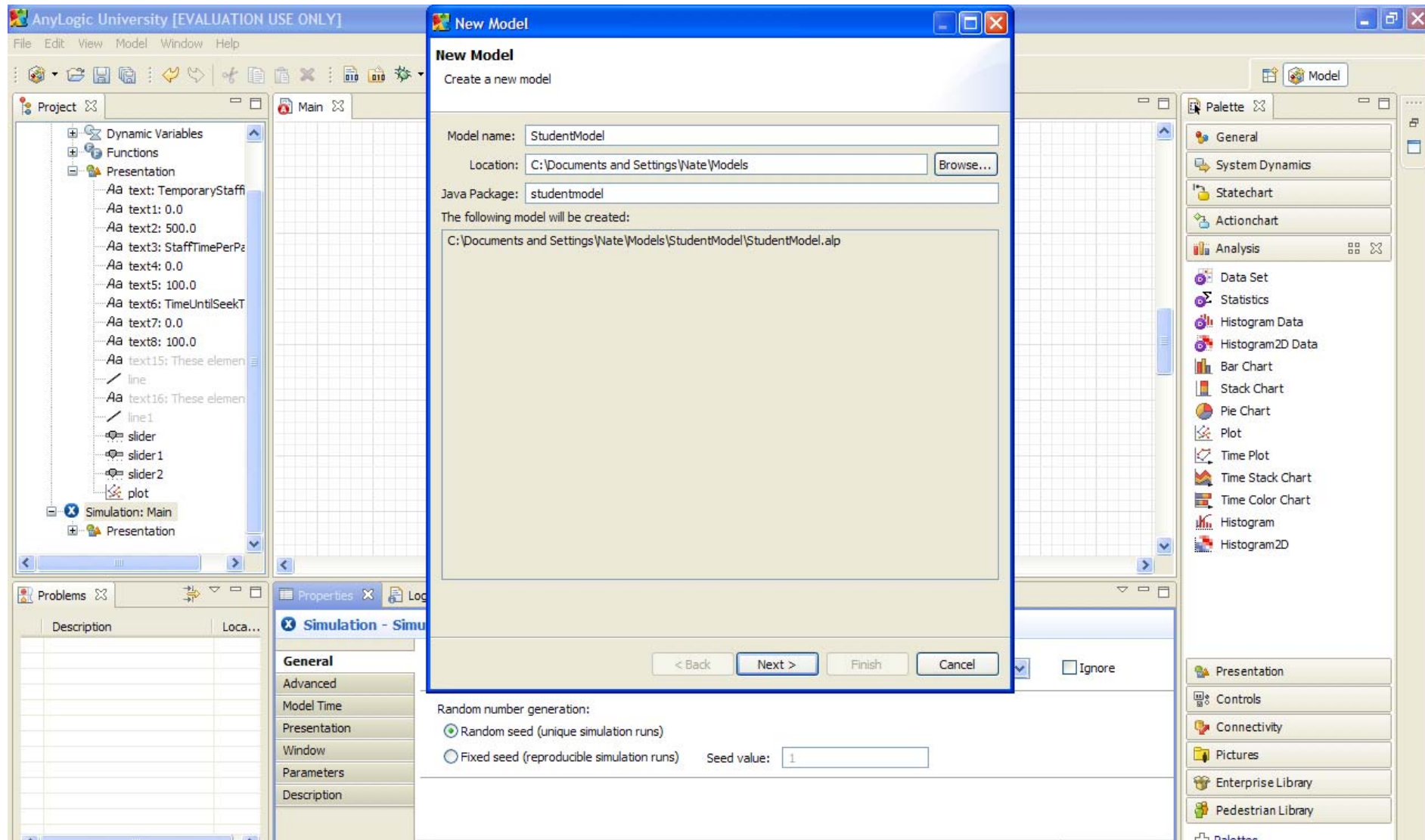
Requesting a New Model



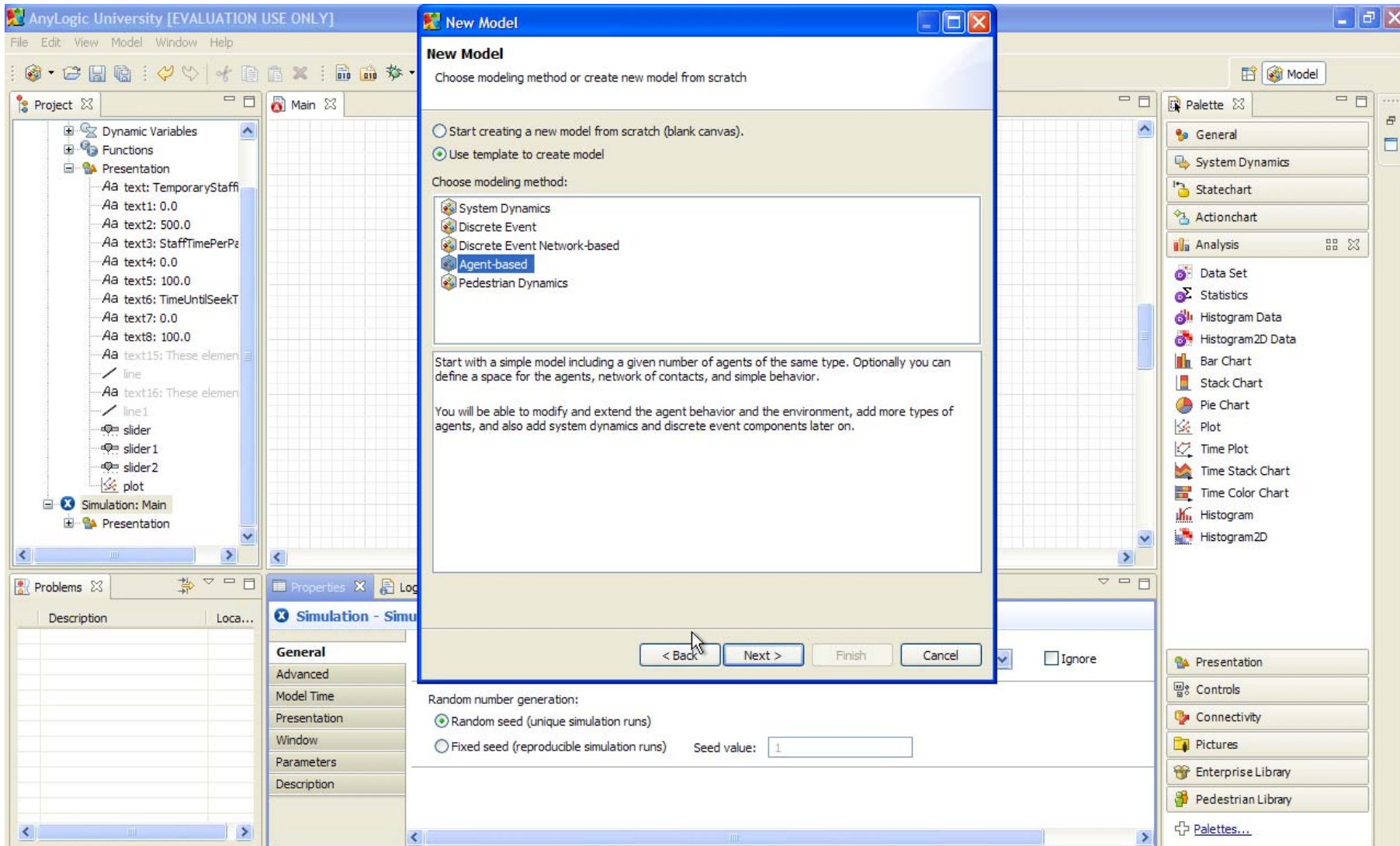
Filling in New Model Information



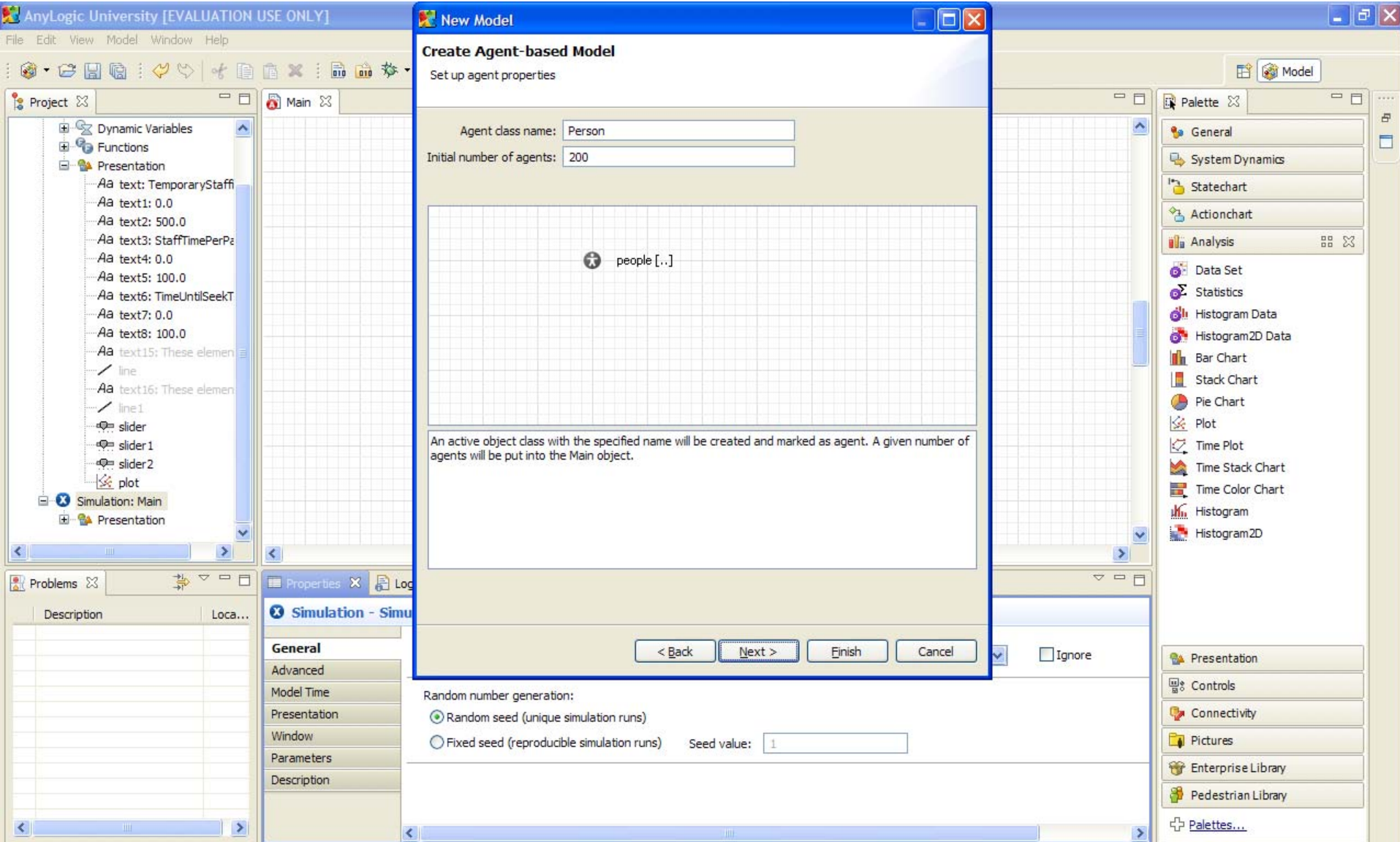
Filling in New Model Information



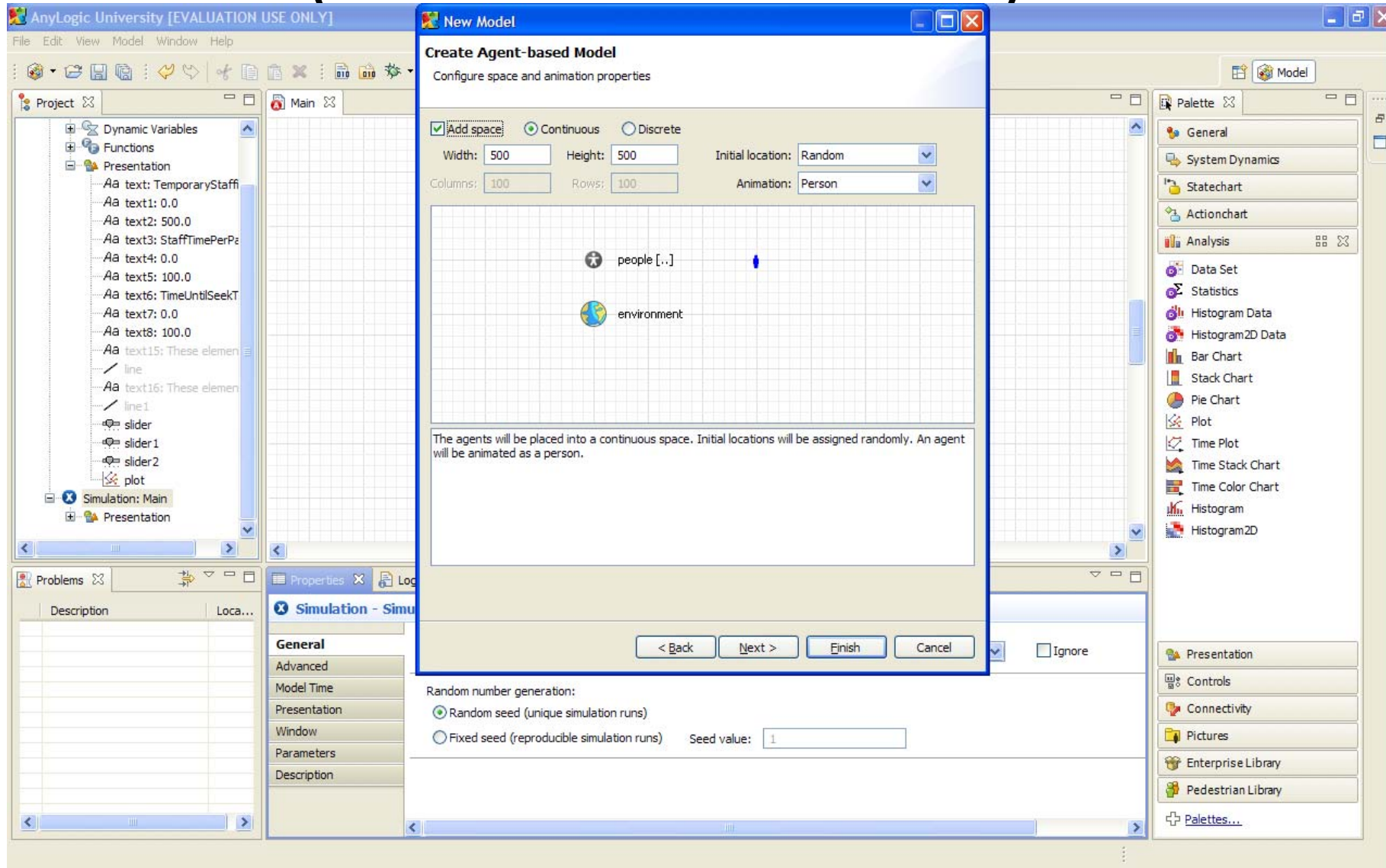
Selecting Model Type



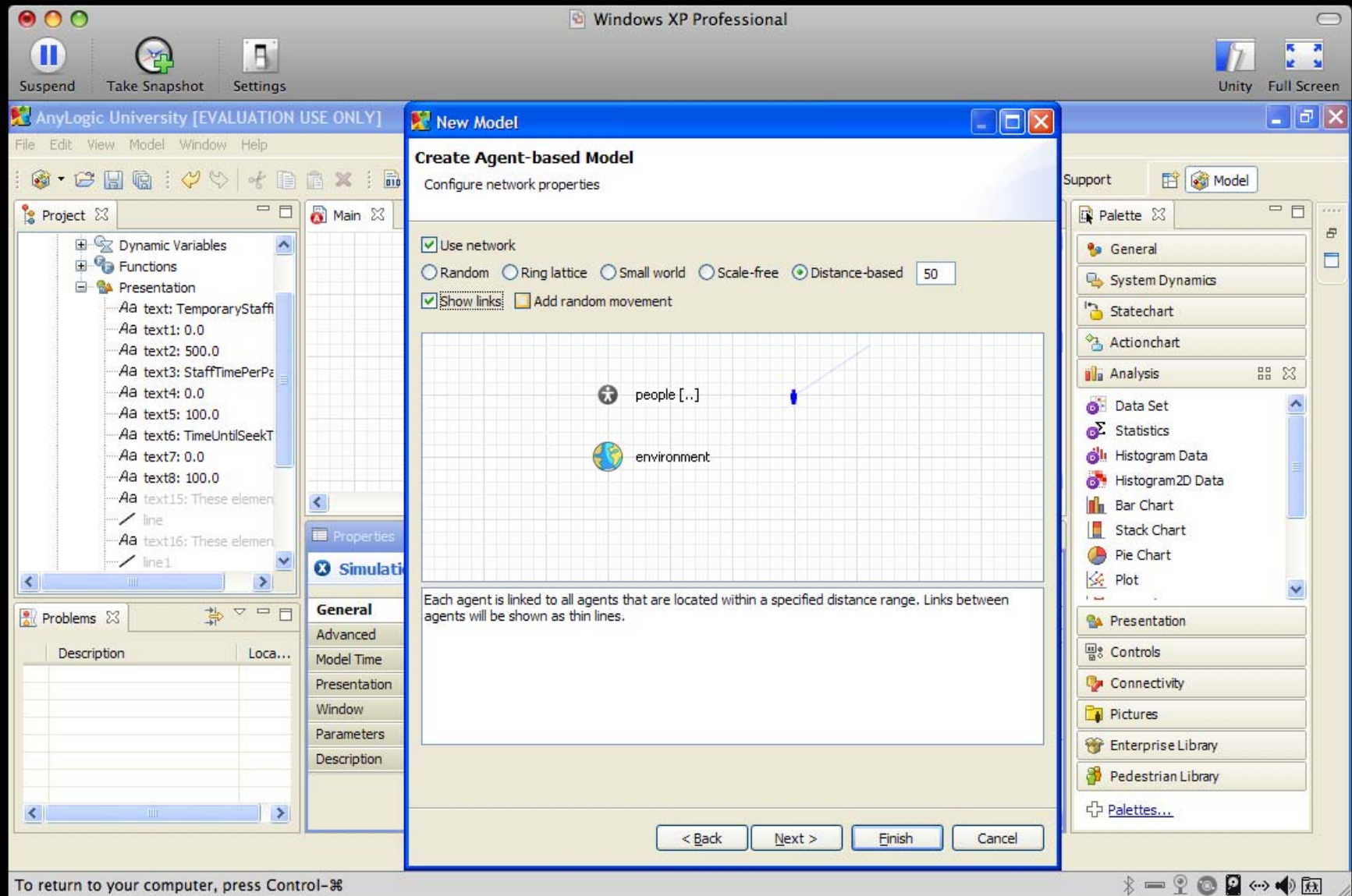
Setting the Agent Name



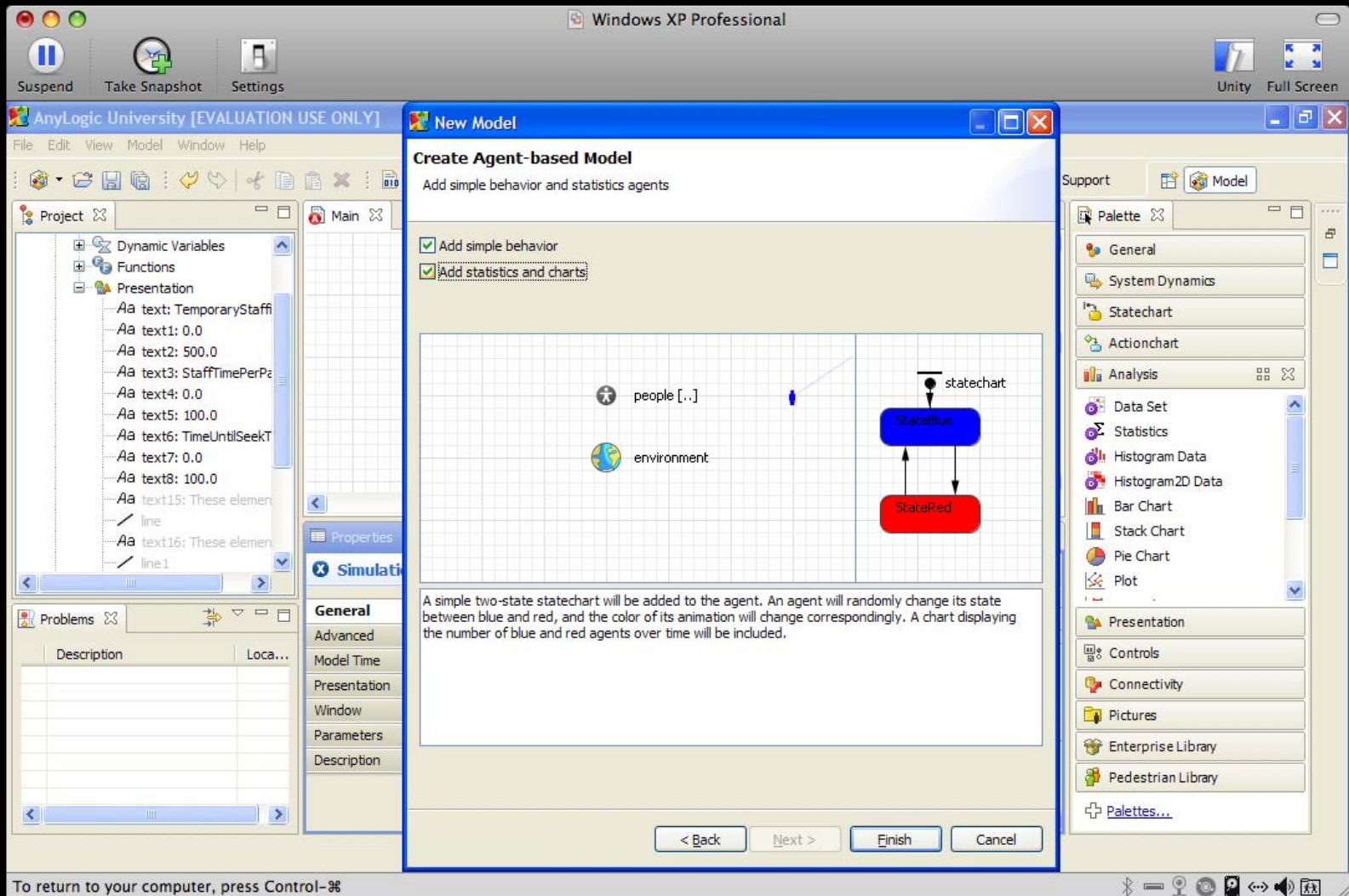
Setting Agent Spatial Properties (Cells vs. Continuous)



Setting Network Properties



Adding Initial State Charts



The Resulting Main Object

The screenshot displays the AnyLogic University software interface, specifically the 'Main' object class configuration window. The interface is divided into several panels:

- Project Panel (Left):** Lists the project structure, including 'Simulation: Main', 'Presentation', 'StudentModel', and 'Main' (selected).
- Main Panel (Center):** Shows the 'Main' object class configuration. It includes a diagram with 'people[.]' and 'environment' objects, and a plot showing two data series: 'Number Blue' (blue line) and 'Number Red' (red line). The plot has a y-axis from 0 to 1 and an x-axis from 0 to 100.
- Properties Panel (Bottom):** Displays the 'Main - Active Object Class' properties. The 'General' tab is active, showing the 'Name' as 'Main' and the 'Ignore' checkbox. The 'Agent' checkbox is also checked. The 'Startup code' and 'Destroy code' fields are empty.
- Palette Panel (Right):** Shows the 'Model' palette with various object types, including 'General', 'System Dynamics', 'Statechart', 'Actionchart', 'Analysis', 'Data Set', 'Statistics', 'Histogram Data', 'Histogram2D Data', 'Bar Chart', 'Stack Chart', 'Pie Chart', 'Plot', 'Time Plot', 'Time Stack Chart', 'Time Color Chart', 'Histogram', and 'Histogram2D'.

The status bar at the bottom indicates 'Main - ActiveObjectClass'.

The Resulting Person Object

The screenshot displays the AnyLogic University [EVALUATION USE ONLY] interface. The top menu bar includes File, Edit, View, Model, Window, and Help. The toolbar contains various icons for file operations, simulation control, and navigation. The main workspace shows a statechart with two states: StateBlue and StateRed, connected by transitions. The left sidebar lists the project structure, including Simulation: Main, Presentation, StudentModel, Main, Person, and Simulation: Main. The bottom panel shows the Properties window for the Person - Active Object Class, with tabs for General, Advanced, Agent, Preview, and Description. The Agent tab is active, displaying movement parameters such as Velocity, Rotation, and On arrival. The right sidebar contains a vertical toolbar with icons for controls, connectivity, pictures, enterprise library, pedestrian library, and palettes.

AnyLogic University [EVALUATION USE ONLY]

File Edit View Model Window Help

100%

Get Support

Project

Main Main Person

statechart

StateBlue

StateRed

Person - Active Object Class

General

Advanced

Agent

Preview

Description

Movement parameters:

Velocity:

Rotation:

On arrival:

Selection X=206, Y=348

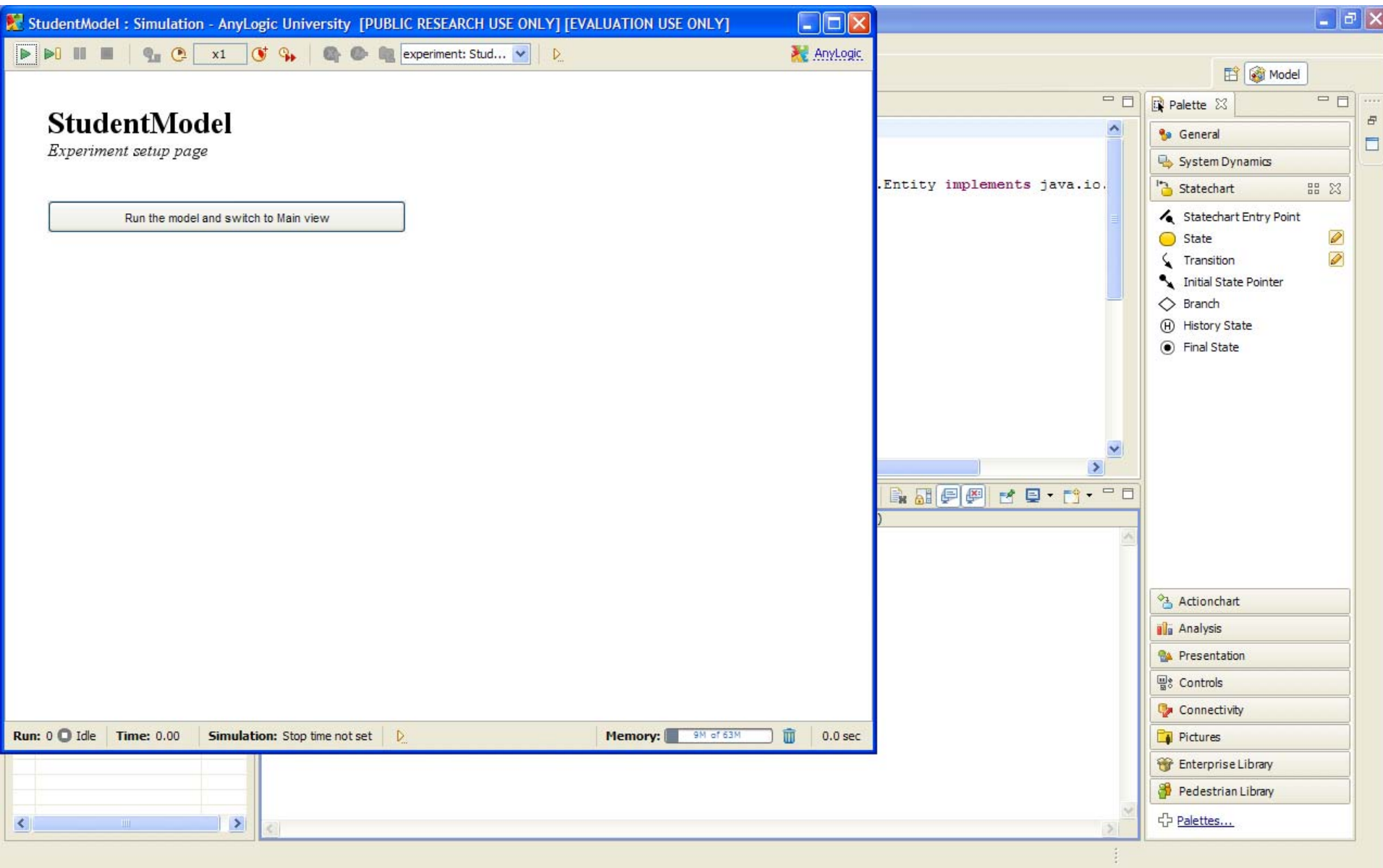
Running the Model

The screenshot displays the AnyLogic University software interface, which is used for modeling and simulation. The interface is divided into several panels:

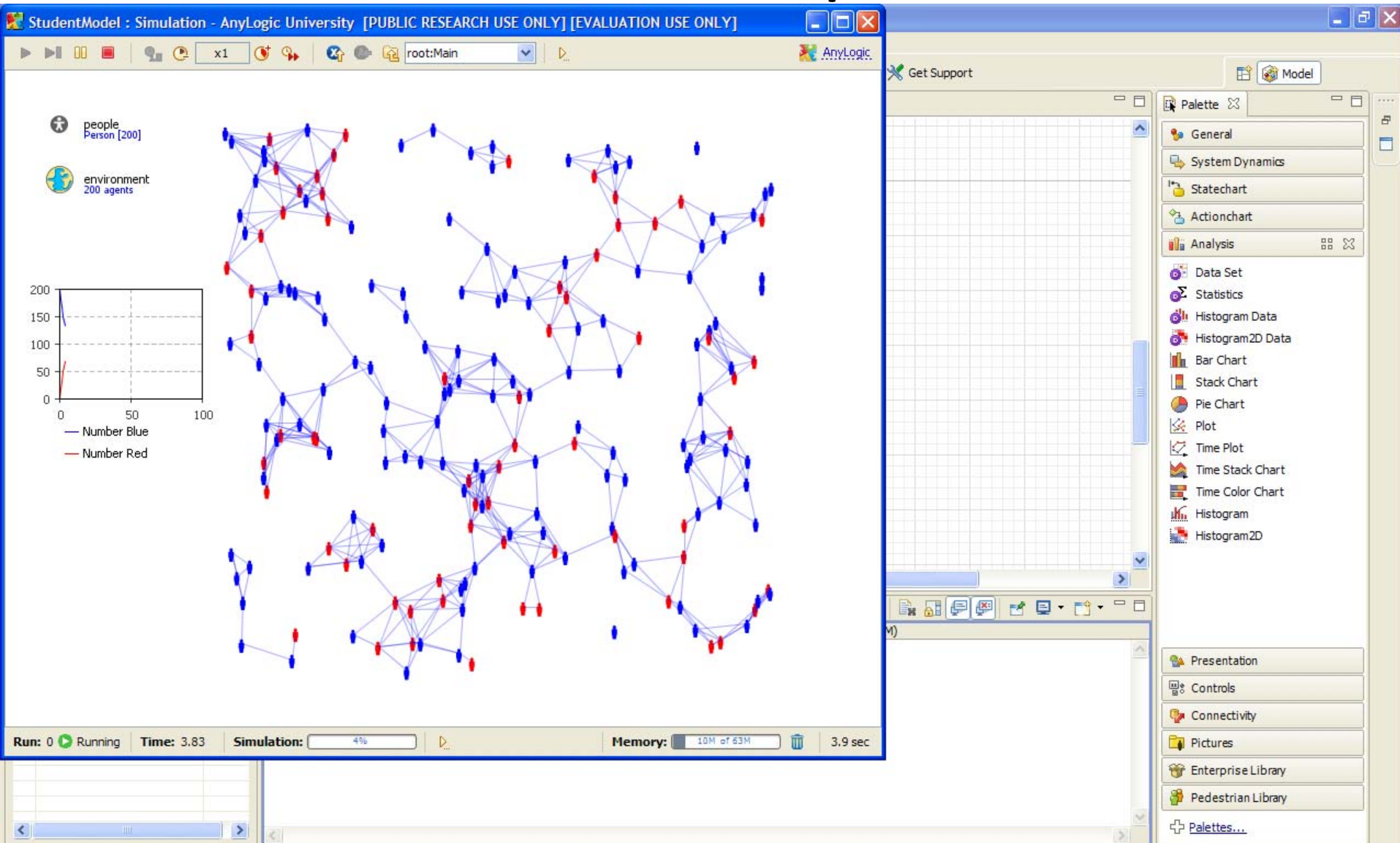
- Top Panel:** Contains the menu bar (File, Edit, View, Model, Window, Help) and a toolbar with various icons for file operations, editing, and simulation. The title bar indicates "AnyLogic University [EVALUATION USE ONLY]".
- Left Panel (Project Explorer):** Shows a hierarchical view of the project structure. It includes a list of variables (e.g., text1, text2, text3, text4, text5, text6, text7, text8, text15, text16) and a tree view of the model components, including "Simulation: Main", "Presentation", "StudentModel", "Main", "Person", and "Simulation: Main".
- Center Panel (Model Canvas):** Displays a statechart diagram. It features a blue state labeled "StateBlue" and a red state labeled "StateRed", connected by arrows. A "statechart" label is also visible.
- Right Panel (Palette):** Provides a collection of modeling elements categorized into "General", "System Dynamics", "Statechart", "Actionchart", and "Analysis". The "Analysis" category is currently expanded, showing options like "Data Set", "Statistics", "Histogram Data", "Histogram2D Data", "Bar Chart", "Stack Chart", "Pie Chart", "Plot", "Time Plot", "Time Stack Chart", "Time Color Chart", "Histogram", and "Histogram2D".
- Bottom Panel (Properties and Console):** Contains a "Properties" section for the selected "Person - Active Object Class". It includes tabs for "General", "Advanced", "Agent", "Preview", and "Description". The "Agent" tab is active, showing movement parameters such as "Velocity", "Rotation", and "On arrival". Below the properties is a "Log" and "Console" section.

The status bar at the bottom indicates the current selection and coordinates: "Selection X=169, Y=-54".

Run Setup Screen – Press Button!



The Model in Operation



Adding Agent Interaction

AnyLogic University [EVALUATION USE ONLY]

File Edit View Model Window Help

This means that the model has changed
Since the last time it was saved.
You should consider saving the model when you see
this!

Trigger transition based on
reception of any message

The screenshot displays the AnyLogic University software interface. On the left, the Project pane shows a list of elements, with 'StudentModel*' highlighted. The main workspace shows a state transition diagram with two states, 'StateBlue' and 'StateRed', connected by a transition. The Properties window at the bottom shows the 'transition - Transition' settings. The 'Triggered by' dropdown is set to 'Message', and the 'Fire transition' options are set to 'Unconditionally'. A red arrow points from the text 'this!' to the 'StudentModel*' element in the Project pane. A blue arrow points from the text 'Trigger transition based on reception of any message' to the 'Message' option in the 'Triggered by' dropdown.

Project

- Aa text1: 0.0
- Aa text2: 500.0
- Aa text3: StaffTimePerPa
- Aa text4: 1.0
- Aa text5: 100.0
- Aa text6: TimeUntilSeekT
- Aa text7: 0.0
- Aa text8: 100.0
- Aa text15: These elemen
- / line
- Aa text16: These elemen
- / line1
- slider
- slider1
- slider2
- plot
- Simulation: Main
- Presentation
- StudentModel*
- Main
- Person
- Simulation: Main

Model

Palette

- General
- System Dynamics
- Statechart
- Actionchart
- Analysis
- Data Set
- Statistics
- Histogram Data
- Histogram2D Data
- Bar Chart
- Stack Chart
- Pie Chart
- Plot
- Time Plot
- Time Stack Chart
- Time Color Chart
- Histogram
- Histogram2D
- Presentation
- Controls
- Connectivity
- Pictures
- Enterprise Library
- Pedestrian Library
- Palettes...

Properties

Log Console

transition - Transition

General

Name: transition

Triggered by: Message

Message type: Rate

Class name: Message

Fire transition: Unconditionally

Action:

Making Transition Depend on State

The screenshot displays the AnyLogic University software interface, which is used for modeling and simulation. The main window shows a statechart diagram with two states: "StateBlue" (blue) and "StateRed" (red). A transition arrow points from "StateBlue" to "StateRed", and another points from "StateRed" back to "StateBlue". The transition is labeled "transition".

The left sidebar contains a project tree with the following items:

- Simulation: Main
- Presentation
- StudentModel*
- Main
- Person
- Simulation: Main

The right sidebar contains a palette with the following categories:

- General
- System Dynamics
- Statechart
- Actionchart
- Analysis
 - Data Set
 - Statistics
 - Histogram Data
 - Histogram2D Data
 - Bar Chart
 - Stack Chart
 - Pie Chart
 - Plot
 - Time Plot
 - Time Stack Chart
 - Time Color Chart
 - Histogram
 - Histogram2D
- Presentation
 - Controls
 - Connectivity
 - Pictures
 - Enterprise Library
 - Pedestrian Library
- Palettes...

The bottom panel shows the "transition - Transition" properties window. The "General" tab is active, displaying the following settings:

- Name: transition
- Show name: ☐
- Ignore: ☐
- Public: ☐
- Show at runtime: ☒
- Triggered by: Message
- Message type: ☐ boolean ☐ int ☐ double ☐ String ☒ Other
- Class name: Object
- Fire transition: ☒ Unconditionally ☐ If message equals ☐ If expression is true
- Action: (empty field)
- Guard: (empty field)

Adding a New Transition

AnyLogic University [EVALUATION USE ONLY]

File Edit View Model Window Help

100%

Get Support

Model

Project

- Aa text1: 0.0
- Aa text2: 500.0
- Aa text3: StaffTimePerPz
- Aa text4: 0.0
- Aa text5: 100.0
- Aa text6: TimeUntilSeekT
- Aa text7: 0.0
- Aa text8: 100.0
- Aa text15: These elemen
- / line
- Aa text16: These elemen
- / line1
- slider
- slider1
- slider2
- plot
- Simulation: Main
- Presentation
- StudentModel*
- Main
- Person
- Simulation: Main

statechart

StateBlue

StateRed

transition2 - Transition

General

Name: transition2 ☐ Show name ☐ Ignore ☐ Public ☒ Show at runtime

Triggered by: Timeout

Timeout: 1

Action:

Guard:

Properties Log Console

Palette

- General
- System Dynamics
- Statechart
 - Statechart Entry Point
 - State
 - Transition
 - Initial State Pointer
 - Branch
 - History State
 - Final State
- Actionchart
- Analysis
- Presentation
- Controls
- Connectivity
- Pictures
- Enterprise Library
- Pedestrian Library
- Palettes...

transition2 - Transition

Selection

X=122, Y=186

This is a Self-Transition

An Action is Fired, but No State Transition

The screenshot displays the AnyLogic University interface. The main workspace shows a statechart with two states: 'StateBlue' (blue) and 'StateRed' (red). A self-transition arrow is drawn on 'StateRed', labeled 'transition2'. The 'Properties' panel at the bottom is set to 'transition2 - Transition'. The 'General' tab is active, showing the following configuration:

- Name: transition2
- Triggered by: Timeout
- Timeout: 1
- Action: (empty text box)
- Guard: (empty text box)
- Options: ☐ Show name, ☐ Ignore, ☐ Public, ☒ Show at runtime

The left sidebar shows a project tree with a 'Person' entity selected. The right sidebar contains a palette with various modeling elements like 'Statechart Entry Point', 'State', 'Transition', and 'Initial State Pointer'.

Setting the Self-Transition to Go off Occasionally

The screenshot displays the AnyLogic University software interface, which is used for modeling and simulation. The main workspace shows a statechart with two states: **StateBlue** (blue rounded rectangle) and **StateRed** (red rounded rectangle). A self-transition arrow is attached to **StateRed**, labeled **transition2**. The interface includes several panels:

- Project** (left): A tree view showing the project structure, including **Simulation: Main**, **Presentation**, and **StudentModel***.
- Properties** (bottom): A panel for configuring the selected element, **transition2 - Transition**. It includes fields for **Name** (transition2), **Triggered by** (Rate), **Rate**, **Action**, and **Guard**. The **Show at runtime** checkbox is checked.
- Palette** (right): A panel containing various modeling elements, including **Statechart Entry Point**, **State**, **Transition**, **Initial State Pointer**, **Branch**, **History State**, and **Final State**.

The **Properties** panel for **transition2 - Transition** is expanded, showing the following settings:

- Name:** transition2
- Show name:** ☐
- Ignore:** ☐
- Public:** ☐
- Show at runtime:** ☒
- Triggered by:** Rate
- Rate:** [empty field]
- Action:** [empty field]
- Guard:** [empty field]

Setting the Action to Send a Message

The screenshot displays the AnyLogic University [EVALUATION USE ONLY] interface. The main workspace shows a statechart diagram with two states: 'StateBlue' (blue) and 'StateRed' (red). A transition arrow points from 'StateBlue' to 'StateRed'. The 'transition2 - Transition' properties panel is open, showing the following settings:

- Name: transition2
- Triggered by: Rate
- Rate: 1
- Action: `send("Infect", RANDOM_CONNECTED);`
- Guard: (empty)

The left sidebar shows a project tree with the following structure:

- Simulation: Main
- Presentation
- StudentModel*
 - Main
 - Person
 - Simulation: Main

The right sidebar shows a palette with various components, including Statechart, State, Transition, Initial State Pointer, Branch, History State, and Final State. The bottom right sidebar shows a list of libraries and palettes.

Letting a Person Know What to Do when a Message is Received

The screenshot displays the AnyLogic University software interface, specifically the 'Person' agent's statechart. The main workspace shows a statechart with two states: 'StateBlue' (blue rounded rectangle) and 'StateRed' (red rounded rectangle). An initial state pointer (a black dot with an arrow) points to 'StateBlue'. A transition arrow connects 'StateBlue' to 'StateRed', and another transition arrow connects 'StateRed' back to 'StateBlue'. The 'Person' agent is selected in the Project pane on the left, which lists various components like text, sliders, and plots. The Properties pane at the bottom shows the 'Person - Active Object Class' with tabs for General, Advanced, Agent, Preview, and Description. The 'Agent' tab is active, showing movement parameters (Velocity, Rotation) and event-driven actions. The 'On message received' event has a triggered action: `statechart.receiveMessage ( msg );`. The right-hand Palette contains various modeling elements categorized under General, System Dynamics, Statechart, and Actionchart.

AnyLogic University [EVALUATION USE ONLY]

File Edit View Model Window Help

100%

Get Support

Project

- Aa text1: 0.0
- Aa text2: 500.0
- Aa text3: StaffTimePerPe
- Aa text4: 0.0
- Aa text5: 100.0
- Aa text6: TimeUntilSeekT
- Aa text7: 0.0
- Aa text8: 100.0
- Aa text15: These elemen
- / line
- Aa text16: These elemen
- / line1
- slider
- slider1
- slider2
- plot
- Simulation: Main
- Presentation
- StudentModel*
- Main
- Person**
- Simulation: Main

Main Main Person

statechart

StateBlue

StateRed

Properties Log Console

Person - Active Object Class

General

Advanced

Agent

Preview

Description

Movement parameters:

Velocity:

Rotation:

On arrival:

On message received:

`statechart.receiveMessage ( msg );`

On before step:

Palette

- General
- System Dynamics
- Statechart
- Statechart Entry Point
- State
- Transition
- Initial State Pointer
- Branch
- History State
- Final State
- Actionchart
- Analysis
- Presentation
- Controls
- Connectivity
- Pictures
- Enterprise Library
- Pedestrian Library
- Palettes...

We Start with Exactly One Infective

The screenshot displays the AnyLogic University software interface, titled "AnyLogic University [EVALUATION USE ONLY]". The main workspace shows a statechart model with two states: "StateBlue" (blue rounded rectangle) and "StateRed" (red rounded rectangle). An initial state pointer (black dot) is connected to "StateBlue". Transitions (arrows) connect "StateBlue" to "StateRed" and "StateRed" back to "StateBlue". The left sidebar contains a Project view with a tree structure showing the model hierarchy: "Simulation: Main", "Presentation", "StudentModel*", "Main", "Person", and "Simulation: Main". The right sidebar contains a Palette view with various modeling elements categorized under "General", "System Dynamics", "Statechart", "Actionchart", "Analysis", "Presentation", "Controls", "Connectivity", "Pictures", "Enterprise Library", "Pedestrian Library", and "Palettes...". The bottom panel shows the "Main - Active Object Class" properties, including a "Name" field set to "Main", an "Ignore" checkbox, and "Startup code" and "Destroy code" fields. The "Startup code" field contains the text: `environment.deliverToRandom( "Infect" );`.

Run the Model Again!

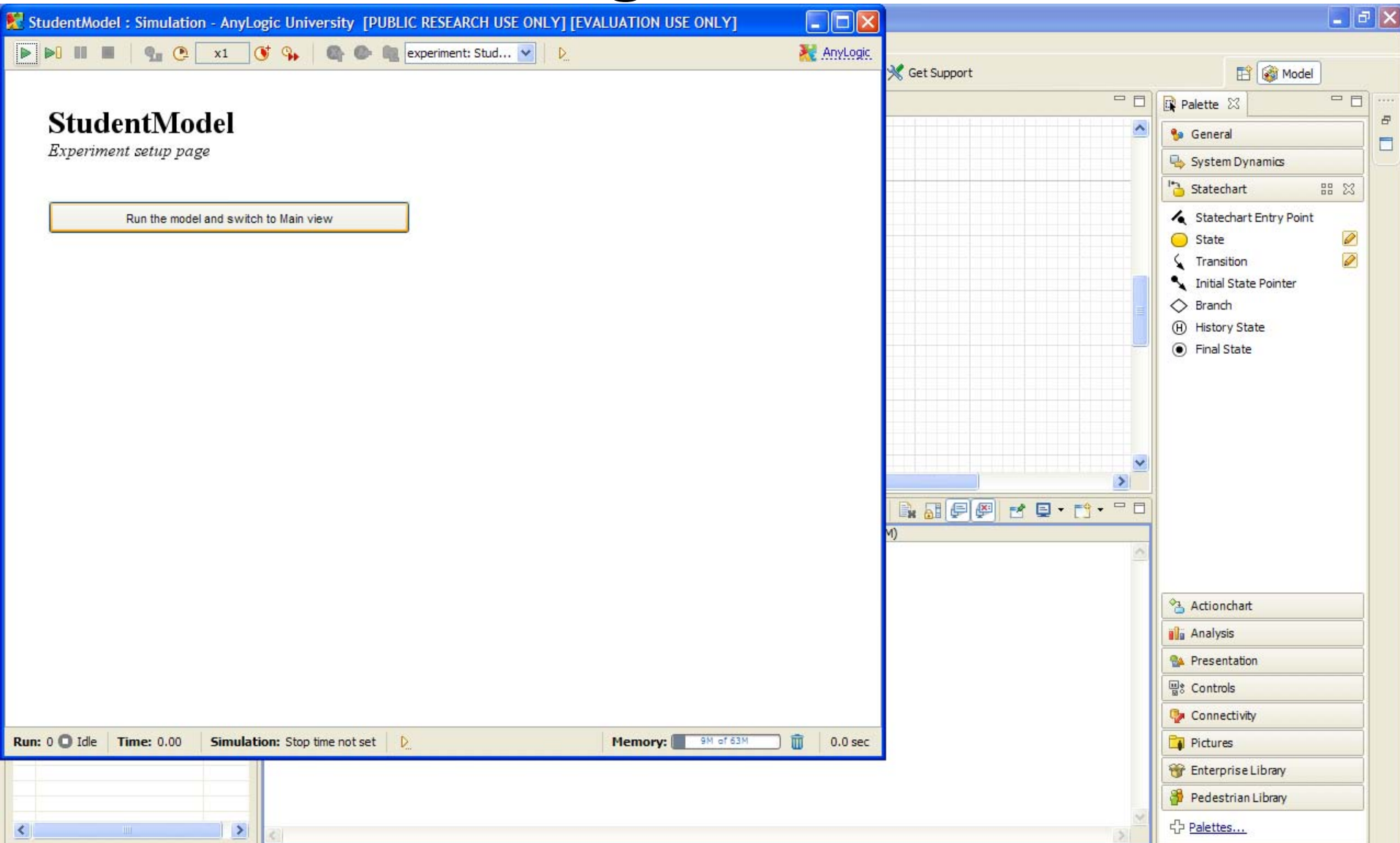
The screenshot displays the AnyLogic University software interface. The main workspace shows a statechart model with two states: "StateBlue" (blue) and "StateRed" (red). A transition arrow points from "StateBlue" to "StateRed", and another points from "StateRed" back to "StateBlue". A label "statechart" is positioned above the "StateBlue" state. The left sidebar contains a project tree with the following structure:

- Simulation: Main
 - Presentation
 - StudentModel
 - Main
 - Person
 - Simulation: Main

The right sidebar shows a palette with various modeling elements, including "General", "System Dynamics", "Statechart", "Statechart Entry Point", "State", "Transition", "Initial State Pointer", "Branch", "History State", and "Final State". The bottom console window displays the following text:

```
<terminated> anylogic config [Java Application] C:\Program Files\AnyLogic 6 University\jre\bin\javaw.exe (Oct 29, 2009 12:58:14 AM)
```


Starting the Model



Network Spread of Influence

