

AgentSheets

These are just some introductory remarks on what AgentSheets is and how to use it. For a comprehensive set of manuals, please refer to <http://www.agentsheets.com/support/manuals/> and a comprehensive list of research papers discussing AgentSheets, please refer to http://www.agentsheets.com/about_us/papers/index.html.

What is AgentSheets?

AgentSheets is an authoring tool allowing end-users to build their own interactive simulations and publish them on the Web. In its core, it is the combination of three concepts: agents, spreadsheets, and java authoring tools (Figure below).



Agents: Entities with looks and associated behaviors that define how they interact with their environment. They can be programmed to perceive mouse clicks, sound and keyboard input, the existence of other agents, and even web page content. They act by moving, changing their appearance, playing sounds, playing video clips, computing formulae, “speaking” text through voice synthesis, sending messages to other agents, and opening URLs.








Spreadsheets: Agents are placed together in a grid, called a *worksheet*, where they interact with one another. Similar to a spreadsheet, the grid structure of a worksheet enables spatial communication between elements in cells. Unlike spreadsheet cells, which are limited to numbers, text and formulae, worksheet cells can contain any number of interacting agents.

Java Authoring Tools: the Ristretto™ technology provides a simple way for users to turn their simulations into Java applets that can be embedded into web pages. This mechanism empowers users to create applications that can be shared with others over the web, without needing to learn Java programming.

AgentSheets tool

The AgentSheets tool has the following components. Please note that these may look slightly different on the Mac and Windows version of AgentSheets, but the idea is the same:



- 1) **Gallery:** The place where you define your agents
- 2) **Worksheet:** The place where your simulation or game takes place. The simulated world.
- 3) **Tool Panel:** The set of tools available for using on the Worksheet. It includes the following tools:
 -  **Pointer Tool:** use it to select and drag agents
 -  **Draw (Pencil) Tool:** use it to draw the agent selected in the Gallery
 -  **Eraser Tool:** use it to erase agents
 -  **Hand Tool:** define your own interactions with this tool in the behavior of an agent
 -  **Whack Tool:** define your own interactions with this tool in the behavior of an agent
 -  **Draw Rectangle Tool:** use it to draw a rectangle full of the agents selected in the Gallery
 -  **Question Mark Tool:** use it to inquire agents about the values of their attributes
- 4) **Background:** A picture you can use as a background for your Worksheet.

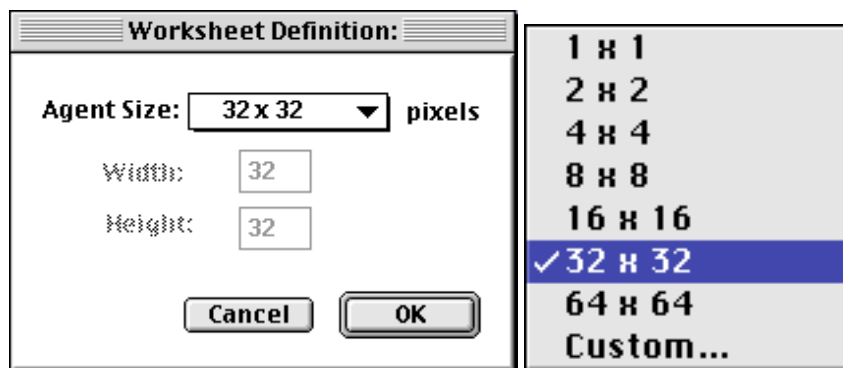
Here are some pointers on how to perform various operations in the AgentSheets environment:

Starting the Simulation Press the  button

Stopping the Simulation Press the  button

Opening a Project Go to **File ->Open Project...**
Choose a project from the list provided and wait for it to load.

Creating a New Project Go to **File ->New Project...** The system will ask you to give a Project Name. Type in a name and click "OK". A window will appear in which you need to select the size of your agents.





From the pop-up menu, choose the dimensions of your agents. *Note that this decision is final. You cannot go back and change the size of your agents after you have created them!* A new Gallery will appear on your screen. Make sure you save it, using **File ->Save** and giving it a name of your choice.

Opening a Worksheet Go to **File ->Open Worksheet...**
Choose a worksheet from the list provided. If there are no worksheets, you can create your own.


Creating a New Worksheet Go to **File ->New Worksheet**
A new untitled worksheet appears.

Saving a Worksheet Select the worksheet to be saved.
Go to **File ->Save** and provide a name (if this is a new worksheet that you are saving).

Placing Agents on a Worksheet In the Gallery, select the agent you want to place on the worksheet.
Go to the worksheet.
Select the "Pencil Tool"  from the Tool Panel.
Click wherever you want your new agent to be on the worksheet.
If you want to add a bunch of agents at once, select the agent you want to place on the worksheet from the gallery, then select the "Draw

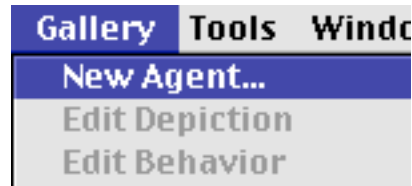
Rectangle Tool"  and draw a rectangle where you want the new agents to appear in your worksheet.

Erasing an Agent

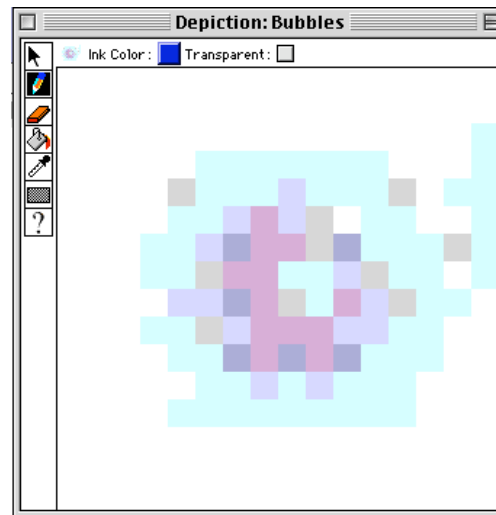
Select the "Eraser Tool"  from the Tool Panel, then click on the agent you want to have erased in the Worksheet.

Creating a New Agent

Go to **Gallery->New Agent...**



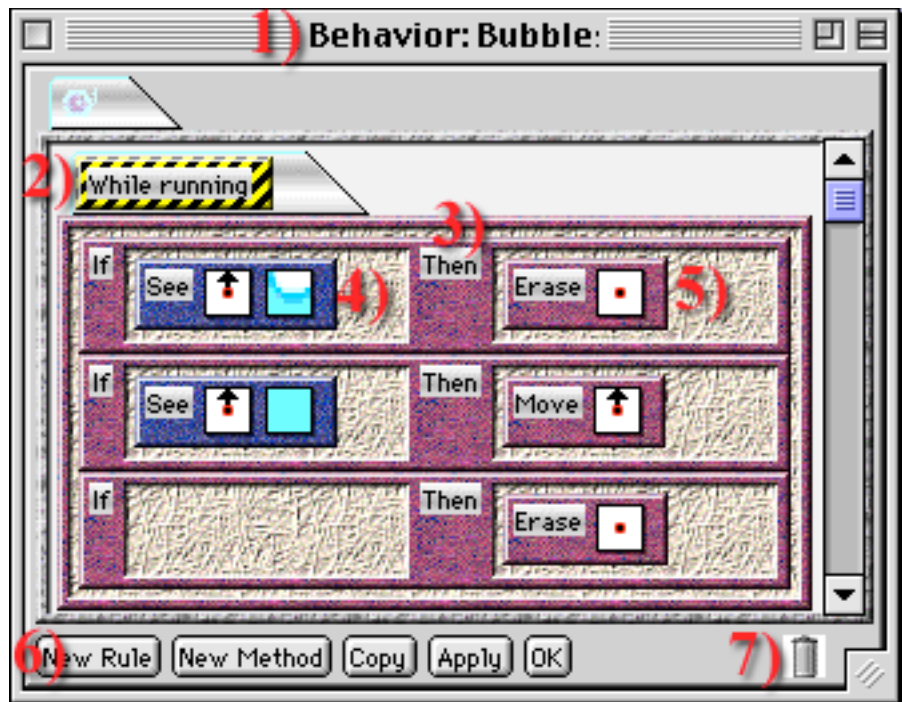
You will be prompted to give the name of your new agent. Type in a name and click "OK". A new agent is created for you in the Gallery. To define its look (depiction), double click on the new agent. You will get the Depiction Editor where you can draw the look of your agent.



If you do not wish to draw your agent from scratch, but have found a good picture that you can use, select the depiction of an Agent in the Gallery that you want to replace, and then use **Gallery->Import image**.

Creating Behaviors

Open agent's Behavior Editors by selecting the agent in the gallery and using the Edit Behavior Button. A Behavior Editor is the place where the behavior of an agent is defined, in the form of IF-THEN rules. It has the following components:



- 1) **Behavior Editor Window**
- 2) **While Running Method:** what gets executed when you run the simulation.
- 3) **Rule:** an IF-THEN pair which contains conditions and actions
- 4) **Condition:** Situations for the agent to check if they apply
- 5) **Action:** Things to perform, given that the conditions of the rule are met
- 6) **Buttons**
 - New Rule:** creates new rule
 - New Method:** creates new method
 - Copy:** copies the selected item (rule, condition, or action)
 - Apply:** applies the changes that you made in the behavior, but without closing the window and without saving the changes
 - OK:** applies the changes that you made in the behavior, closes the window and saves the changes
- 7) **Trash:** where you drag unwanted methods, rules, conditions or actions to delete them

The rules are ordered from top to bottom and the rules at the top have higher priority than the rules at the bottom. This basically means that when the simulation is running and the rules of an agent are checked, the first rule whose conditions are met gets executed and the rest are ignored. If none of the conditions of an agent's rules is met, the agent does nothing.

Getting the Condition and

Go to **Tools ->Conditions Palette** to get the Conditions Palette

Action Palettes

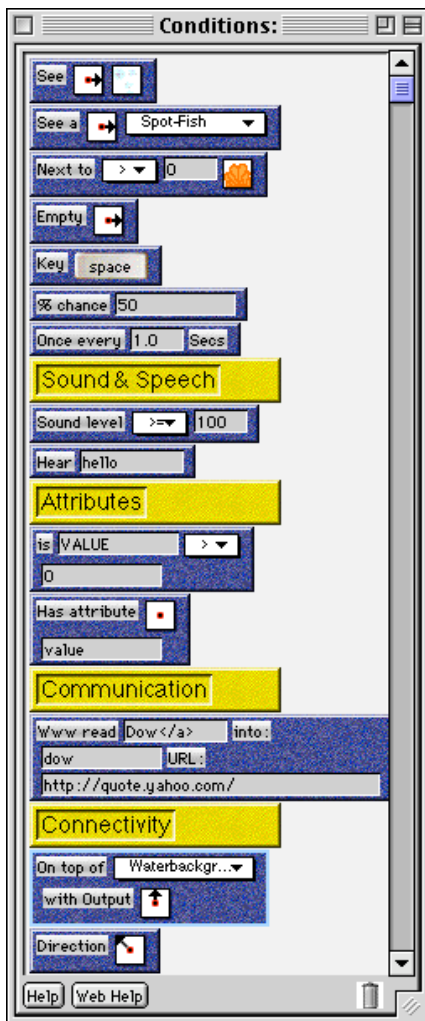
and to **Tools ->Actions Palette** to get the Actions Palette. For the latest language information for the Windows version, please refer to the Conditions

(<http://www.agentsheets.com/Documentation/windows/Reference/tm/conditions.html>) and Actions

(<http://www.agentsheets.com/Documentation/windows/Reference/tm/actions.html>) section of the reference manual.

Choosing Conditions

From the Conditions Palette chose which conditions you wish to use and drag it to the IF part of the rule. You have the following to chose from:

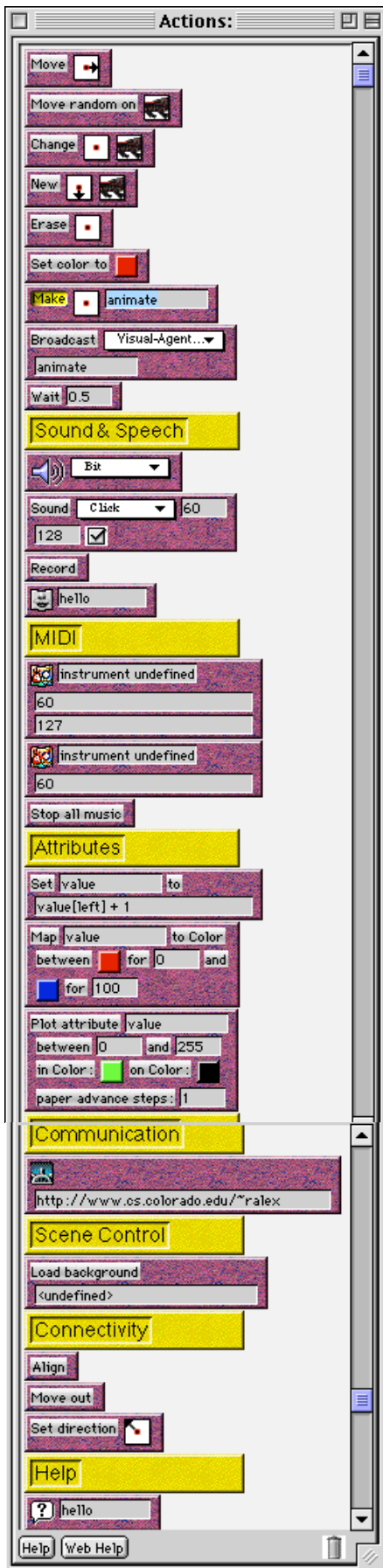





- See:** Detect agents in the direction specified that look like the depiction specified
- See a:** Detect agents in the direction specified that are of the type specified
- Next to:** Check if the agent is next to a number of the agents specified
- Empty:** Check whether the direction specified is empty
- Key:** Check if the key specified is pressed
- %Chance:** With the percentage specified (e.g. 50%), the condition evaluates to true
- Once every:** The condition evaluates to true periodically, for example, once every second
- Sound Level:** Check if the noise level is greater than the value specified (range: 0-255)
- Hear:** Check to see if the string specified was spoken by an agent around you
- Is:** Check whether the value of an attribute (such as age) is equal, greater than, or less than a specified number
- Has Attribute:** Check to see if an agent at the direction specified has a particular attribute
- WWW Read:** Go to the URL specified and look for the string specified and read the value that follows in the attribute specified. For example, go to the yahoo Web page, look for the string "Dow" and save the value that follows it into the dow attribute. This will give you the current Dow Jones index.

For now, ignore the connectivity stuff!

Choosing Actions

From the Actions Palette chose which conditions you wish to use and drag it to the THEN part of the rule. You have the following to chose from:



- Move:** Move the agent one square over in the direction specified
- Move Random On:** Move the agent randomly on the background agent specified
- Change:** Change the look of the agent at the direction specified to the new depiction
- New:** Create a new agent of the kind that was specified, in the direction specified
- Erase:** Erase the agent at the direction specified
- Set Color to:** set the color of the agent to the color specified
- Make:** Make the agent at the direction specified perform the action specified (this needs to be a valid method in that agent)
- Broadcast:** Broadcast a message (e.g. animate) to all the agents of the type specified
- Wait:** Make the simulation stop for the amount of time specified
- : Play the sound specified
- Sound:** Play the sound specified at the pitch specified
- Record:** Record a sound
- : Speak the string specified
- MIDI music:** Play the pitch specified with the instrument specified
- Set:** Set the value of an agent's attribute to a number or formula
- Map:** Map the value of the attribute specified to a color using the first color for the one extreme of the range of values and the second color for the other
- Plot:** Plot the value of the attribute specified between the two values specified, using the foreground and background colors specified
- : Open the URL specified in a Web Browser
- Load Background:** Load the background picture specified
- Help:** When the Balloon Help on a Macintosh is on, print the specified string in a balloon, when the mouse is over the agent.

Reordering rules

In the Rule Editor, grab a rule and drag it where you want it to be. You will see red lines indicating where the rule will be placed if it is dropped at that moment.

Adding a New Rule

In the Rule Editor, click on the "New Rule" button.



Copying a Rule, Action, or Condition

Select the rule, action, or condition you want copied and click on the "Copy" button in the Rule Editor .



Deleting a Rule, Action, or Condition

Drag the rule, action, or condition you want to delete and drag it to the Trash of the Rule Editor

