

Tools:

Inspectors:

See *Inspectors* documentation and directory in the *Tools* directory

Palette Panel:

The *Palette Panel* button will open the *Palette Panel*, which will allow the user to define particle types, and to drag those particles into the *World View*. (See documentation for *Particles*.)

Document Description:

The *Document Description* panel provides a multi-media text scroll view with which to document the current simulation. The text scroll view allows the user to drag graphics and any other document files, attachments, from the *Workspace* into the text scroll view. When graphics and attachments are dragged into the multi-media text scroll view, they can be copies of the original file which will then be inside the

PhysicsWorld data file. If the user links files and then makes a copy of the *PhysicsWorld* data file, those attachments do not come along with it.

This text scroll view is a multi-media text object written by Joe Freeman at NeXT which supports graphics and file attachments.

New Monitor Panel:

The user can create as many separate *Monitor Panels* as are needed. Using the pop-up list of current particles, the user can choose to display the position, velocity, and acceleration of any particle or the center of mass.

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The *Monitor Panel* displays position, velocity, and acceleration in both cartesian (x and y) and polar (magnitude and direction) coordinates. Each can be separately turned on and off by clicking on their name or the switch button next to their name. To temporarily turn off a monitor, change the particle that it is following to "Nothing". Monitor panels slow a simulation down quite a bit, and so turning them off or closing them when they are not needed improves simulation speed.

Monitor panels correctly display a particle's parameters in *Simulation*, *Reviewer*, as

well as *Trajectory* mode. In *Simulation* mode, the panels display the current frame of the simulation and dynamically change as the simulation progressed. In *Reviewer* and *Trajectory* mode, the *Monitor* panels display the current frame that the user has chosen with the frame slider.

Data Grapher:

The *Data Grapher* is an integrated plotting environment for viewing the data of a simulation.

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The user creates sets of data to display by highlighting fields in the three input browsers: *Particles*, *x Value*, *y Values*. The *Particles* and *y Values* browsers can have multiple selections while there can only be one *x Value* for a given plot. This allows for both multiple plots of data for one particle or multiple plots of certain parameters for multiple particles.

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Once selections are made in the three input browsers, the data sets that were created as a result of these selections are displayed above in the plot view and a

list of the data sets is displayed in the *data Sets* browser. The *data Sets* browser can now be used to select individual data sets to set their connection and marker types and colors.

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When a *data Set* is selected in the *data Sets* browser its connection and marker attributes are displayed through two pop-up lists and two color wells. This data set's attributes can then be changed by using the pop-up lists and the *Color Panel* to drag in new colors for the connecting line or the marker.

The grid of the plot view can be turned on and off with the *grid* switch button. The default setting is to display the grid.

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The *Data Grapher* is set as a default to automatically display every time a change is made to what the plot will display. This option can be turned on and off with the *autoDisplay* switch button. Subsequently, the user can use the *Plot* button to tell the *Data Grapher* to display whenever it is desired.

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The user can choose to display only a portion of the previously recorded frames of the simulation by using the range sliders in the *Data Grapher* panel. The minimum and maximum frames to be used in the plot can be changed either with the sliders or the arrow buttons. The default range is to display every frame of the simulation.

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If there are a large number of frames in the simulation, and it is not necessary to display every consecutive data point, the data skip field can be used to tell the *Data*

Grapher to only use every other, or any number for the skip value when it comes to sampling the list of frames in the simulation.

Closing the *Data Grapher* panel completely removes it from *PhysicsWorld*, and *PhysicsWorld* creates a new default *Data Grapher* if the user were to ask for it again.

The plot view and implementation was written by Antonio M. Zamora at Rose-Hulman Institute of Technology for the Freshman Integrated Curriculum.

Energy Bar Graph:

This window graphically displays the energy of the simulation in either *Simulation*, *Reviewer*, or *Trajectory* mode. Clicking on the *Activate/Deactive* button on the top of the panel turns the *Bar Graph*'s dynamic displaying on/off.

The *Energy Bar Graph* displays the *Total Potential*, *Kinetic*, and *Total Energy* of a simulation. This includes all particles and springs.

The *Energy Bar Graph* panel was written by David Fisher at Rose-Hulman Institute of Technology for the Freshman Integrated Curriculum.

Colors:

This brings up the standard color panel which can be used for giving particles, fields, boundaries, springs, trajectories, or the axis any color value by placing the color into their respective color wells.

Data File:

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Set Save Settings:

Allows the user to setup what will be saved in the text data file when *Save Data File* is selected. The user can only change what is to be saved if there are particles in the simulation and if the simulation has been run so that there are previous frames of data to be saved.

Save Data File:

Saves text in a tab delimited text file.