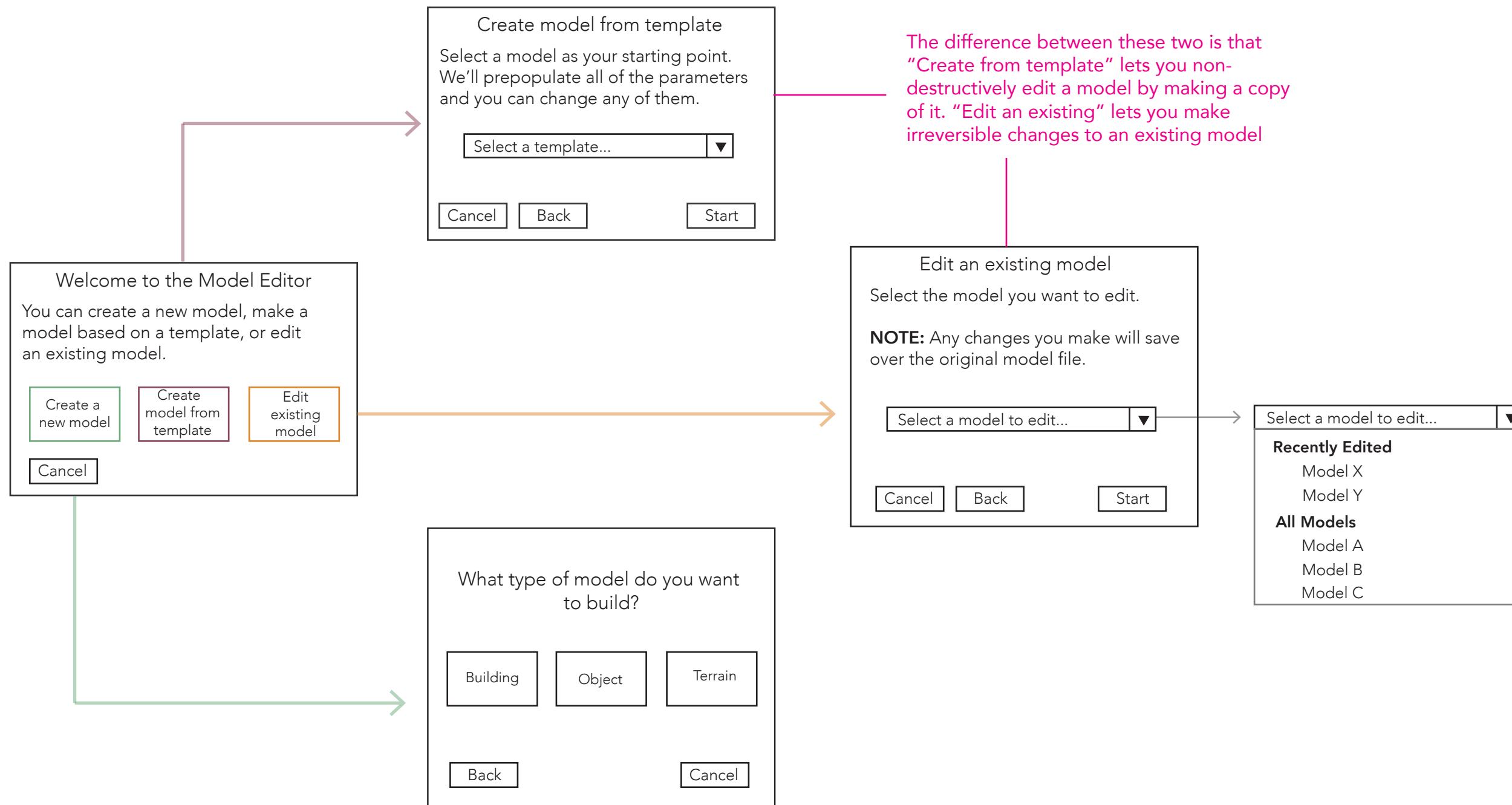


Model Editor Spec: Launch Model Editor

Documentation for the Model Editor tool. Annotations in pink.

We can consider combining the Building and Model Editors into what seems like the same tool. The user would select Model Editor from the menu, and be prompted to decide if they want to create a building or a model (or a terrain once that's built). Depending on their selection, they're sent to the relevant tool. Below is a possible start-up flow for that scenario.



Model Editor Spec: Model Editor Layout (Part 1)

Documentation for the Model Editor tool. Annotations in pink.

Future icons: Copy/Paste, Box Select, Undo/Redo, Snap-to-Grid



Palette & Model Settings

Parts Palette

Simple Shapes ▾

Cylinder Sphere Cube

Imported part libraries appear here. To delete, right-click on library name and pick Delete. (Add Import Library option to Menu to add libraries to Palette).

Custom parts are meshes made in another program. If possible, add a thumbnail to the Palette. (See pop-up # 1)

To delete custom shape, right-click and select "Delete" --> confirmation before deleting from Palette

See Part 2 (next page) for details

Model Settings ▶

Discard Save (As) Finish

See Palette Popups Part 2

File menu gets Save and Save As options

Orthographic View

Orthographic View can display the model from a variety of angles that make the model appear 2D. Moving parts in this view will move them only along the currently selected plane.

3D View

Parts can be dragged into the 3D View, and connected with joints. Users may freely manipulate parts here via rotate, translate, and scale (RTS).

Scale Draw joint (drop down lists joint types)

Orthographic View controls: Scale, Rotate, Pan, Zoom, New View, Add View

3D View controls: Rotate, Pan, Zoom, New View, Add View

Orthographic View status bar: Orthographic View

3D View status bar: 3D View

Orthographic View interface notes: I'm not sure what the options should be for switching views in Orth. mode. Will add in buttons or icons once we discuss.

3D View interface notes: Not sure if this is a good idea: 1) we already have standard controls to change view 2) could be a lot of work

BUT, it's a neat interface (lifted from the Chrome Lego tool), and makes for a more user-friendly, fun interaction

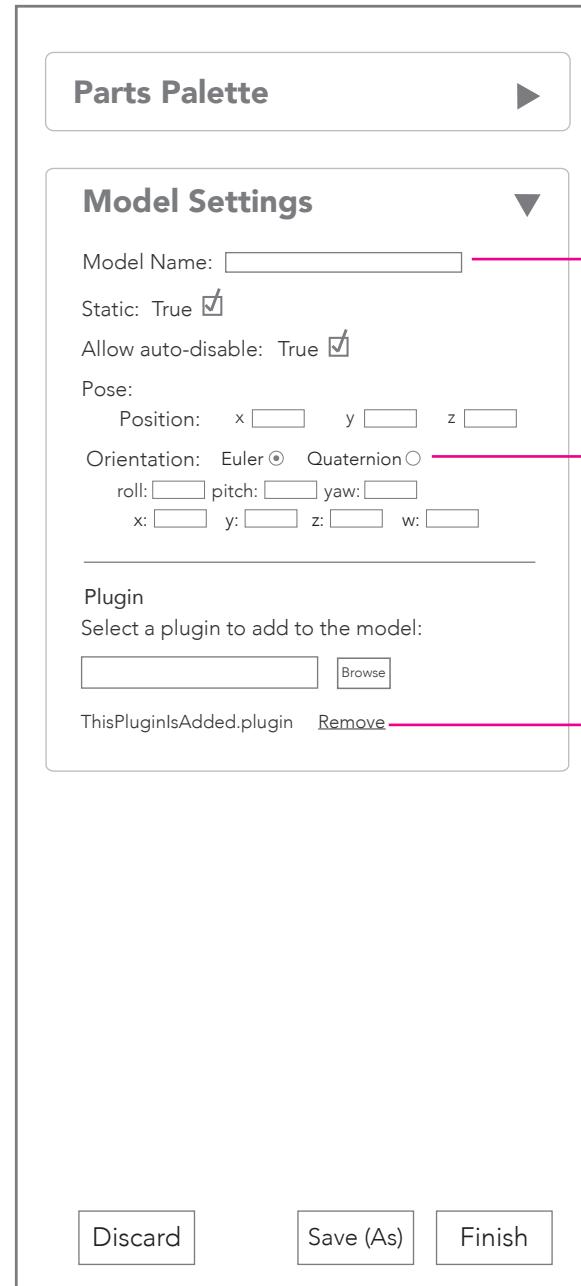
For cool alternative design, see Interactions 2!

The screenshot shows the Model Editor interface. On the left is the 'Palette & Model Settings' panel, which includes a 'Parts Palette' section with 'Simple Shapes' (Cylinder, Sphere, Cube), a 'Keepon Library' section with 'Keepon' and 'Head' icons, and a 'Custom Shapes' section with an 'Add' button. Below these are 'Model Settings' and a row of buttons for 'Discard', 'Save (As)', and 'Finish'. The main area has two views: 'Orthographic View' at the top and '3D View' below it. The Orthographic View shows a 2D representation of a model with various joints. The 3D View shows a 3D representation of the same model. Both views have toolbars above them with icons for scaling, rotating, panning, and zooming. Status bars at the bottom of each view provide information about the current view mode.

Model Editor Spec: Model Editor Layout (Part 2)

Documentation for the Model Editor tool. Annotations in pink.

This describes the interactions for the Model Settings sections in the Palette.



Name entered here is used when user selects Save and Finish

Static: True

Allow auto-disable: True

Pose:
Position: x y z

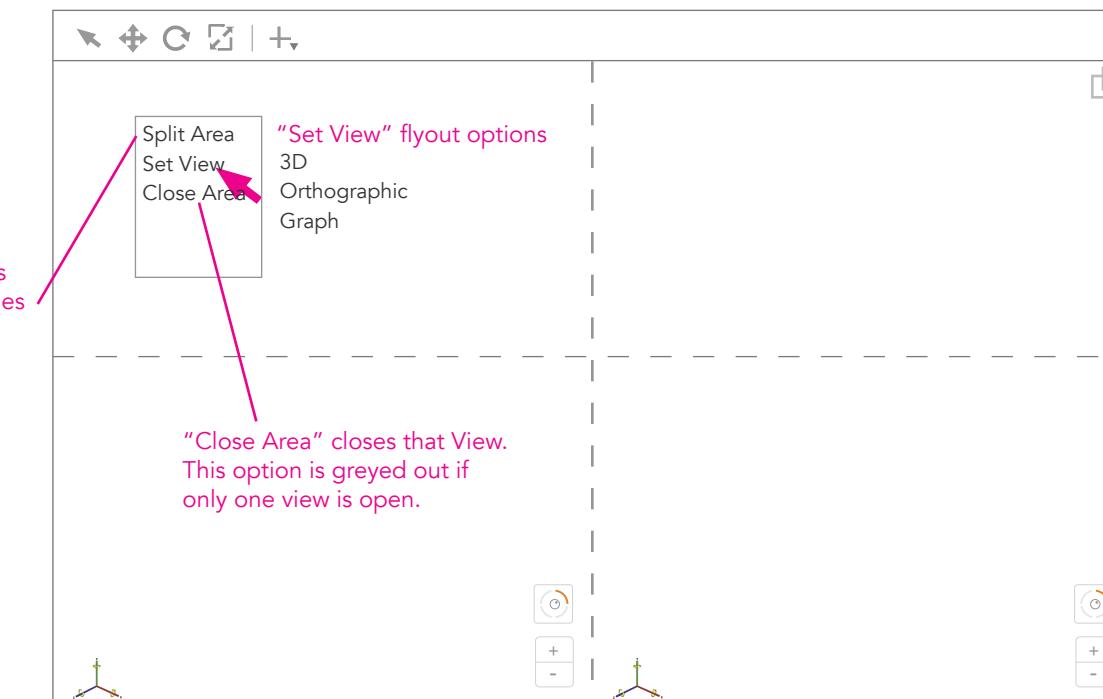
Orientation: Euler Quaternion
roll: pitch: yaw:
x: y: z: w:

Plugin
Select a plugin to add to the model:

ThisPluginIsAdded.plugin
Plugins appear in a list after they're added
• Clicking Remove removes plugin
• More than one plugin can be added

Change View

The Gazebo window can be split into (up to) 4 Views (3D, Graph, or Orthographic). Views can be “popped out”, but not rearranged by dragging. To “rearrange” the views, users manually assign a different view.



Right-click in a View displays this menu. “Split Area” divides the current view in half. “Set View” opens flyout menu to set the view.

“Split Area”
“Set View” flyout options
3D
Orthographic
Graph

“Close Area”
“Close Area” closes that View.
This option is greyed out if only one view is open.

Mousing over a View makes the Popout icon appear. Clicking the icon pops that view out. Dragging the popped out view back over the Gazebo window allows redocking. Or, if it's not too hard, popped out views have the below arrow, and clicking it pops the window back into the area it popped out of originally

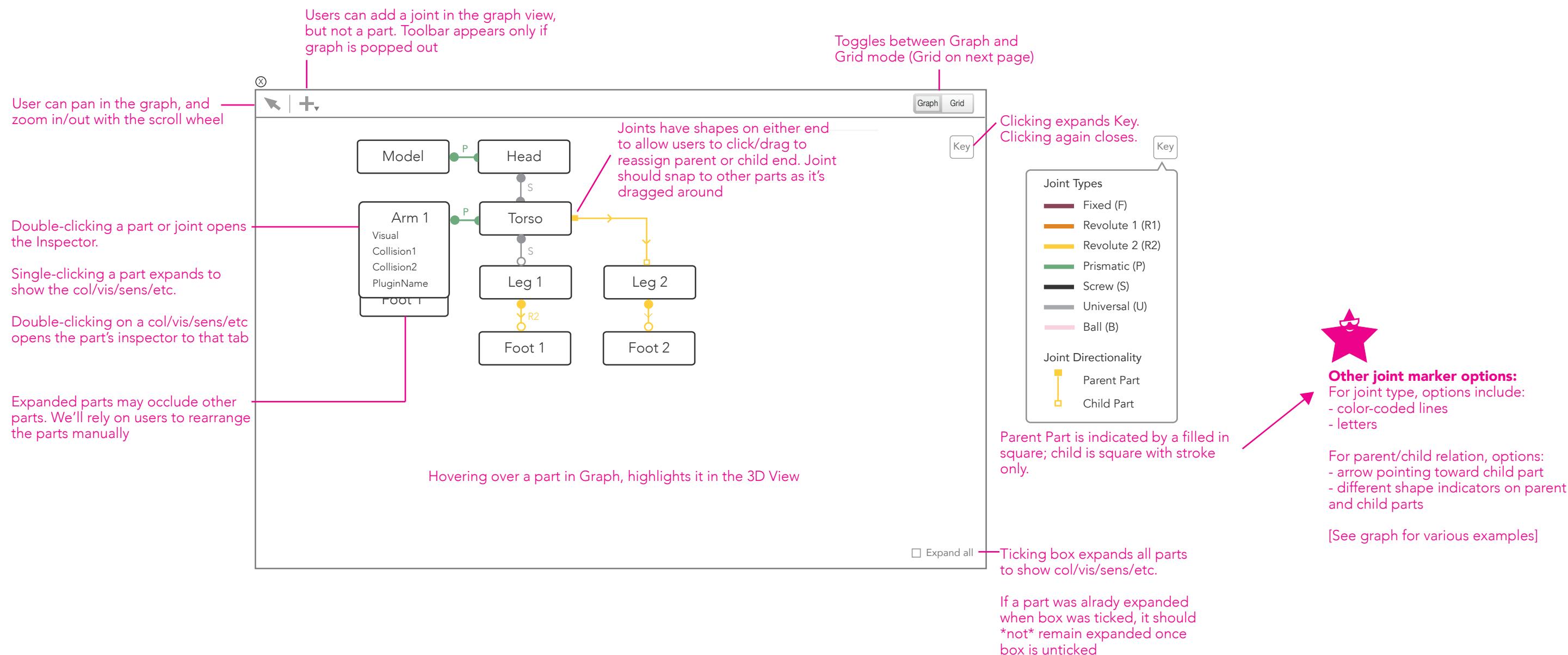
Model Editor Spec: Model Editor Graph (Part 1 of 2)

Documentation for the Model Editor tool. Annotations in pink.

Graph View

The Model Editor has a Graph View option that illustrates, in 2D, the relationships between each part. The graph can be opened as a split-screen view in the main Gazebo window, or it can be dragged out to be free-standing. Pulling it back over the Gazebo window should enable redocking.

Double-clicking on a part or joint opens the corresponding Inspector. Multiple inspectors can be open at once. Joints are displayed in the corresponding color (see the color palette), with a small square on either end. A filled in square indicates the Parent part, while a stroke-only square indicates the Child. Below are various alternatives; let's discuss when we get there! Single-clicking on a joint highlights it; pressing Delete on keyboard deletes the joint. Clicking a joint square and dragging allows the user to reassign the parent or child part. Hovering over a part while dragging the joint causes the part to highlight, indicating that releasing the joint will connect the two.



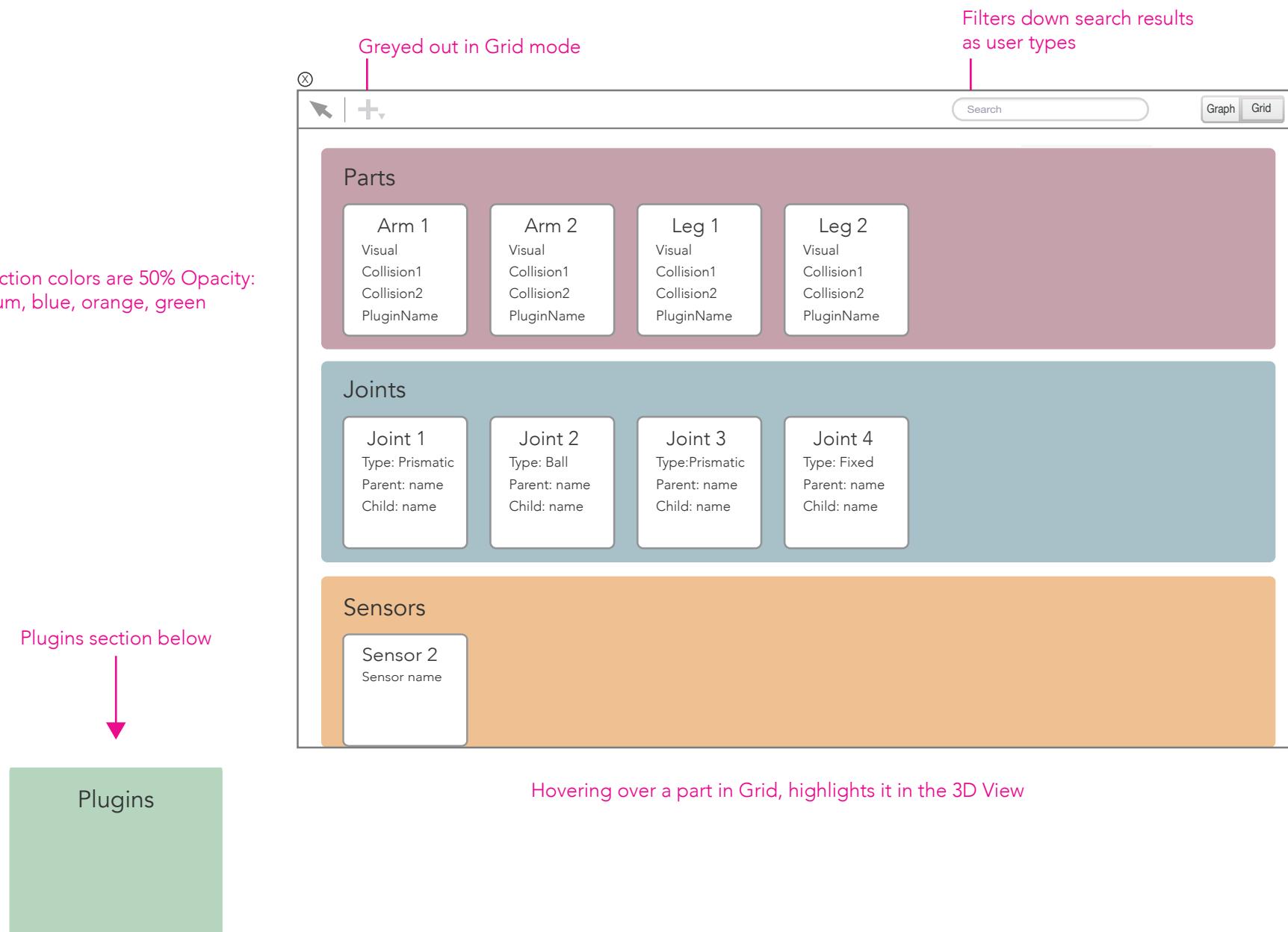
Model Editor Spec: Model Editor Graph (Part 2 of 2)

Documentation for the Model Editor tool. Annotations in pink.

Grid View

The Grid view is accessed by toggling the Graph/Grid toggle in the top, right corner of the toolbar. The Graph view's primary purpose is to offer a clean overview of all of the model's components. For now, components are alphabetically organized.

Double-clicking any component, opens the Inspector.



Model Editor Spec: Interactions (Part 1)

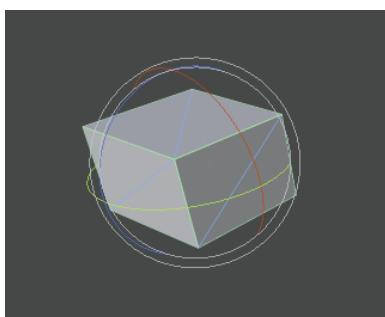
Documentation for the Model Editor tool. Annotations in pink.

Rotate/Translate/Scale (RTS) Parts

For the Scale function, we will add a Scale/Resize mode to the Toolbar. RTS controls can be carried out directly in the 3D View, or in the Part Inspector.

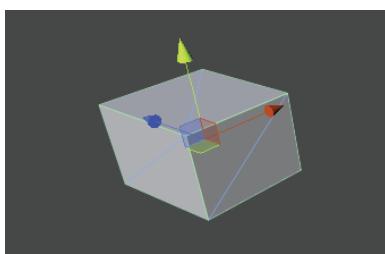
Direct Manipulation

Rotate: 3D part rotation is carried out by first clicking on the Rotate mode icon in the Toolbar, or pressing R on the keyboard. Colored circles appear around the part once it's clicked; clicking and dragging along these lines will rotate the part about the X, Y, and Z axes. Note: we will need to add in a color key so users know which circle represents each axis.



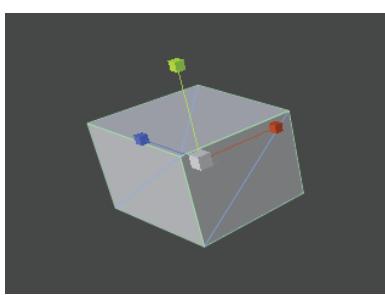
Screenshot from Unity

Translate: To translate, users enter Translate mode in the Toolbar, or by pressing T on the keyboard. Clicking on a part causes colored arrows to appear in the object. Clicking/dragging the arrows translates the part along the corresponding axis. Clicking/dragging in the middle translates freely.



Screenshot from Unity

Scale: Scaling occurs in the (soon-to-be-created) Scale/Resize mode. To enter Scale mode, users click on the Scale icon in the toolbar, or press S on their keyboard. Clicking a part produces colored lines with cubes on the ends. Clicking/dragging a cube resizes the part along that axis. Clicking/dragging in the center cube scales the part, keeping the same proportions.



Screenshot from Unity

Manual Manipulation

Users may choose to manually input values for the rotation and translation. This allows for more precise manipulation. These values can be added by opening the part's Inspector (by double-clicking on the part, or right-clicking and selecting Open Part Inspector from the menu). Edits in the Inspector should be immediately visible in the Views. The Inspector values update as changes are made in the Views, as well.

Part Inspector: Rotate/Translate

Part Name:	Robot Torso				
Position:	x: <input type="text"/> y: <input type="text"/> z: <input type="text"/>				
Orientation:	Euler <input checked="" type="radio"/> Quaternion <input type="radio"/>				
roll:	<input type="text"/>	pitch:	<input type="text"/>	yaw:	<input type="text"/>
x:	<input type="text"/>	y:	<input type="text"/>	z:	<input type="text"/>
Cancel			Ok		

Changes in Views shown here.
Changes here, conversely, are reflected in Views.

Radio button determines if Euler or Quaternion
• Selection determines which input fields are displayed (i.e. only one type visible at a time)

Alternative 3D View Rotate Widget

Instead of using the Lego Chrome approach, we can go for the 3ds Max approach. For an example, skip to 1:20 in this video: <https://www.youtube.com/watch?v=LJG3HuQ54yo> or search for "3Ds Max Tutorial - The Viewport".

Dragging the cube moves the view in multiple dimensions. Dragging the ring rotates only. Clicking Home icon returns view to default view. As a bonus, we could let user right-click on Home and select "Set Current View as Home" to make that the default.



Model Editor Spec: Interactions (Part 2)

Documentation for the Model Editor tool. Annotations in pink.

Create Joints

Adding Joints

Joints are added by entering Joint mode in the toolbar. Users can select desired joint type from the Joint icon drop down, or change the joint type later by opening the Joint Inspector. See Part 3 for joint color assignments.

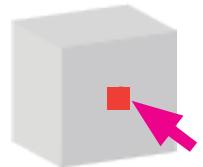
Step One

Enter Draw Joint mode, and optionally select a joint type. If none is selected, joint created is whatever type was last selected.



Step Two

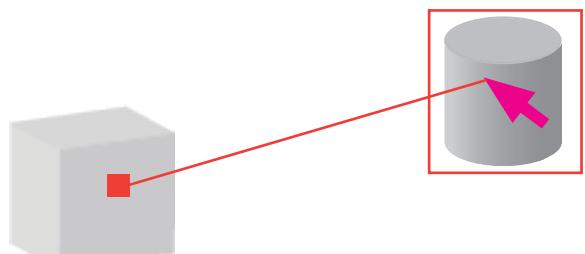
Click on the "Parent" Part. A dot should appear that is the same color as the color assigned to that joint type.



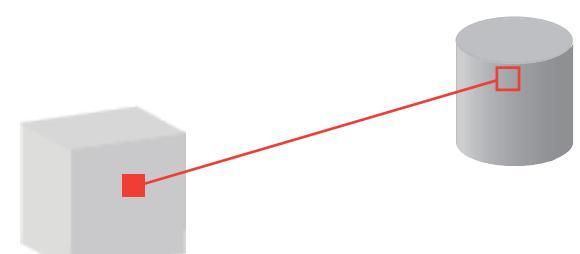
Step Three

Drag cursor to "Child" Part. A line (with the color specified for that joint type) should extend from the Parent Part and follow the cursor, indicating that the Child Part must be selected. As the cursor hovers above parts, the parts should highlight (bounding box or halo). Releasing over a part attaches the line (joint) to that part. Releasing outside of a part is invalid and does nothing.

Pressing Escape on the keyboard before a Child Part is selected causes the joint line to be deleted.



Selecting child part



Finished Joint

Adding Joints in Graph

SEE GRAPH DOCUMENTATION

Model Editor Spec: Interactions (Part 3)

Documentation for the Model Editor tool. Annotations in pink.

Create Joints

Joint Line Colors

Each joint is represented by a different color to help differentiate between joint types. The line and square markers representing the joint should be in the assigned color.

Fixed Joint

Plum

R: 140

G: 69

B: 88



Revolute Joint

Orange

R: 225

G: 132

B: 6



Revolute 2 Joint

Yellow

R: 255

G: 206

B: 60



Prismatic Joint

Green

R: 111

G: 171

B: 125



Screw Joint

Gray

R: 53

G: 53

B: 53



Universal Joint

Grey

R: 167

G: 169

B: 171



Ball Joint

Pink

R: 228

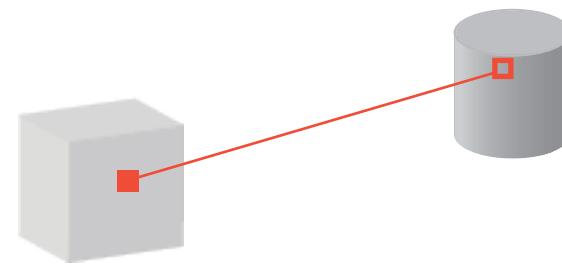
G: 75

B: 49



Moving Joints

Joints, by default, are anchored at the center of the part. Joints can be moved by opening the Joint Inspector and editing the Position fields, or by dragging the joint markers to a new parent or child.



Deleting Joints

Selecting the joint in the 3D view or Graph highlights the joint. Pressing Delete on the keyboard deletes the joint.

Model Editor Spec: Part Inspector (Part 1)

Documentation for the Model Editor tool. Annotations in pink.

Note: These param fields are placeholders and are not necessarily relevant to the section (ian, you know more about this than I do :). I'm not sure where things like Mass, Center of Mass, Moment of Intertia go...

The Part Inspector pop-up is opened by double-clicking a part, or right-clicking on a part, and selecting Part Inspector from the menu. The Part Inspector is not modal. When the Inspector is open, the corresponding part should be highlighted. A white "halo" outline should be sufficient. See Part Inspector (Part 3) for an example.

#1 Part Inspector: opens on General tab

Annotations for #1 Part Inspector:

- Potential spot for instruction/hints: Points to the top right corner of the main panel.
- Saves and closes: Points to the Ok button at the bottom right.
- Pop-up warning if user has made changes: Points to the Cancel and Restore Defaults buttons at the bottom left.
- Restores defaults after confirmation: Points to the Restore Defaults button.

#2 Part Inspector: Visual tab 2

Annotations for #2 Part Inspector:

- Default name is assigned to each element: Points to the Visual Name field.
- Deletes visual, after pop-up confirmation: Points to the Remove button.
- Options: basic geo shapes, and custom mesh: Points to the Geometry dropdown.
- Name of custom mesh appears in Palette if user added Custom Part: Points to the Geometry dropdown.
- Include Euler/Quaternion and orientation, as well (see #3): Points to the + Another Visual button.
- Would be neat to have options like: glass, carbon fiber, metal, etc. Texture drop down would be cool, too. What's feasible here?: Points to the Geometry dropdown.
- See to the right for details: Points to the Geometry dropdown.
- Standard pop-up to upload a file: Points to the Upload Custom button.

#3 Part Inspector: Visual tab 3 (if more than one visual exists)

Annotations for #3 Part Inspector:

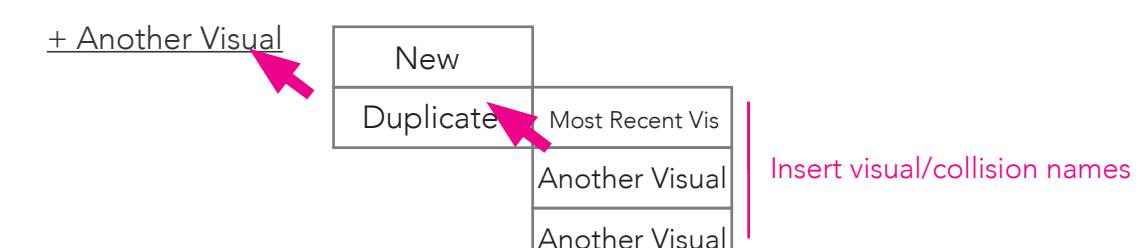
- Once more than one visual exists, they are divided by a thin, gray line. Scroll bar appears: Points to the scroll bar on the right side of the list.
- Include Euler/Quaternion orientation, as well: Points to the Position input fields.
- Radio button determines if Euler or Quaternion • Selection determines which input fields are displayed (i.e. only one type visible at a time): Points to the Euler/Quaternion radio buttons.

“+ Another Visual/Collision” Interaction

The Visual and Collision Part Inspectors have the option to + Another Visual/Collision.

There are two options: New and Duplicate. Selecting **New** adds another visual/collision with all fields blank.

Selecting **Duplicate** opens a second flyout with a list of existing visuals/collisions (from this or other Parts). The first in the list is the most recent visual/collision, and the other options are any visuals/collisions that have been added for other parts in the same model.



Model Editor Spec: Part Inspector (Part 2)

Documentation for the Model Editor tool. Annotations in pink.

#4 Part Inspector: Collision

Part Name: Robot Torso

General → Visual → Collision → Sensor → Attach Model

Collision Name: Collision One

Geometry: Geometry

Position: Euler (radio button selected) Quaternion (radio button)

roll: [] pitch: [] yaw: []
x: [] y: [] z: [] w: []

Laser Retro: []

Surface Bounce: []

Surface Friction: []

+ Another Collision

Cancel | Restore Defaults | Ok



I DON'T REMEMBER WHAT I MEANT BY THIS.
WHICH PARTS HERE CAN BE CARRIED OVER
FROM THE VISUAL?

- Checked by default.
- Lets user assign same params as a corresponding visual (whichever fields are duplicates across col/vis)
- Dropdown is grayed out unless checkbox is ticked
- Params that are the same across visual and collision should be grouped below "Position" so it's easy to see which params are mirrored
- If there are more than 1 visual or collision, the first visual to be created should be by default matched to the 1st collision created. The 2nd visual to the 2nd collision, etc.

Either Euler *or*
Quaternion, not both

#5 Part Inspector: Sensor Tab 1

Part Name: Robot Torso

General → Visual → Collision → Sensor → Attach Model

Add a Sensor

Cancel | Restore Defaults | Ok

Button appears when user
first visits Sensor tab. Reappears
on re-visit if user did not add a
sensor.

#6 Part Inspector: Sensor Tab 2

Part Name: Robot Torso

General → Visual → Collision → Sensor → Attach Model

Sensor Name: Sensor One

Type: Camera

Position: Euler (radio button selected) Quaternion (radio button)

roll: [] pitch: [] yaw: []
x: [] y: [] z: [] w: []

Visualize: True (checkbox checked)

Always On: True (checkbox checked)

Topic Name: []

Plugin: [] | Browse

ThisPluginIsAdded.plugin | Remove

+ Another Sensor

Cancel | Restore Defaults | Ok

Put sensor-specific
fields directly under
Type; indented

Plugins appear in a list
after they're added
• Clicking Remove
removes plugin

#7 Part Inspector: Attach Model 1

Part Name: Robot Torso

General → Visual → Collision → Sensor → Attach Model

You can attach an existing model to this part; sensors are common examples. You can set the pose, but will not be able to edit the model itself.

Select model to attach: []

Position: Euler (radio button selected) Quaternion (radio button)

roll: [] pitch: [] yaw: []
x: [] y: [] z: [] w: []

Attach

Cancel | Restore Defaults | Ok

If user presses OK w/out pressing Attach (and
they've picked a model), confirm if they meant to
attach the model before closing the Inspector
...perhaps this isn't necessary...

Can any model from
database be attached?
• Dropdown?

We fill in default pose
at top of part

Model Editor Spec: Part Inspector (Part 3)

Documentation for the Model Editor tool. Annotations in pink.

#8 Part Inspector: View of 2 Models

After a model has been attached to the part. Attached models are displayed in the order they were created, with a scroll bar to navigate.

Part Name: Robot Torso

General Visual Collision Sensor Attach Model

Position: x: [] y: [] z: []

Attach another model:

Position: Euler (radio) Quaternion (radio)
roll: [] pitch: [] yaw: []
x: [] y: [] z: [] w: []

Attach

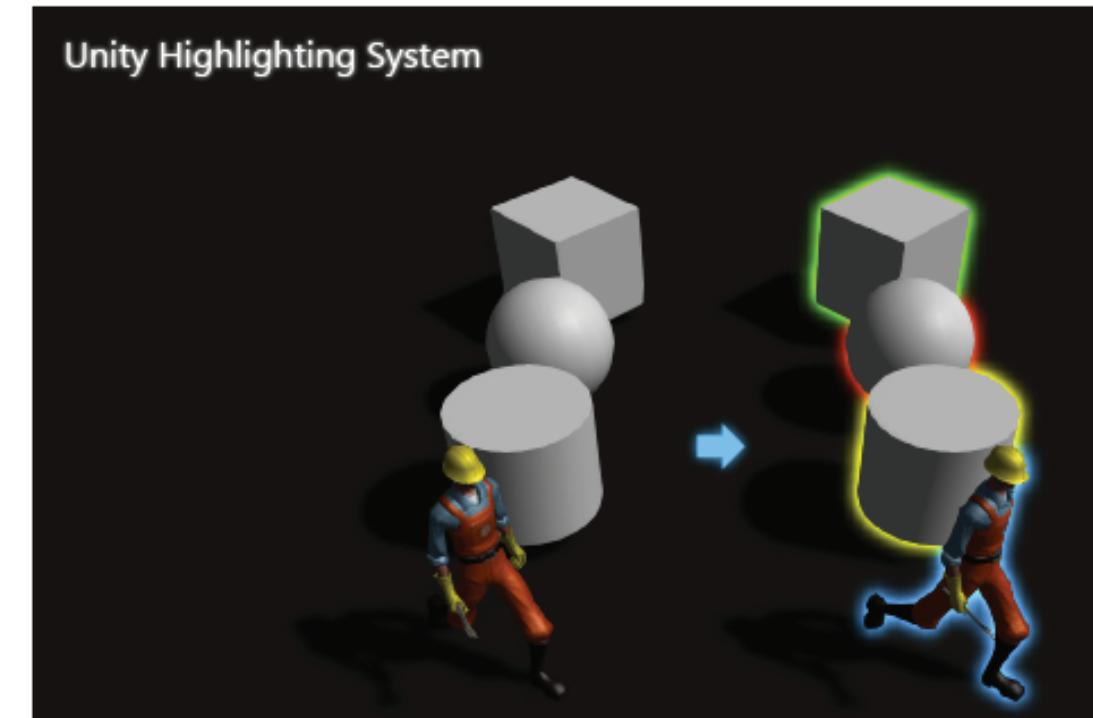
Cancel Restore Defaults Ok

Don't forget the Remove link at the top of the first model's section. Visible when scrolled up.

Drop down with categories (we need to implement tags), until list gets too long

We fill in default pose at top of part

Example of highlighting when a part's Inspector is open. Highlighting should be in white so as not to interfere with joint colors or interactive marker colors.



#9 Part Inspector: Joint

Joint Name: Joint 1 Remove

Type: Revolute

Parent Part: Robot Torso

Position: x: [] y: [] z: []

Child Part: Left arm

Position: x: [] y: [] z: []

Thread Pitch: []

Axis:
Axis2:

Physics: ODE

Fudge Factor: []
CFM: []

Cancel Restore Defaults Ok

Does this get Euler/Quat. options, too?

These will vary based on the joint. Params included here are placeholders.

Grey out the option that is already selected in the other field

Future Feature?
If there are many parts, it'll be confusing to pick the right one for parent/child. Can hovering over an item on the dropdown highlight the part in the 3D View? Perhaps a white halo, that blinks slowly.

Model Editor Spec: Palette Popups (Part 1)

Documentation for the Model Editor tool. Annotations in pink.

#1 Upload Custom Part (1)

If user elects to upload a custom part, it appears in the 3D View once it's uploaded, and it becomes a Part in the Palette.

Upload Custom Part

You can upload a 3D mesh that you have made with a modeling tool such as Maya or SolidWorks. It will appear as a Part in the Palette.

①

② Part Name:
X chars max. This will be the Part label in the Palette.

Question: what default collision do we assign to custom meshes?

Name should be short enough to fit in Palette under Part thumbnail

Grayed out until valid file is selected and name is entered

#2 Upload Custom Part (2)

Once a custom part/mesh has been uploaded.

Upload Custom Part

NameOf3DMesh.file

Upload another 3D mesh

①

② Part Name:
X chars max. This will be the Part label in the Palette.

Uploaded file is viewable in Palette once uploaded

Grayed out until valid file is selected

#3 Finish Popup

If user selects Finish Model in Palette

Finish Model

Before we finalize your model, please make sure that the following information is correct:

Name:

Location:

Contribute this model to The Prop Shop so that the entire Gazebo community can benefit!
[This will open up a new tab in your browser.]

Opens file browser. Autofill and highlight the selection they made when they first saved

Once user selects Finish, if they ticked Contribute, we send them to the Prop Shop website, with the Model name pre-filled (along with anything else that we can pre-fill)

Selecting Finish takes user back to regular Gazebo mode, and the new model is in the world, in the location they built it in. The new model is also now in the Insert list.

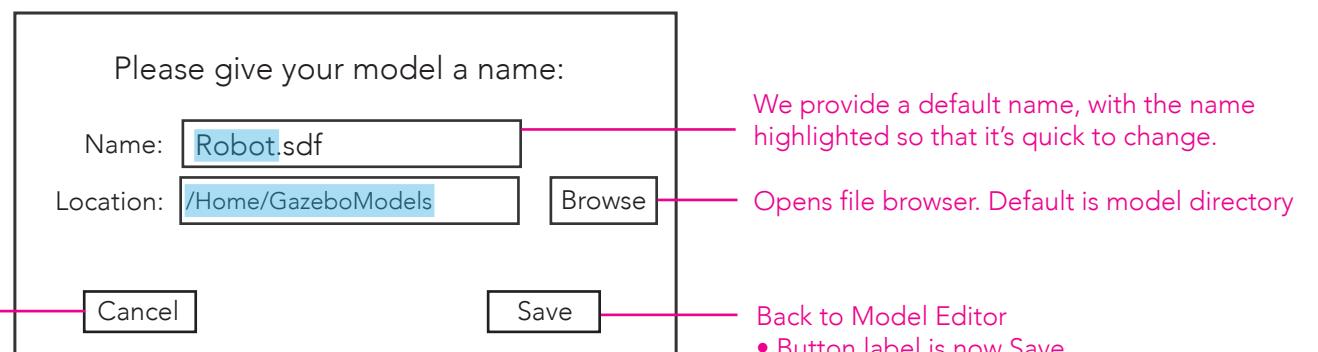
- If they checked Contribute, see above.

Model Editor Spec: Palette Popups (Part 2)

Documentation for the Model Editor tool. Annotations in pink.

#4 Save As Popup

Palette Save button label is Save As until user saves model (via Save As button in Palette, or Save As/Save in File menu). Thereafter, button label is Save, and clicking it saves progress. Selecting Save As in File menu lets user save another version of the model.



Back to Editor
• this pop-up appears again if user presses Save b/c they still haven't named model

#5 Discard Popup

If user presses Discard in Palette.

