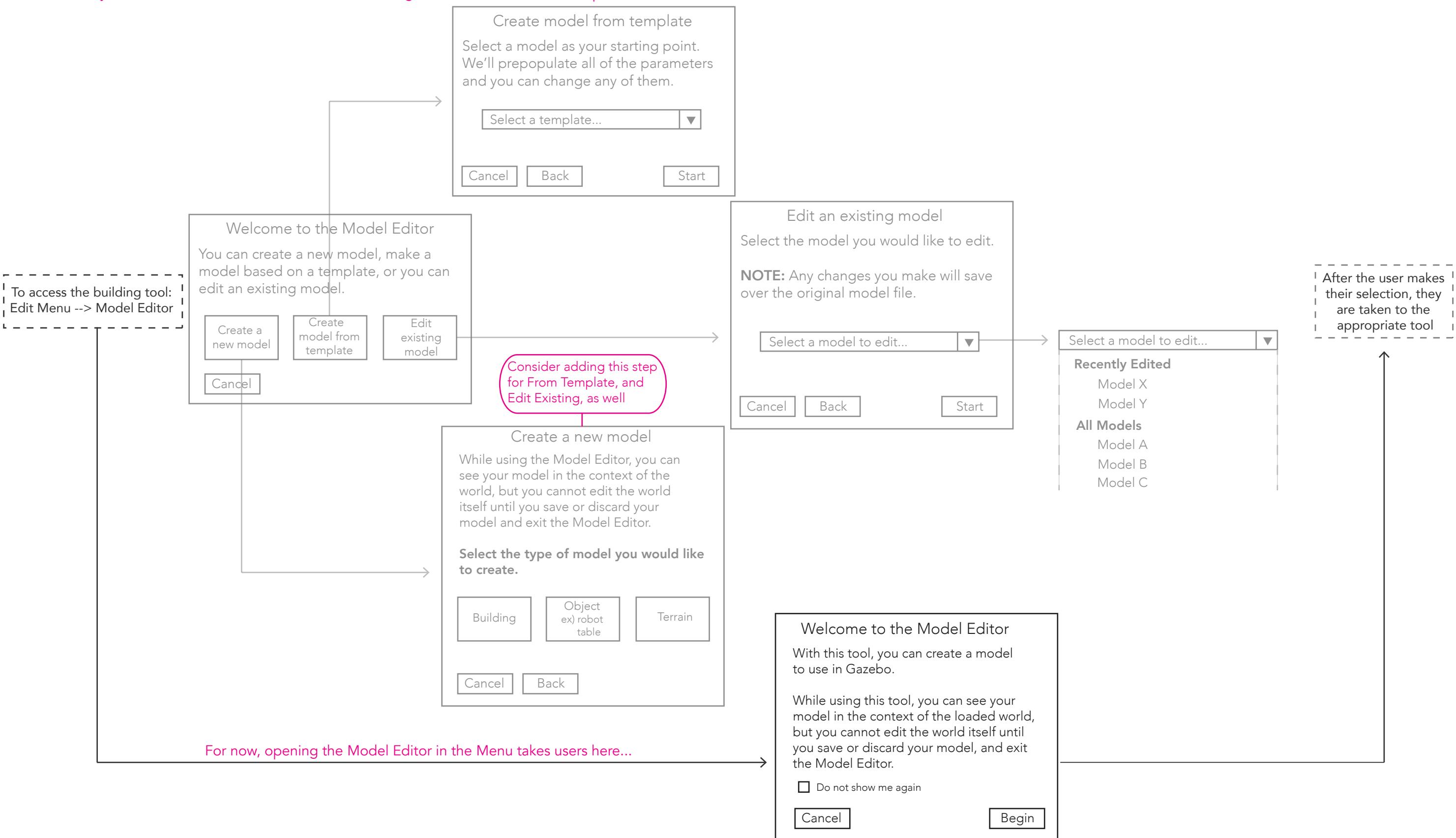


Model Editor Spec: Launch Model Editor

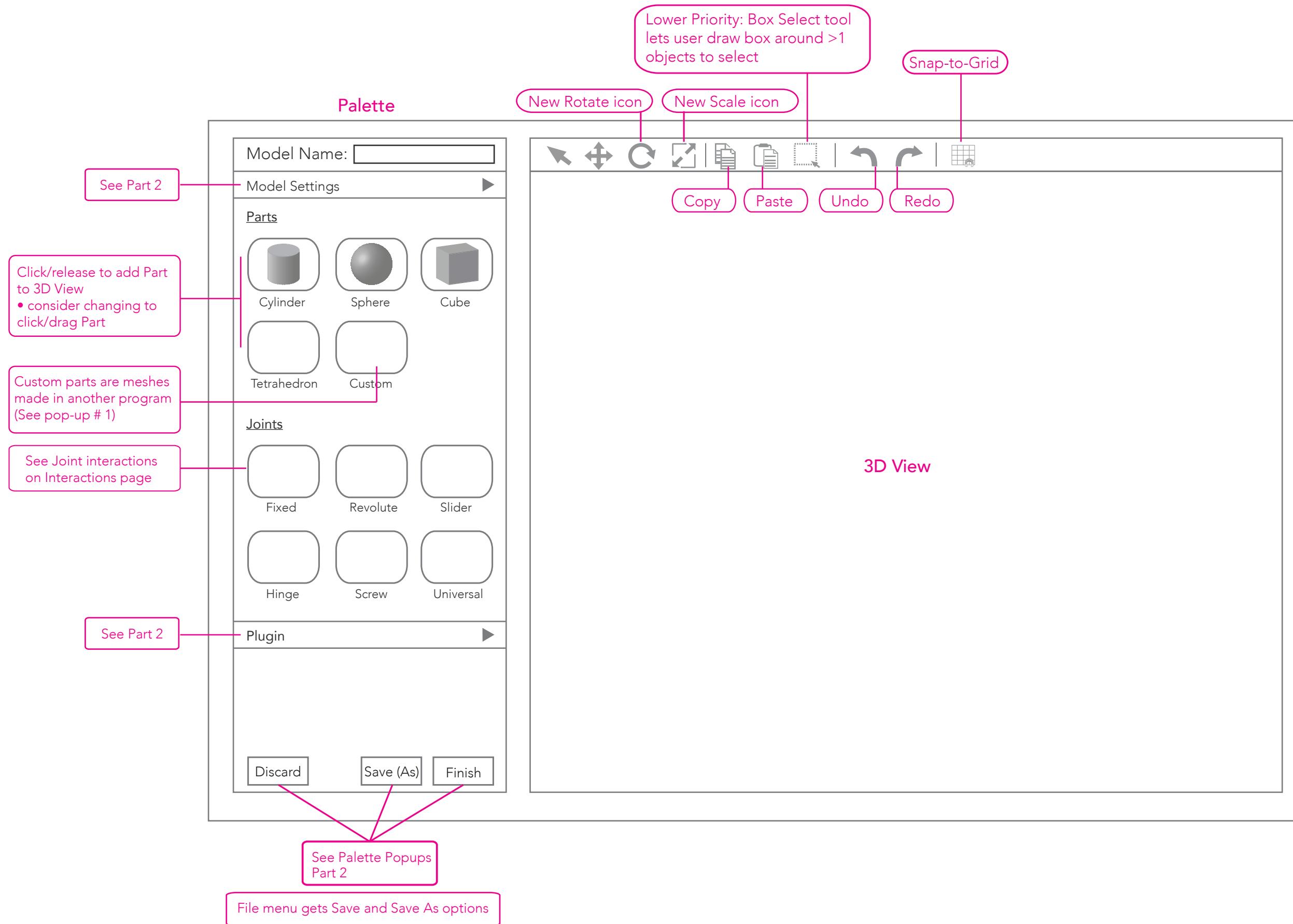
Documentation for the Model Editor tool. Annotations in pink.

Grayed out sections will be built when both Building and Model Editors are complete.



Model Editor Spec: Model Editor Layout (Part 1)

Documentation for the Model Editor tool. Annotations in pink.



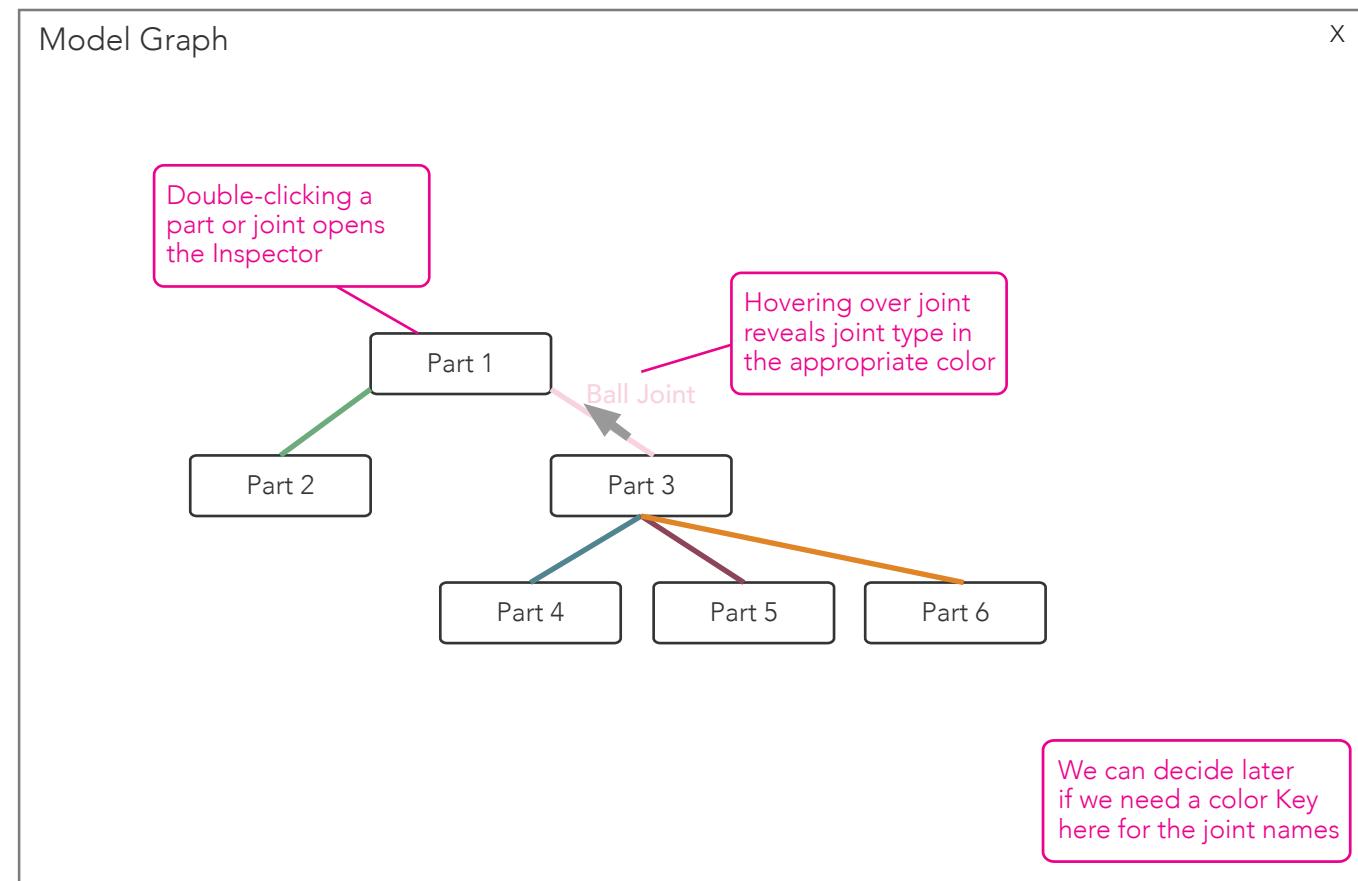
Model Editor Spec: Model Editor Layout (Part 1.5)

Documentation for the Model Editor tool. Annotations in pink.

Graph

The Model Editor also has a Graph that illustrates, in 2D, the relationships between the various parts. It is a separate window to accomodate graphs that could potentially be quite large.

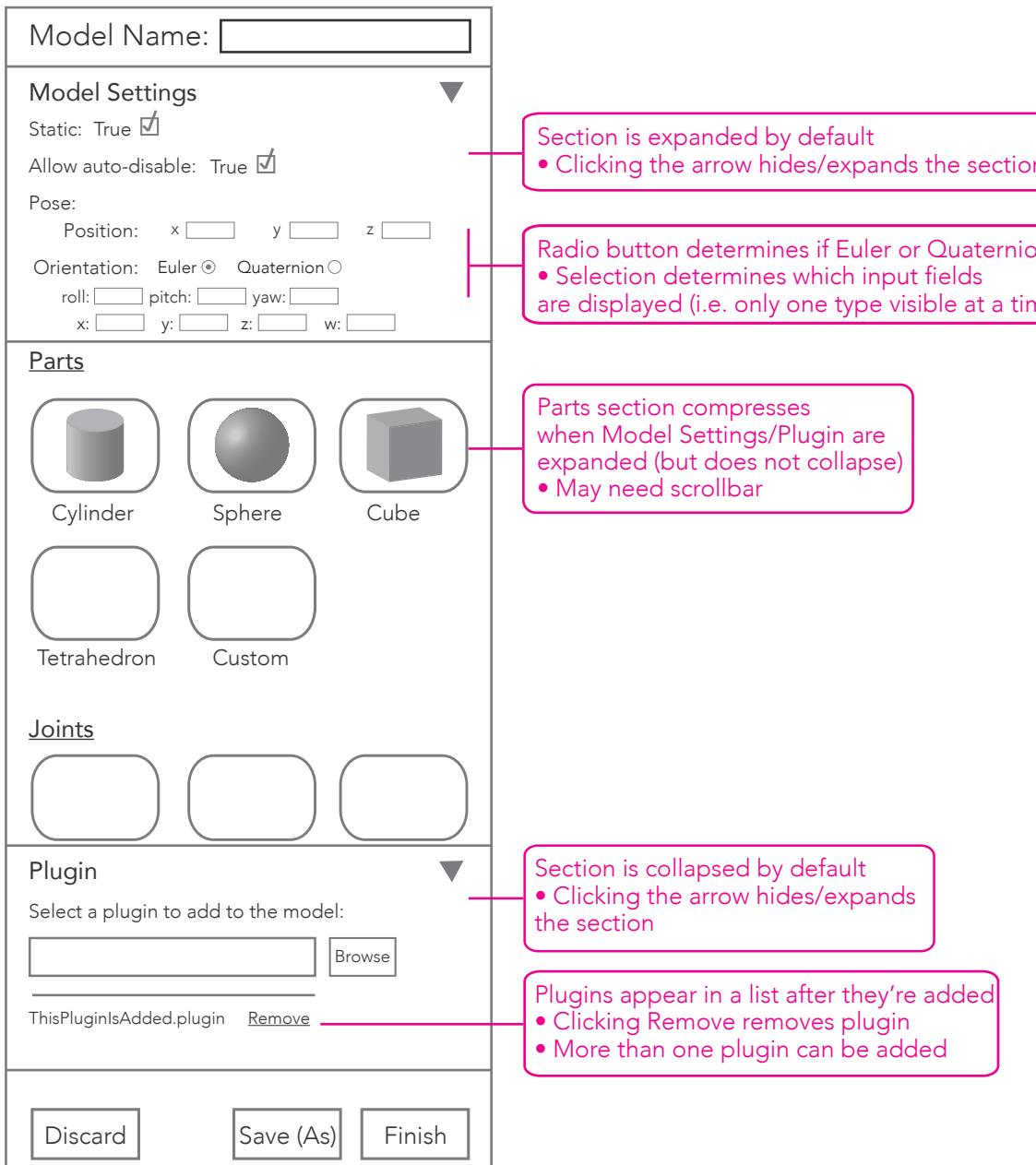
Double-clicking on a part opens that part's Inspector, and the same behavior goes for the joints. Joints are displayed in the corresponding color (see the color palette on a subsequent page). Hovering over a joint reveals the joint type.



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 and Plugin sections in the Palette.



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.

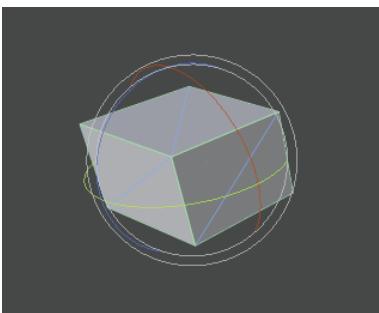
Direct Manipulation

The RTS direct manipulation interactions for 3D parts/models are different than the interactions with 2D objects like doors and windows in the Building Editor. Here, in the Model Editor, we use the more standard RTS controls found in other 3D modeling tools.

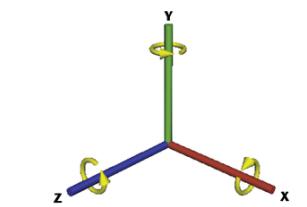
Rotate: 3D object (part) rotation is carried out by first clicking on the Rotate mode icon in the Toolbar.

Users can also press R on their keyboard to enter into Rotate mode.

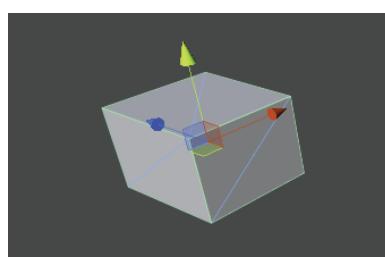
Colored circles appear around the part once it's clicked; clicking and dragging along these lines will rotate the part about the X, Y, and Z axes. Note: we will need to add in a color key so users know which circle represents each axis.



Screenshot from Unity



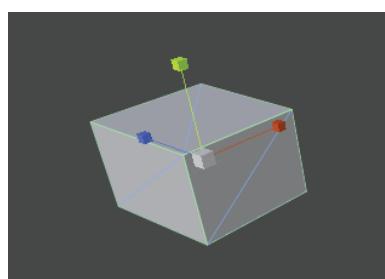
A similar key will be added to the bottom left of the 3D view.



Screenshot from Unity

Translate: To translate, users enter Translate mode in the Toolbar. Users can also press T on their keyboard to enter into Translate mode. 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

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 object's Inspector (by double-clicking on the object, or right-clicking and selecting Open Part Inspector from the menu). Edits in the Inspector should be immediately visible in the 3D View. The Inspector values update as changes are made in the 3D View, 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"/>
w:	<input type="text"/>

Cancel Ok

Changes in 3D View shown here. Changes here, conversely, are reflected in 3D view.

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

NOTE: Holding down Control when in Rotate or Translate mode will make both sets of markers appear as in MoveIt. If the user is in Rotate mode, the Translate controls will also appear, and vice versa. This is meant for power users and for those used to these combined interactive markers.

Model Editor Spec: Interactions (Part 2)

Documentation for the Model Editor tool. Annotations in pink.

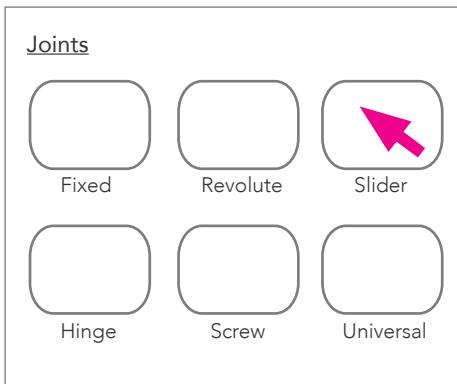
Create Joints

Adding Joints in 3D View

Joints can be added in the 3D view when both the parent and child parts are visible. See Part 3 for joint color assignments.

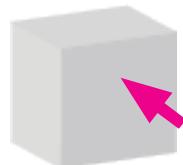
Step One

Click the desired joint icon in the Palette.



Step Two

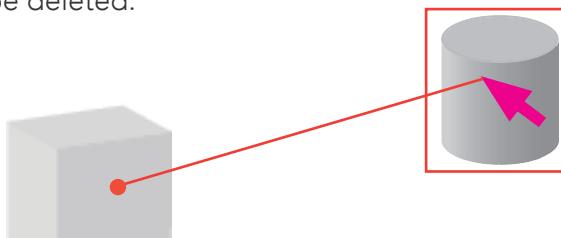
Click/release the Parent Part. A dot should appear that is the same color as the color assigned to that joint type.



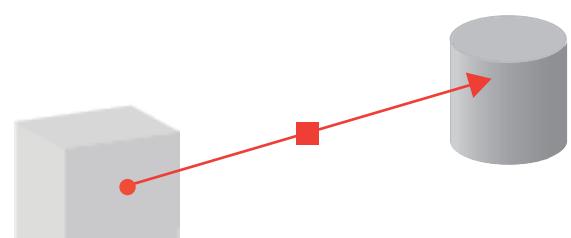
Step Three

Move 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 as though they had been selected (bounding box). Clicking/releasing the Child Part attaches the line (joint) to that part. Clicking 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

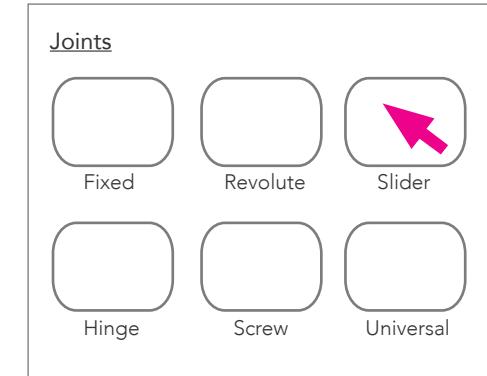
After the Parent and Child Parts are selected, the joint line has an arrowhead on the end connected to the Child Part, and a circle on the end attached to the Parent. A square in the middle represents the joint position.

Adding Joints in Graph

Joints can be added in the Graph when either or both of the parts are not visible. Note: these interactions may change depending on graph design.

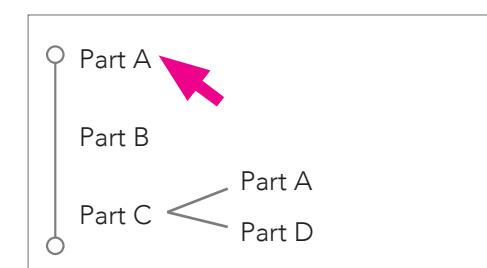
Step One

Click the desired joint icon in the Palette.



Step Two

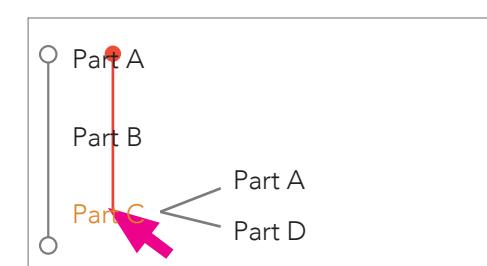
Click/release the Parent Part in the Graph.



Step Three

Move cursor to Child Part (in Graph). 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 as though they had been selected. Clicking/releasing the Child Part attaches the line (joint) to that part. Clicking 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.



Do we support attaching a part to the ground plane via joint? If so, how do we handle panning (clicking will attach the joint to the ground)?

After both Parent and Child are selected, the joint line has an arrowhead on the end connected to the Child part, and a circle on the end attached to the Parent. (This may change depending on how the graph is generated)

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 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

Blue

R: 81

G: 131

B: 145



Ball Joint

Pink

R: 228

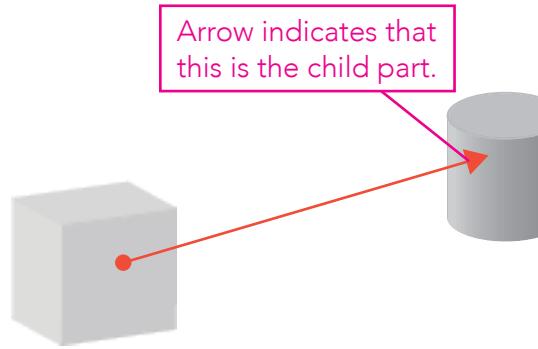
G: 75

B: 49



Moving Joints

Joints, by default, are anchored at the center of the part. Once placed, joints can only be moved by opening the Joint Inspector and editing the Position fields.



Arrow indicates that
this is the child part.

Future Feature

In 3D View, offer Exploded View toggle to see and manipulate parts/joints more easily.

Deleting Joints

Selecting the joint in the Graph and pressing Delete on the keyboard deletes the joint. (This may change depending on forthcoming graph design)

To delete a joint in the 3D View, users access the Joint Inspector, and select Remove next to the joint name. It can be hard to right- or double-click a joint line, so we may consider including Open Joint Inspector in the right-click menu whenever a user right-clicks within a certain distance of a joint.

Another option is to click the line (perhaps we widen the line's hot spot by a few pixels). The line should change color (white?), and users can then press Delete on their keyboard. This could be difficult with particularly small joints.

Model Editor Spec: Interactions (Part 4)

Documentation for the Model Editor tool. Annotations in pink.

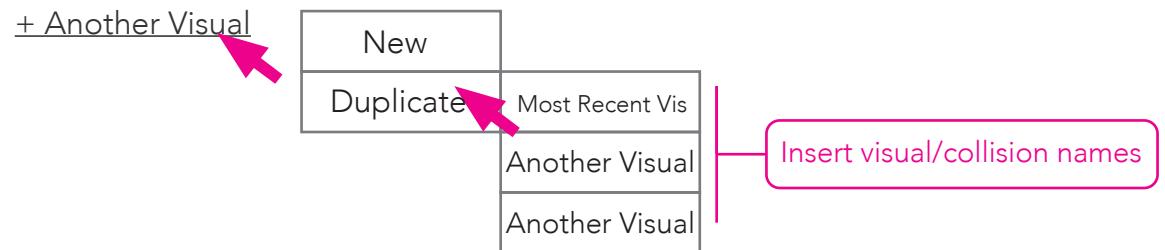
"+ Another Visual/Collision" Interaction for Part Editor

The Visual and Collision Part Editors have the option to + Another Visual/Collision. When adding a second visual/collision to a Part, users may want to duplicate a previous visual/collision. Clicking + Another X should cause a flyout menu to appear to the right of the link.

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 created for other parts in the same model.



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 3D View and 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?

- 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

- Uploaded file is viewable and manipulatable in 3D View 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 Model Database 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 Model Database website, with the Model name pre-filled (along with anything else that we can pre-fill)

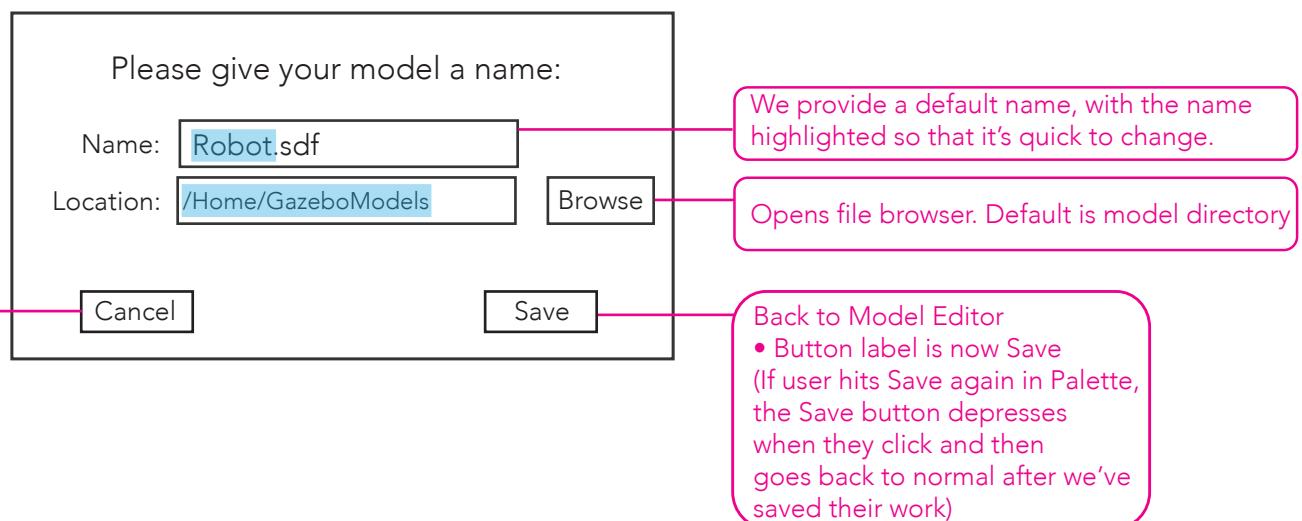
Selecting Finish takes user back to regular Gazebo mode, and the new model is in the world, in the location they built it in. The new model is also now in the Insert list.
• If they checked Contribute, see above.

Model Editor Spec: Palette Popups (Part 2)

Documentation for the Model Editor tool. Annotations in pink.

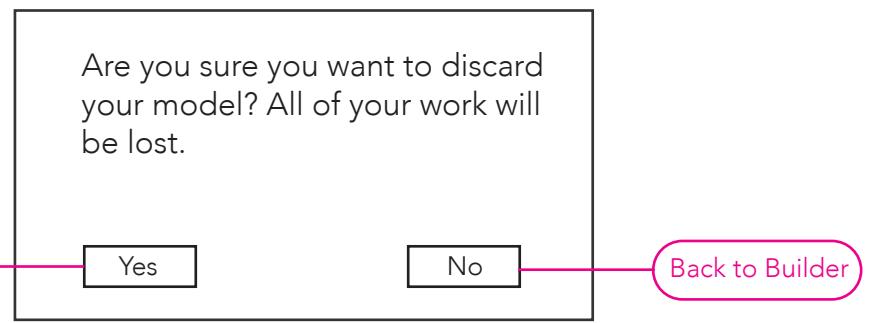
#4 Save As Popup

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.



#5 Discard Popup

If user presses Discard in Palette.



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 :)

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

Part Name: Robot Torso

General Visual Collision Sensor Attach Model

Gravity: True

Self-Collide: True

Kinematic: True

Position:

Inertial:

Cancel Restore Defaults Ok

Potential spot for instruction/hints

Pop-up warning if user has made changes

restores defaults after confirmation

Saves and closes

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

Part Name: Robot Torso

General Visual Collision Sensor Attach Model

Position: x: y: z:

Visual Name: Visual Two

Geometry: custom.obj

Transparency:

Material:

Position: Euler Quaternion

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

+ Another Visual

Cancel Restore Defaults Ok

Once more than one visual exists, they are divided by a thin, gray line. Scroll bar appears.

Include Euler/Quaternion orientation, as well

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

#2 Part Inspector: Visual tab 2

Default name is assigned to each element

Include Euler/Quaternion orientation, as well

Part Name: Robot Torso

General Visual Collision Sensor Attach Model

Visual Name: Visual One

Geometry: Geometry

Transparency:

Material:

Position: x: y: z:

+ Another Visual

Cancel Restore Defaults Ok

Only appears if there is >1 visual. Deletes visual, after pop-up confirmation

dropdown options

See Interactions Part 4 for details

Geometry ▼

Geometry 1

Geometry 2

Geometry 3

Upload Custom

Standard pop-up to upload a file

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 Quaternion

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

Laser Retro: []

Surface Bounce: [] ▾

Surface Friction: [] ▾

+ Another Collision

Remove Same as: Visual 1

Ok Cancel Restore Defaults

#6 Part Inspector: Sensor Tab 2

Part Name: Robot Torso

General → Visual → Collision → Sensor → Attach Model

Sensor Name: Sensor One

Type: Camera ▾

Position: Euler Quaternion

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

Visualize: True

Always On: True

Topic Name: []

Plugin: [] Browse

ThisPluginIsAdded.plugin Remove

+ Another Sensor

Ok Cancel Restore Defaults

#5 Part Inspector: Sensor Tab 1

Part Name: Robot Torso

General → Visual → Collision → Sensor → Attach Model

Add a Sensor

Ok Cancel Restore Defaults

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

Either Euler *or* Quaternion appear, not both

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.

Can any model from database be attached?
• Dropdown?

We fill in default pose at top of part

#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 Quaternion

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

Attach

Ok Cancel Restore Defaults

After model is attached, see #9 Part Editor: Attach Model 2

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

Model Editor Spec: Part Inspector (Part 3)

Documentation for the Model Editor tool. Annotations in pink.

#8 Part Inspector: Attach Model 2

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

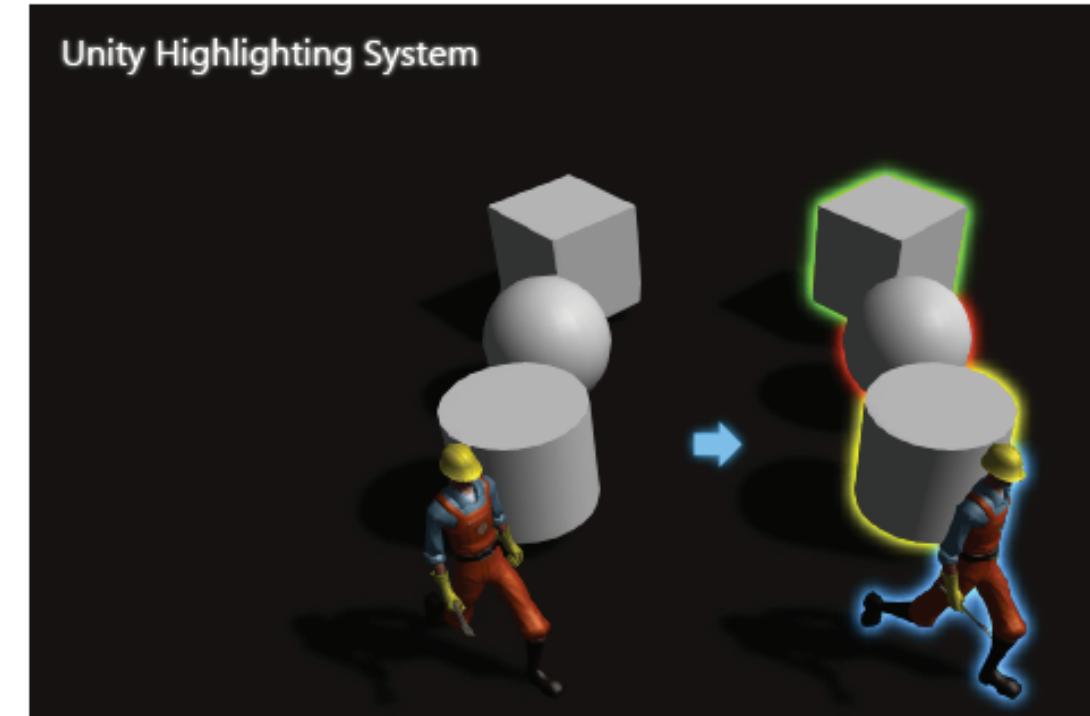
Attach

Cancel Restore Defaults Ok

Annotations:

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

Type: Revolute

Parent Part: Robot Torso

Child Part: Left arm

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

Thread Pitch: []

Axis:

Axis2:

Physics: ODE

Fudge Factor: []

CFM: []

Cancel Restore Defaults Ok

Annotations:

- 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.