

FreeForm Workflow Study “The Frog”



Artist: Mike Rockwood – Product Specialist, SensAble Technologies

Description: this workflow study shows how to create a sculpted toy using FreeForm V2 in conjunction with prismatic engineering data: either existing legacy data or specific engineering CAD data.

Software Version: FreeForm[™] modeling system, Version 2

Copyright 2000, SensAble Technologies, Inc. All rights reserved. FreeForm, “From Mind into Matter,” and SensAble are trademarks of SensAble Technologies, Inc. All other trademarks are trademarks of their respective holders.

FreeForm Workflow Study – The Frog

Before beginning, mention that most designs start with a simple sketch, which describes the concept being explored. In this case, it is a frog riding a tricycle. As described above, the tricycle is prismatic engineering data. The frog will be sculpted in relation to this data. Open the file “original_frog.jpg” and point out that this is the original design concept for the frog.

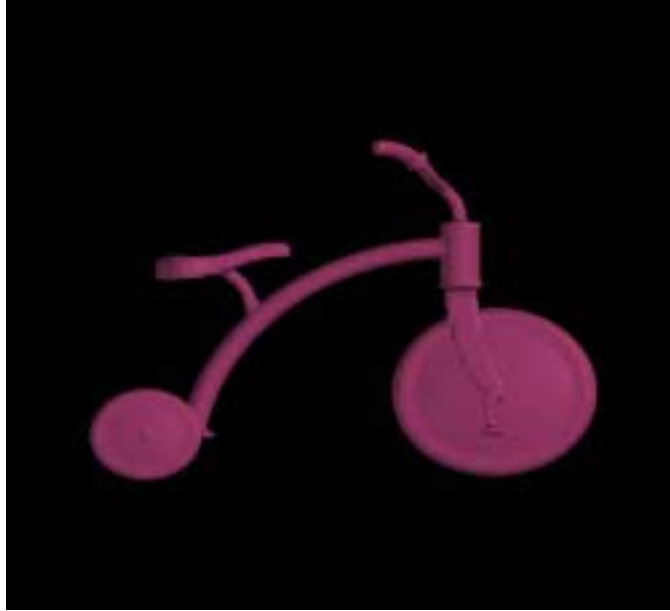


Next, open the file “frog1.jpg.” Explain that this is the completed sculpt using FreeForm. Compare the concept sketch to the finished model.



FreeForm Workflow Study – The Frog

Start the FreeForm software and import the file "tricycle.stl" as a Buck with the clay coarseness set to "Refine Shape." Mention that the file was exported from a traditional CAD program: Pro/E in this case.



Next, load the file "frog_side.bmp" as a Reference Image. Position and scale the image so that it fits exactly over the tricycle as shown below.

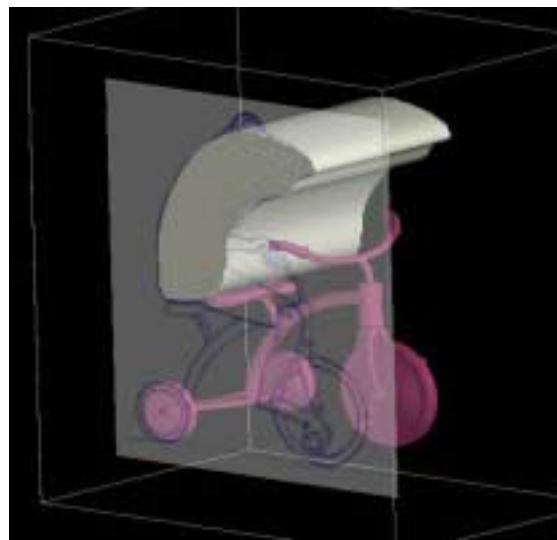


FreeForm Workflow Study – The Frog

Resize the Work Area in order to include enough space around the frog in the reference image. Specifically, add enough space at the top to accommodate the frog's head (Y2 is the side to be moved).

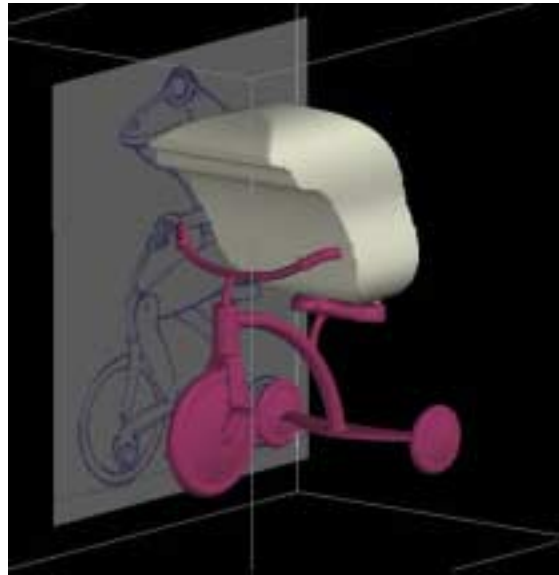


Using Wire Cut, trace around the frog's body as shown and make the extrusion. When completed, compare the extrusion to a traditional wire cut made in foam.

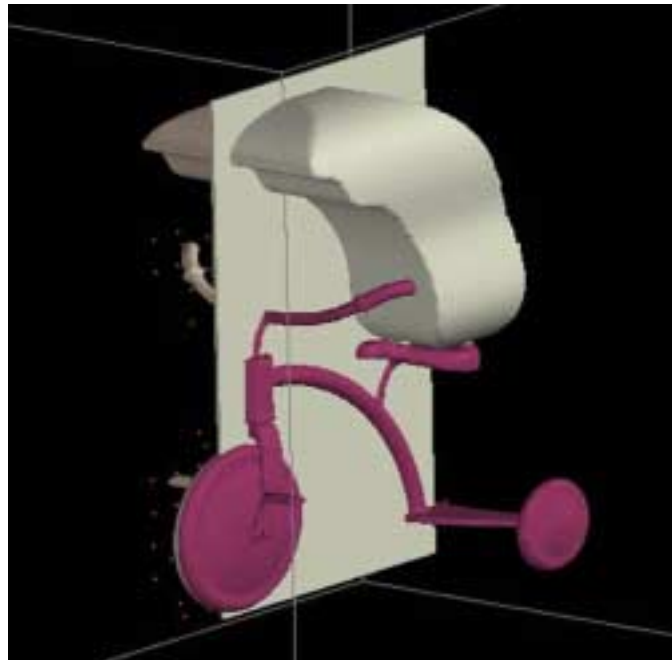


FreeForm Workflow Study – The Frog

Next, make a new cut. Reorient the planes to cut the front profile of the frog's body. To do this, import the sketch "front_profile.skh" onto the plane and make the cut.

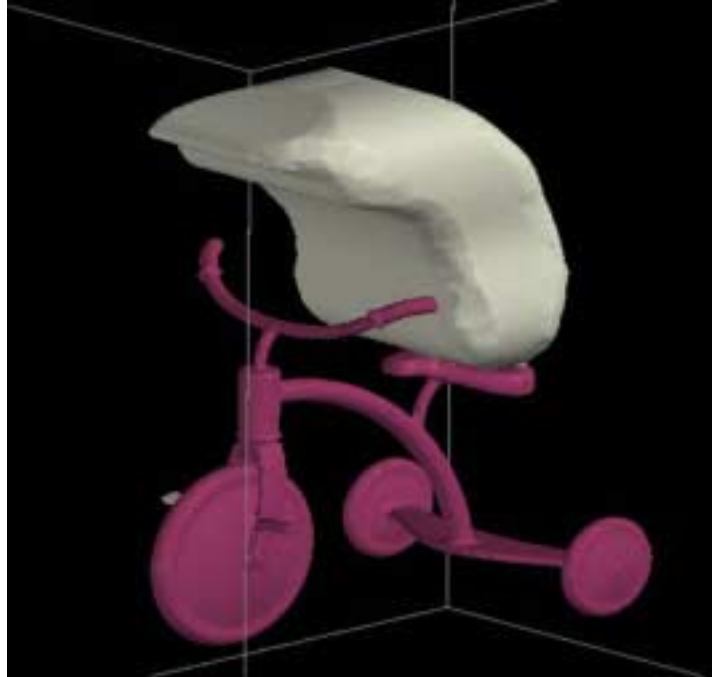


Mirror the model along the centerline, or z-axis. Make sure you mirror the right-hand side of the model to the left. Explain how the Mirror Tool works and highlight its advantages.

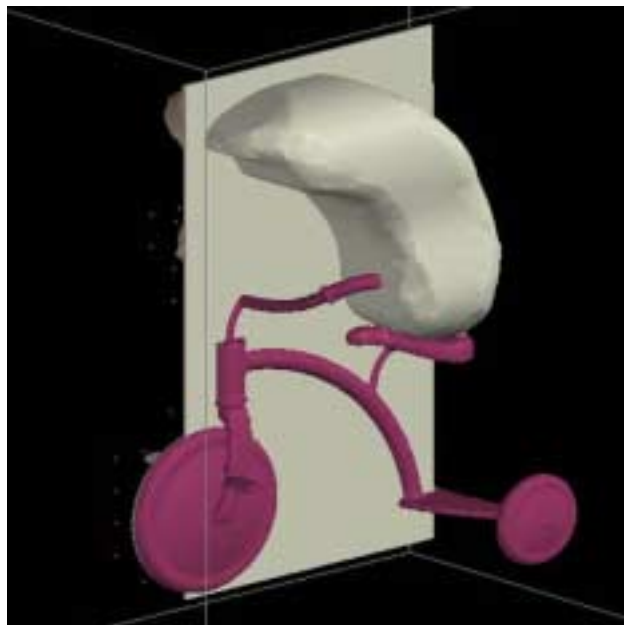


FreeForm Workflow Study – The Frog

Once the body has been “blocked in,” start removing the sharp corners with a carving tool such as the Scraper. Explain all aspects of the carving: tool shapes shelf, custom tools, etc.

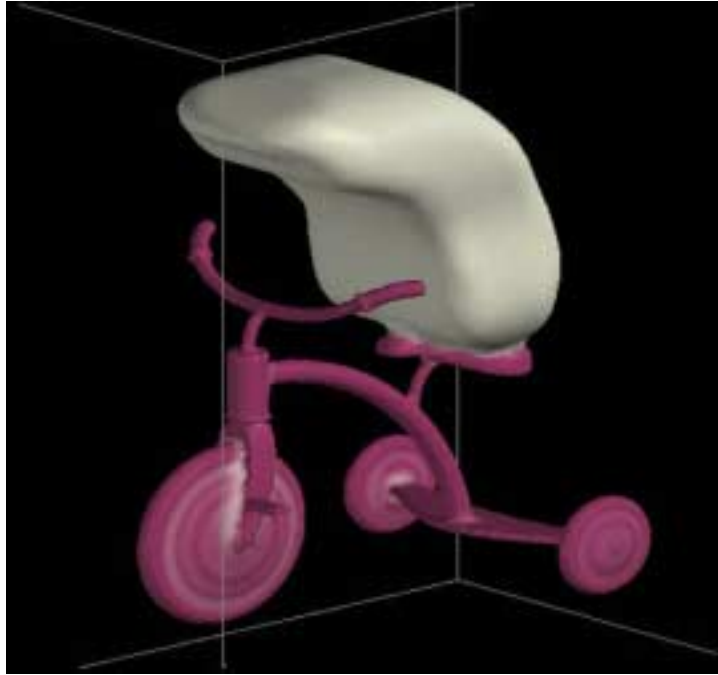


Mirror the model again and demonstrate how the model can be carved while in Mirror mode.



FreeForm Workflow Study – The Frog

Smooth the entire model using Smooth Area with the smooth level slider set all the way to the right (very aggressive).



Reorient the model to match the side view, as illustrated below. Select the Carve with Ball tool and click the Work from Inside button. Lift out a structure to create an eye.

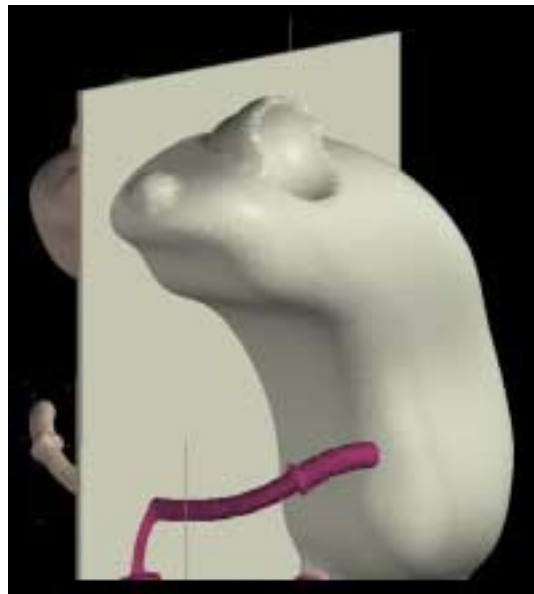


FreeForm Workflow Study – The Frog

With the tool size the same, toggle back to Work from Outside and carve an eye socket.

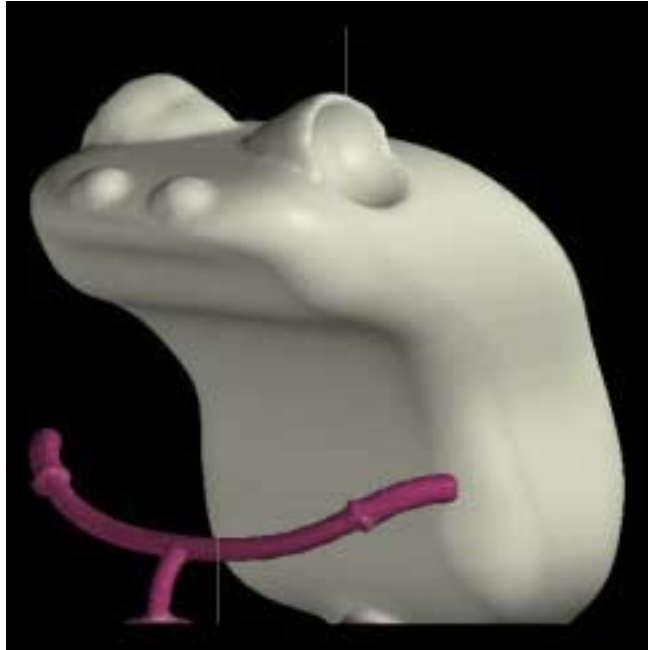


Next, decrease the size of the Ball Tool. Toggle back to Work from Inside and lift out a nose as shown below. Mirror the model again.

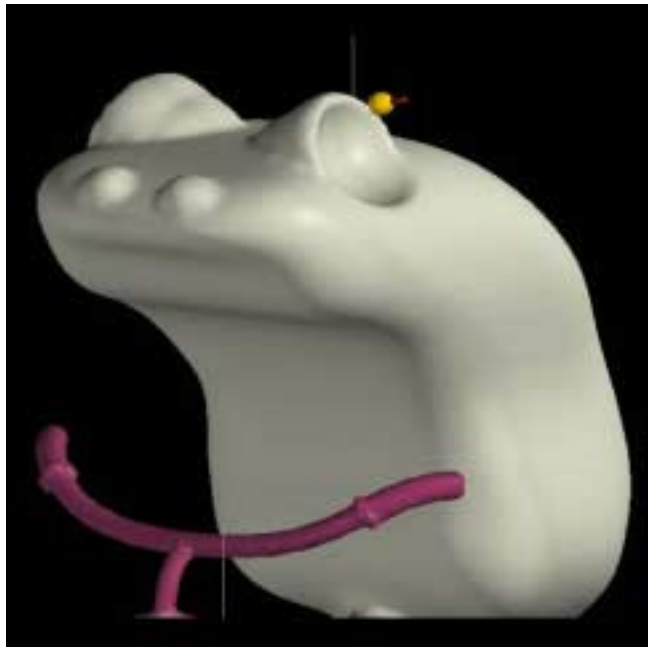


FreeForm Workflow Study – The Frog

At this point, Change Clay Coarseness one level to Add Detail.



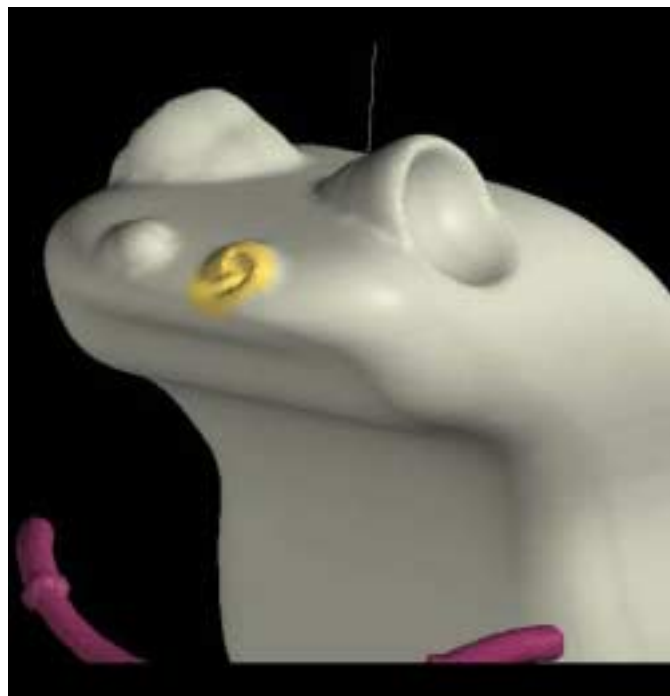
Use the Smooth Tool to clean the eyelid.



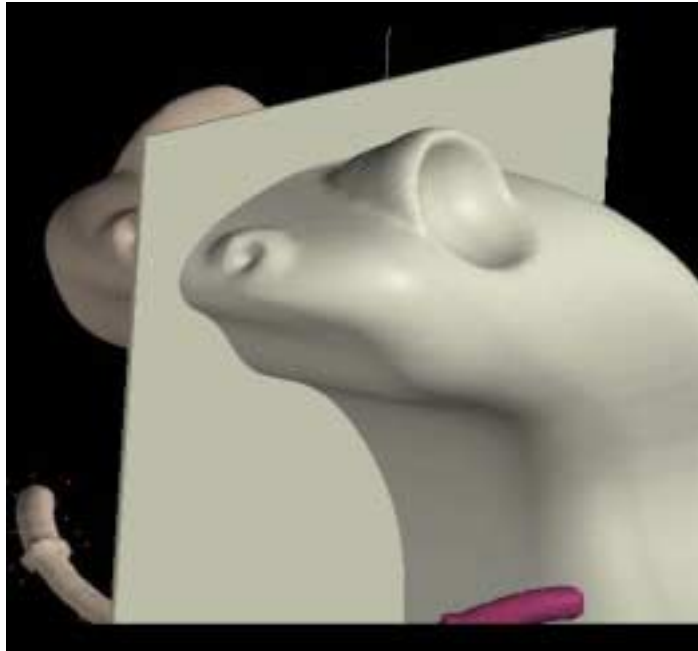
Using the Ball Tool, set to Work from Outside, carve a nostril as shown.



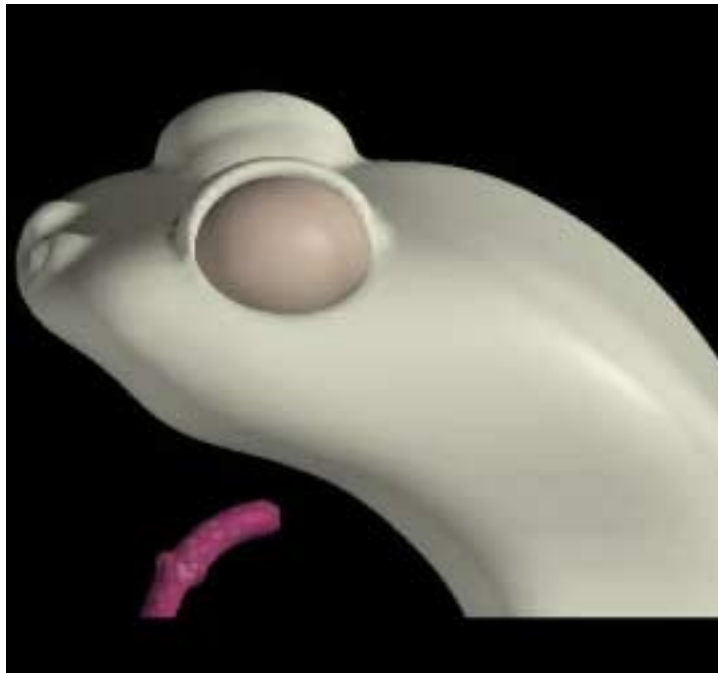
Using Smooth Area, paint the region around the nostril and smooth it with the level set in the middle of the range.



Mirror the model.

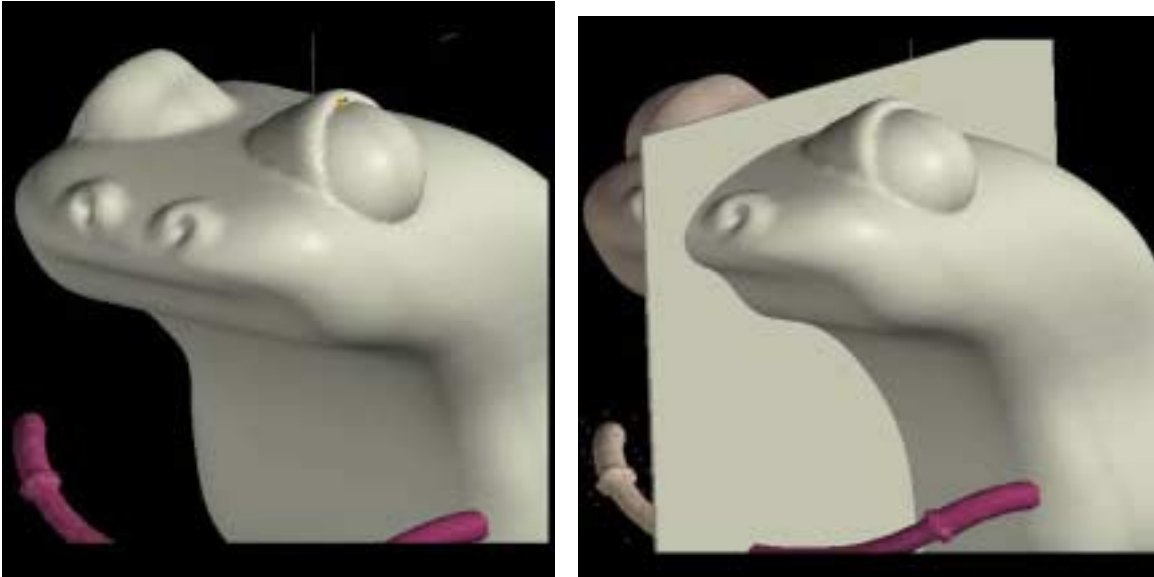


Use Add Clay to plop a precisely-sized eye into the socket as shown below.

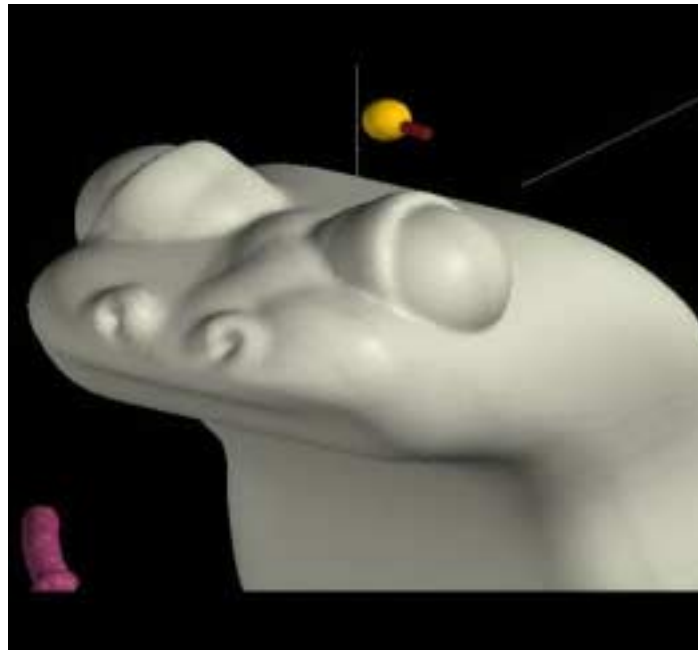


FreeForm Workflow Study – The Frog

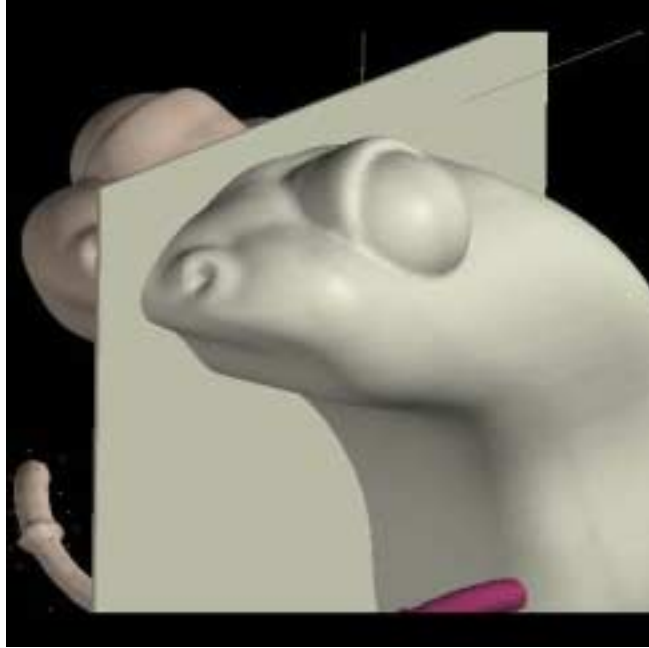
Use Smooth to blend the crease between eyelid and eyeball and then mirror the model.



Select the Smudge Tool and set it to Work from Inside. Create ridges between the eyes. Remember to explain the differences between Smudge and Carve.



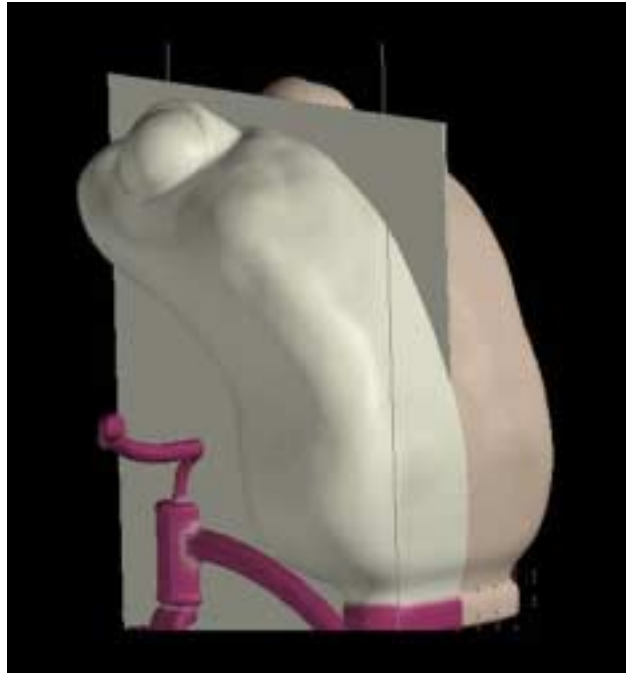
Mirror the model.



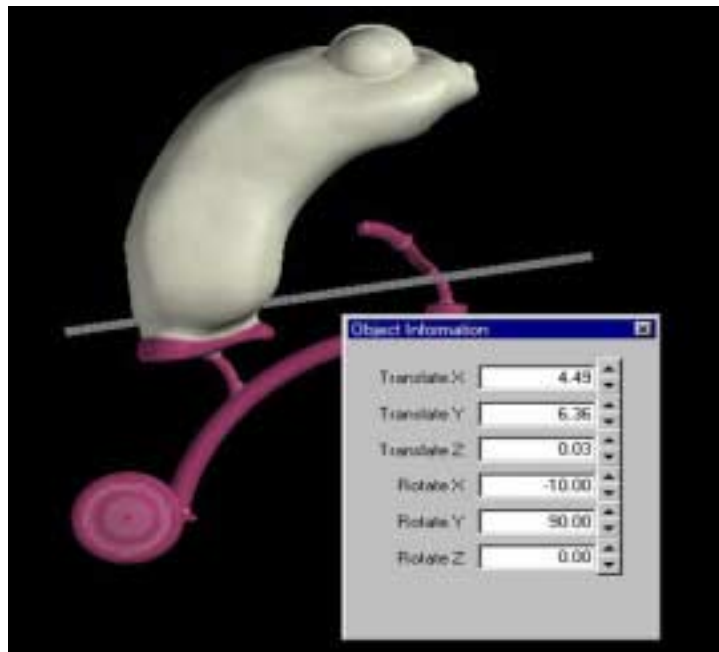
Rotate the model to view the back of the frog. Using the Attract tool, lift up the areas in the back, cheek, and side to make muscles. At this point, describe the differences of the Attract tool.



Again, mirror the model.



Now, select Wire Cut and orient the planes to cut the front view. Bring up the sketch plane's Object Information dialog box, accessed by clicking the “Advanced” arrow button on the Dynabar. Looking at the model from the side, rotate the planes ten degrees in the x-axis by typing in the field. Doing so will ensure a better cut for the lips.



FreeForm Workflow Study – The Frog

Switch your view back to the front and sketch the curves for the mouth. Deboss the sketch using the default depth setting.



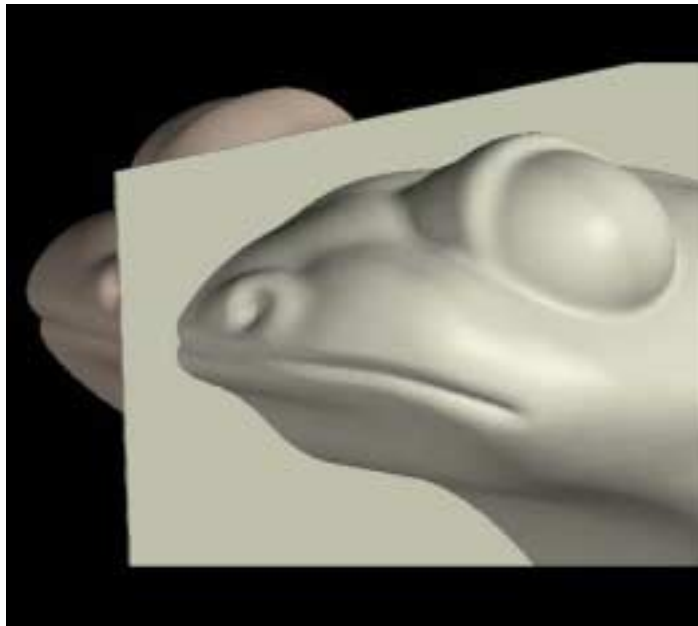
Below is the mouth after the Deboss operation.



Smooth the debossed lips into the face as shown.

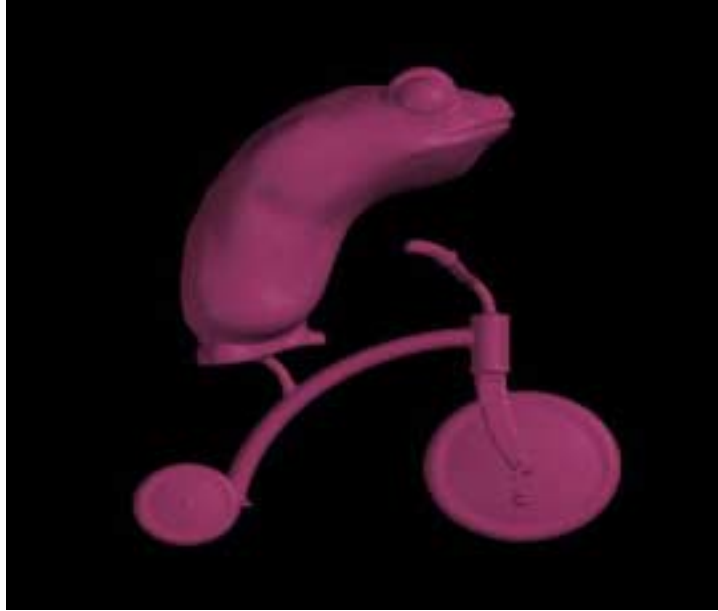


Mirror the model.

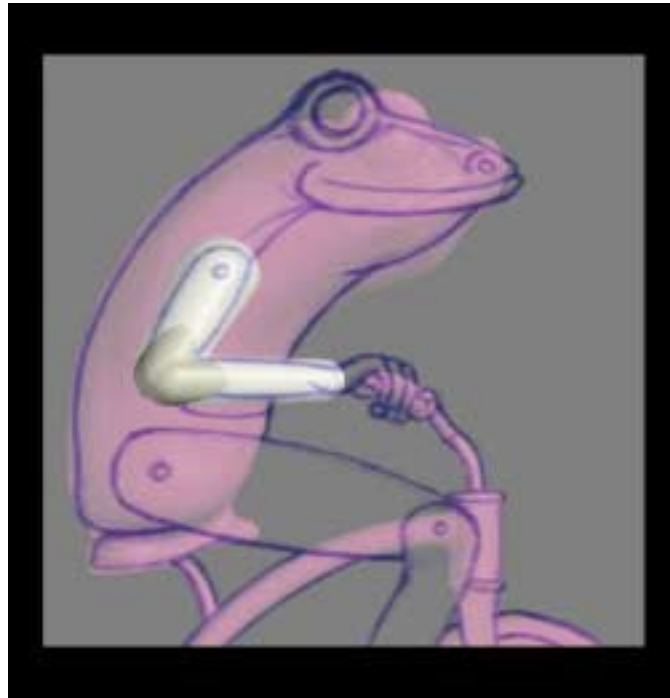


FreeForm Workflow Study – The Frog

At this time, mention that the body of the frog is essentially finished. Also, describe how the model will be exported as an .stl file and then re-imported as a Buck in order to create the arms and the legs. Import the file called “frogbody.stl” as a Buck with the clay coarseness set to Add Detail. Import the Reference Image again and position as before.

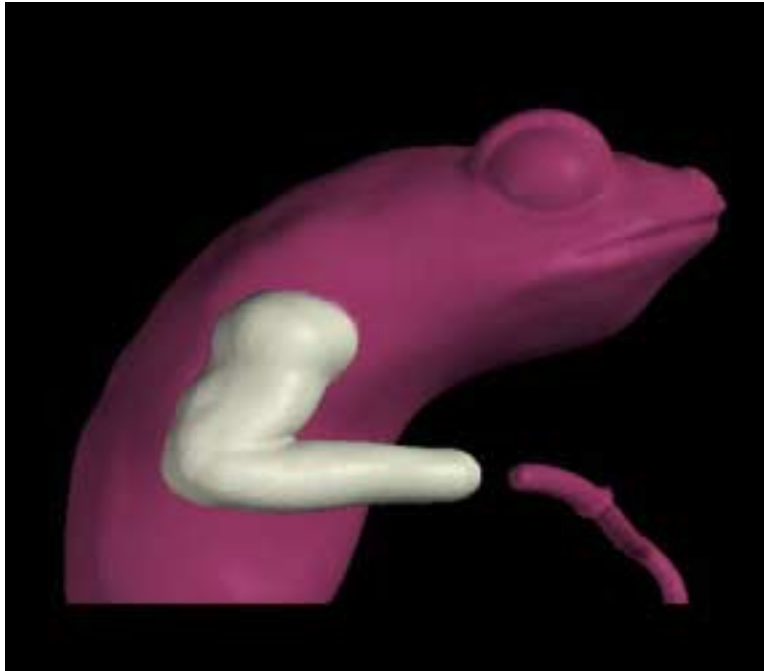


With the Reference Image lined up, create the arm using Add Clay with the Connect button checked. Use the Side View to help precisely position clay being added.

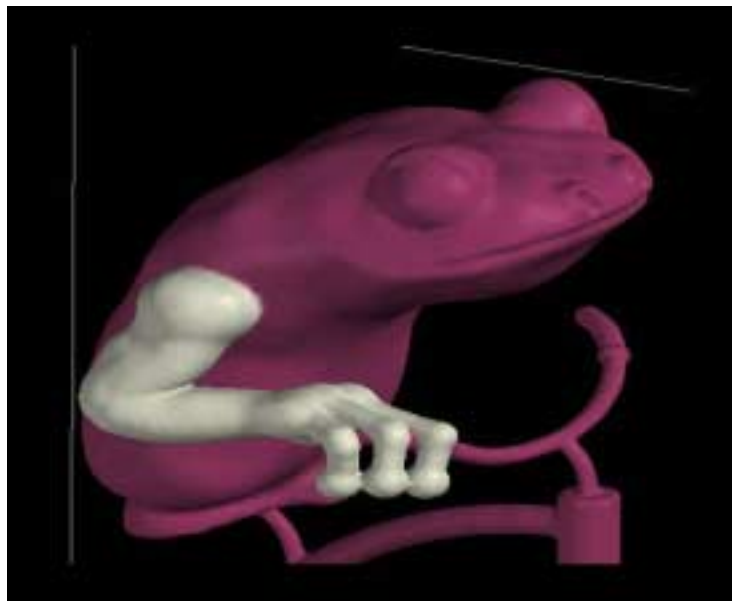


FreeForm Workflow Study – The Frog

Using the Smudge Tool, toggled to Work from Inside, lift up the muscles in the arm.

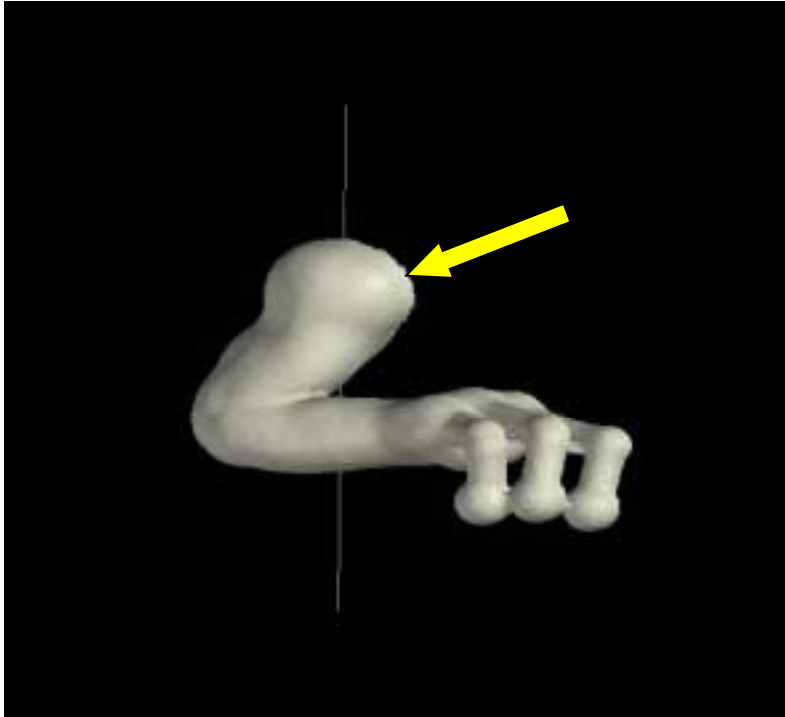


Next, create the hand and fingers using Add Clay, again with the Connect box checked. Use Smooth to blend the hand and fingers.

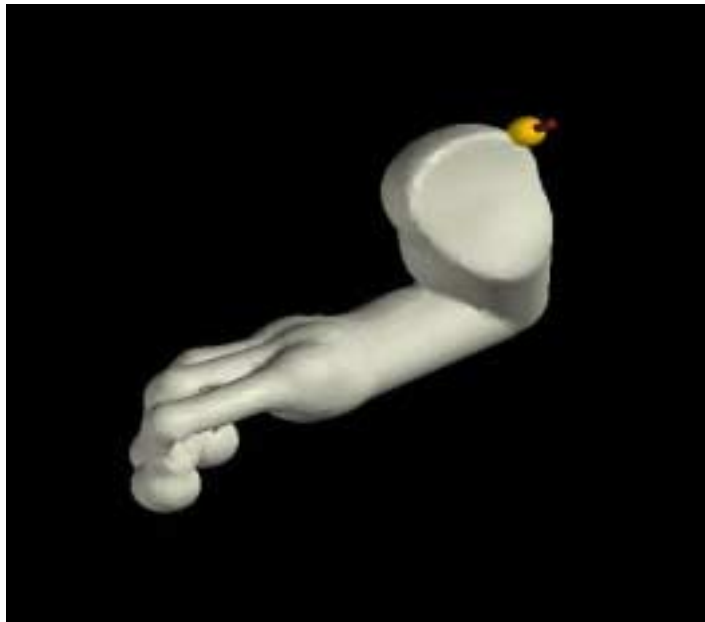


FreeForm Workflow Study – The Frog

Once the arm is complete, delete the Buck with the Delete Buck command. Show how the newly created arm is left, with a sharp interface with where the body was.

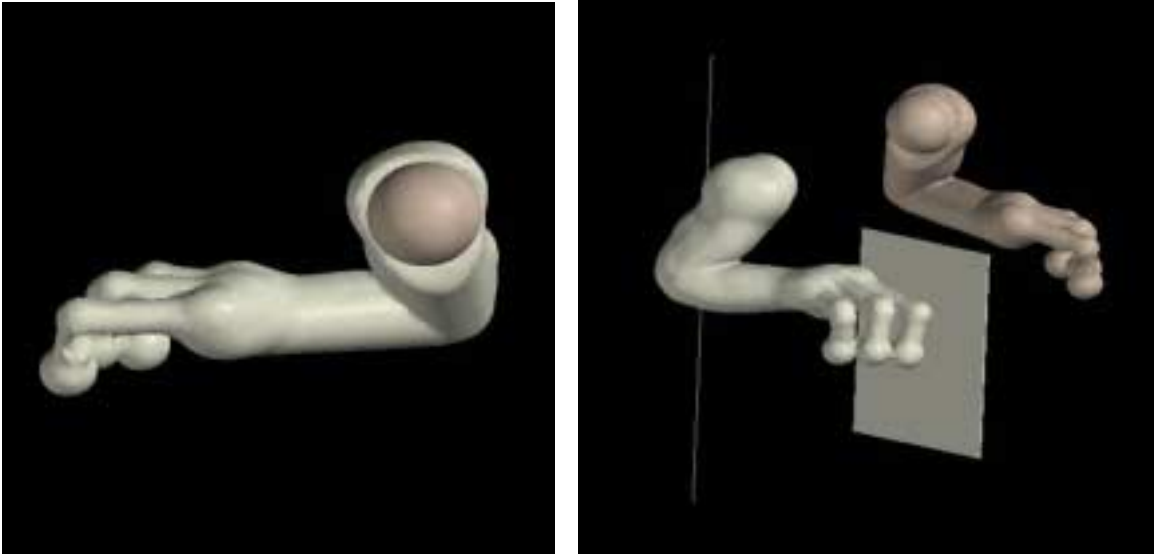


Smooth the interface where the arm will meet the body, as shown.

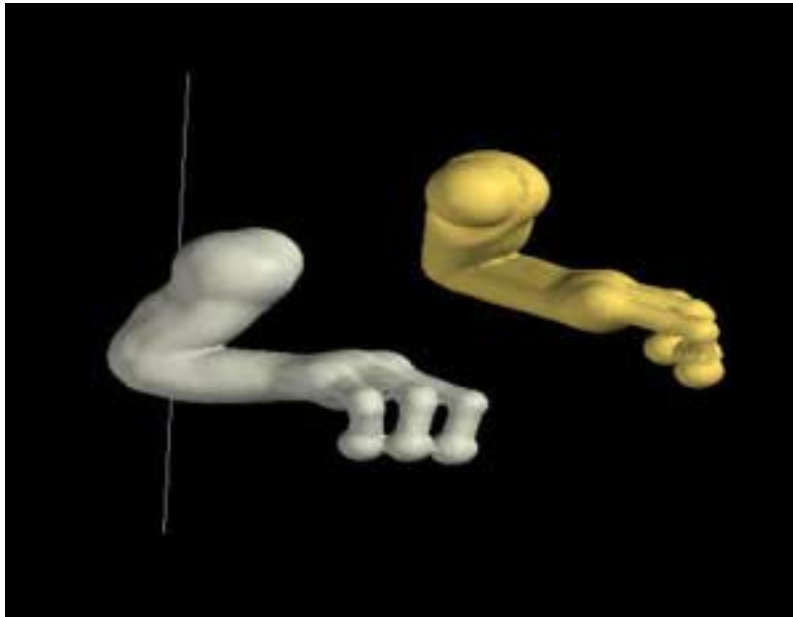


FreeForm Workflow Study – The Frog

Next, create a ball socket for the arm using Add Clay Then Mirror the model to create the left arm.

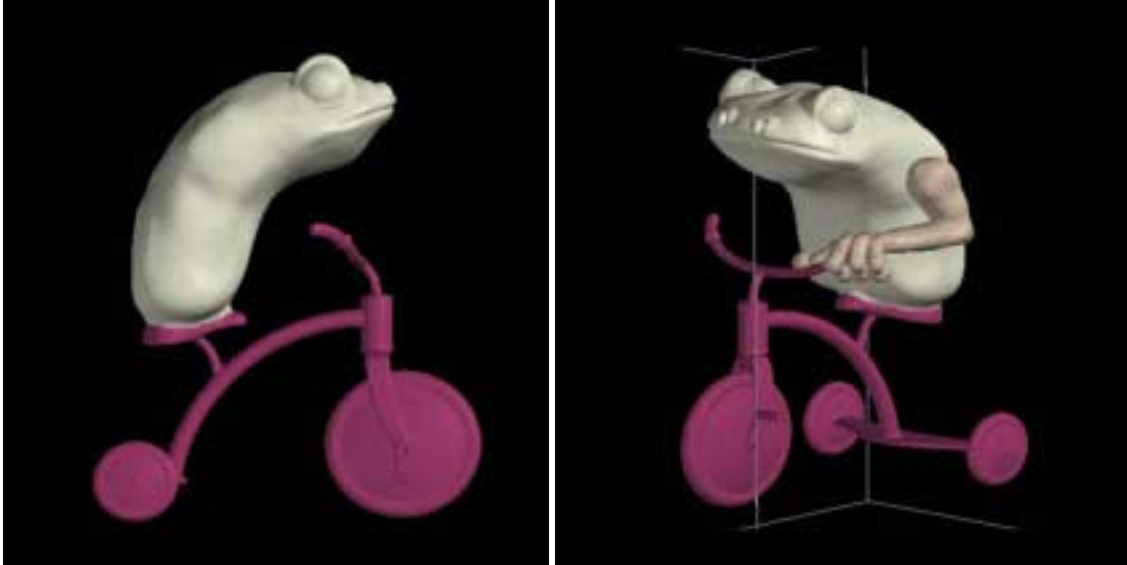


Select the left arm and show how to Paste to File to make individual parts. At this point, mention that the legs were created using the same techniques.



FreeForm Workflow Study – The Frog

Load the file “frog_body.cly.” Demonstrate how to bring the arms in using Paste from File. Bring in the “left_arm.cly” file as shown below but DO NOT merge it yet.

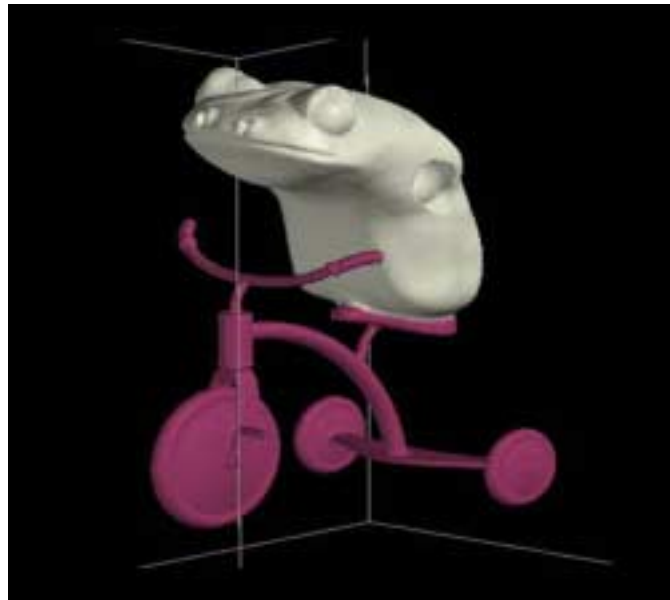


Explain how the arm ball socket of the arm piece is penetrating the body. Show how the overlap can be removed by checking the Subtract radio button from the Dynabar and then clicking Merge.



FreeForm Workflow Study – The Frog

The result is shown below. Mention that each of the separate parts (two arms and two legs) will be brought in and subtracted this way to create a body with ball sockets that match the limbs. Mention that the body is now ready to be produced on a rapid prototype machine.



This concludes the demonstration. Show the completed frog by opening the file “frogfinished.cly.”

