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F E E L T H E D I F F E R E N C E

FreeForm Modeling Workflow Study “Creating smooth blends and sharp creases in V3”



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Description: This technique study shows how to use separate pieces in a model to create smooth blends and sharp creases.

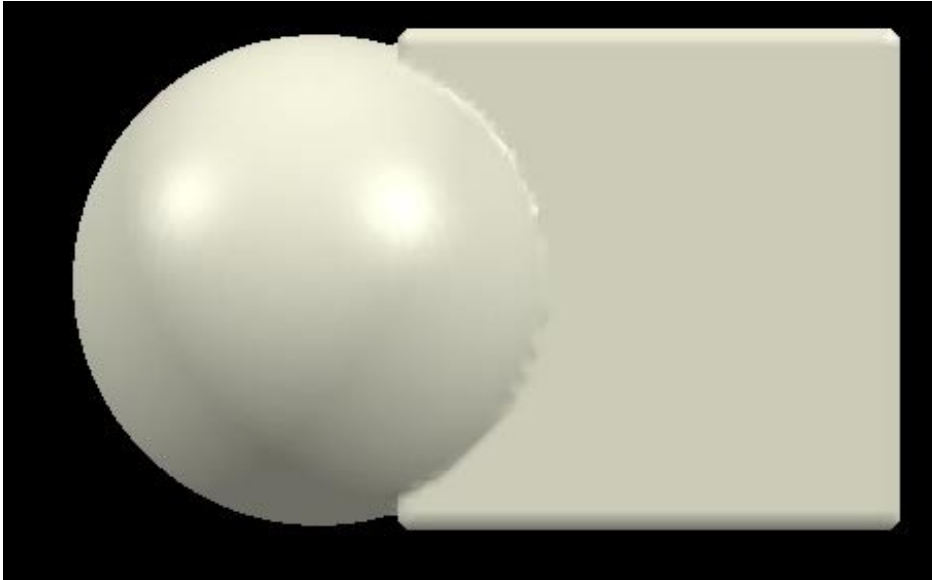
Software Version: FreeForm Modeling System, version 3

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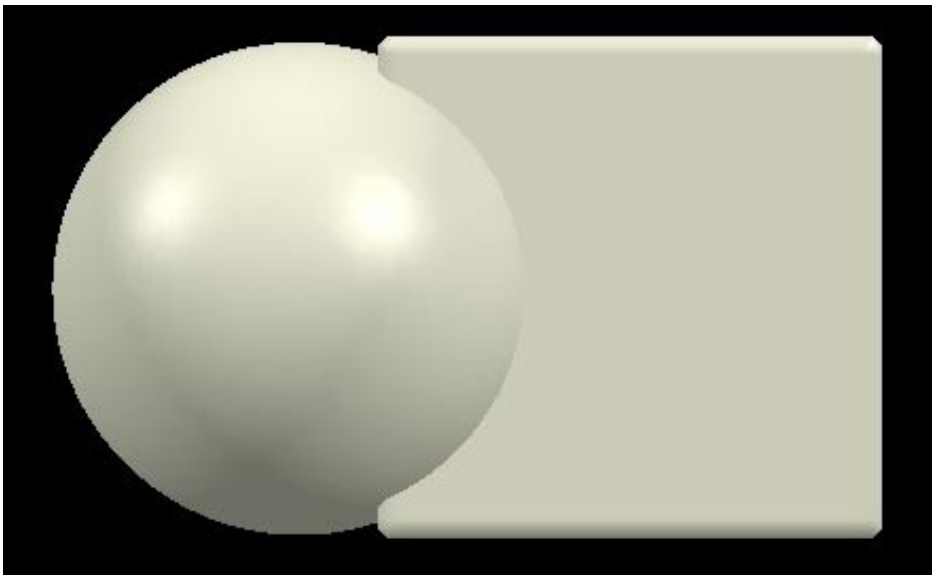
Sharp Creases

Here's a quick demonstration of sharp intersections between forms.

1. Default size cube and sphere combined into one object at 4mm clay coarseness.



2. Cube and sphere as separate objects at 4mm with parts colored the same using Paint tool.



Most RP systems will accept and successfully print multiple object parts as one solid piece, so for final RP workflows no merging is needed and intersections remain sharp at low resolutions.

To illustrate further, here is an example of an eyeball that was created with a sphere. The eyelid was modeled as a separate piece around the sphere and not merged.

1. Eye model consisting of eyeball sphere and separate surrounding eyelid and skin.



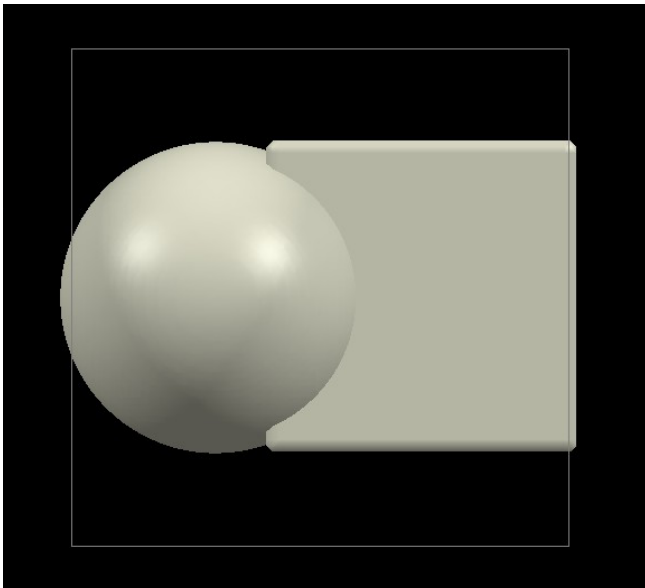
2. Eye model merged with eyelid and skin as one piece at a fine clay coarseness. Note the filling in of the crease between the eyelid and eyeball in this version.



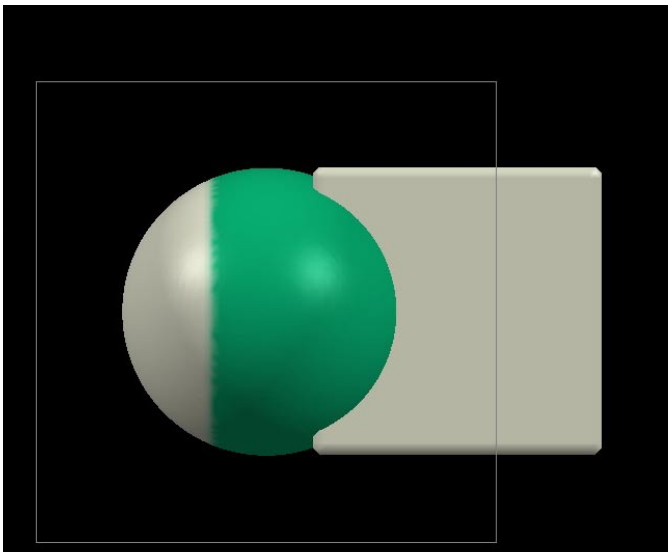
Smooth Blends

Let's take this one step further. Say you want to blend between two precisely created objects without compromising the integrity of either object. Merging and smoothing as one piece will immediately compromise the integrity of both objects. So, let's maintain each object as they are and create a third object that creates a transition between the original two.

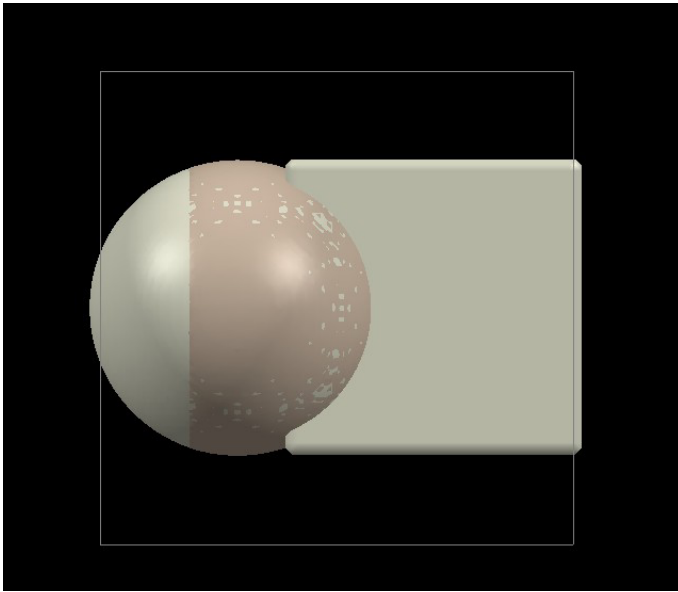
1. New (3rd) "empty" workspace created and repositioned to encapsulate the intersecting region of two original objects. Third piece renamed "Blend."



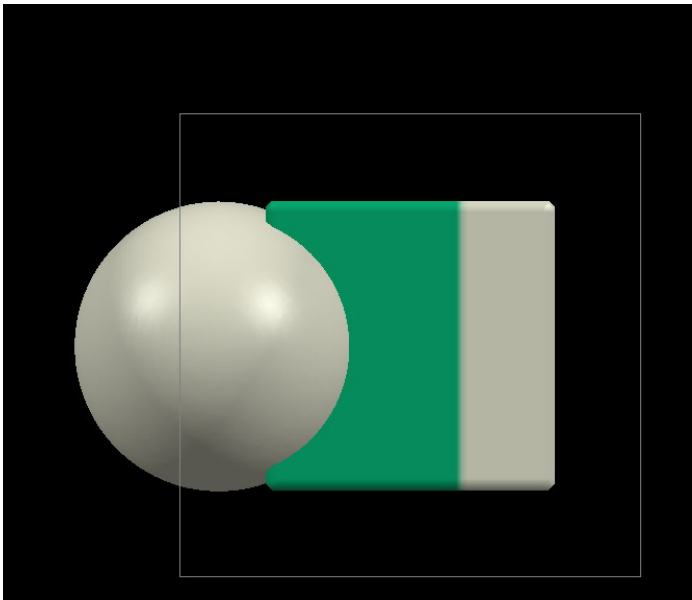
2. Intersecting region of sphere "Piece 1" selected and copied.



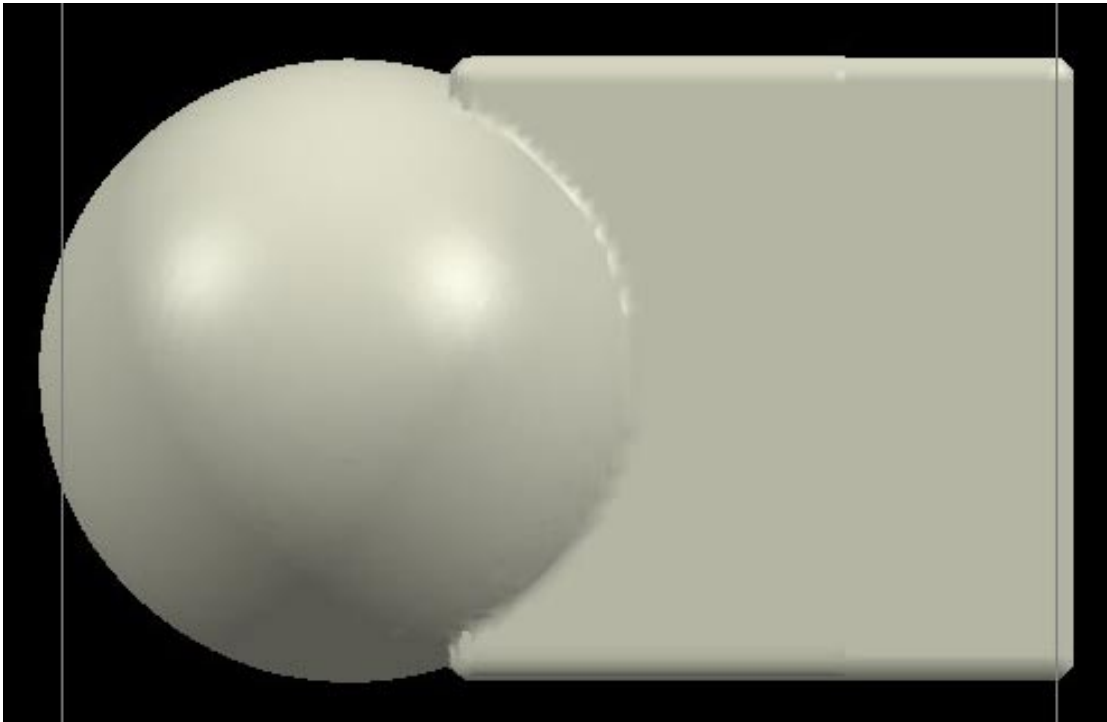
3. Intersecting region of sphere pasted into third workspace.



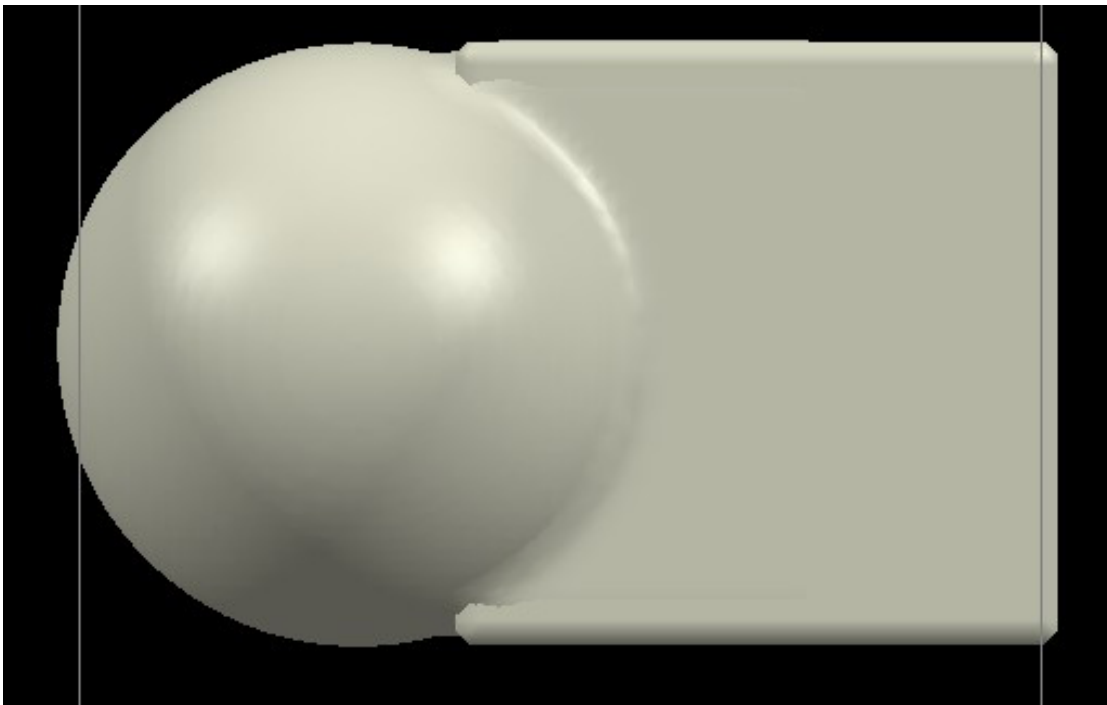
3. Intersecting region of cube "Piece 2" selected and copied.



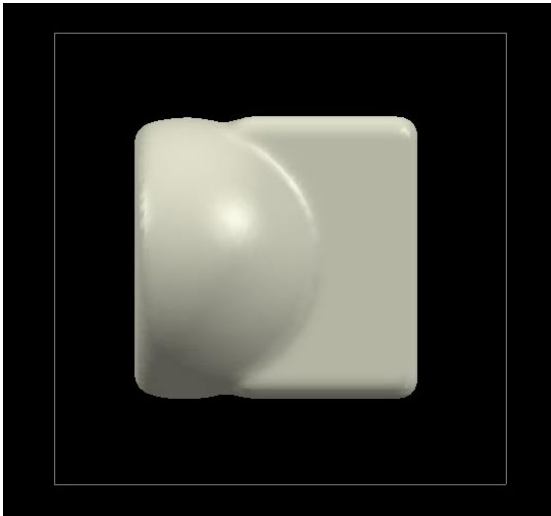
4. Intersecting region of cube pasted into third workspace. Notice that a transition is created between the two forms when merging cube intersecting region to sphere intersecting region in third workspace.



5. Smooth all applied at a medium range to third object – renamed “Blend”.



6. Sphere and cube hidden to reveal blend piece

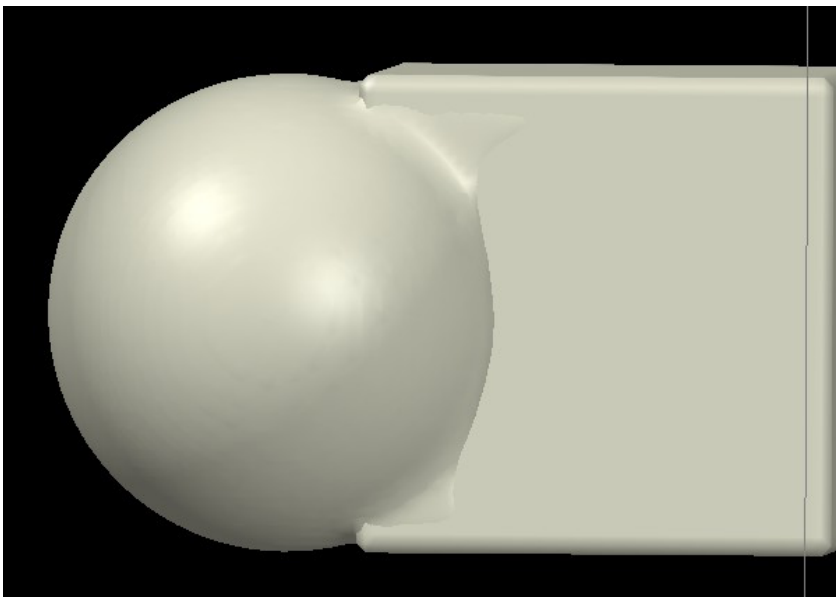


Now we have a smooth blend between two precise forms but have retained the integrity of the original two objects. For RP purposes, printing all as one part is possible.

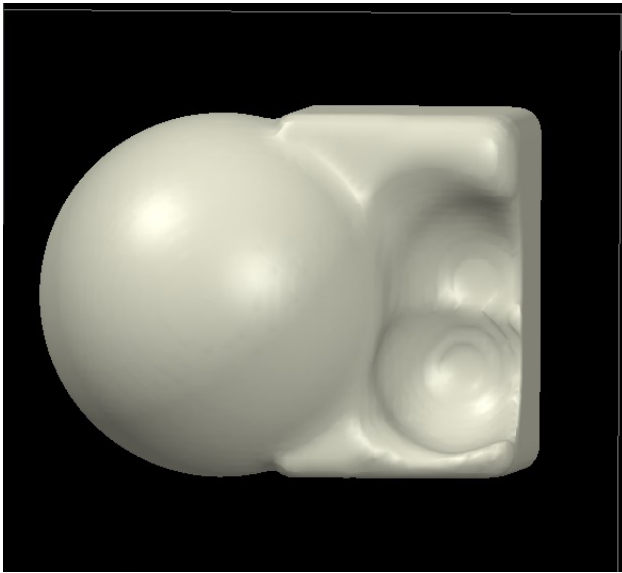
Sharp Creases and Smooth Blends Combined

Let's go the last mile and say that along with the smooth transition between parts, there needs to be a sharp crease as well. Simply combine the blend piece with one of the objects, in this case the sphere, and carve away the "Blend/sphere combined part" where the crease is desired between the sphere and cube.

1. Image of combined blend and sphere carved away to create crease between sphere and cube.



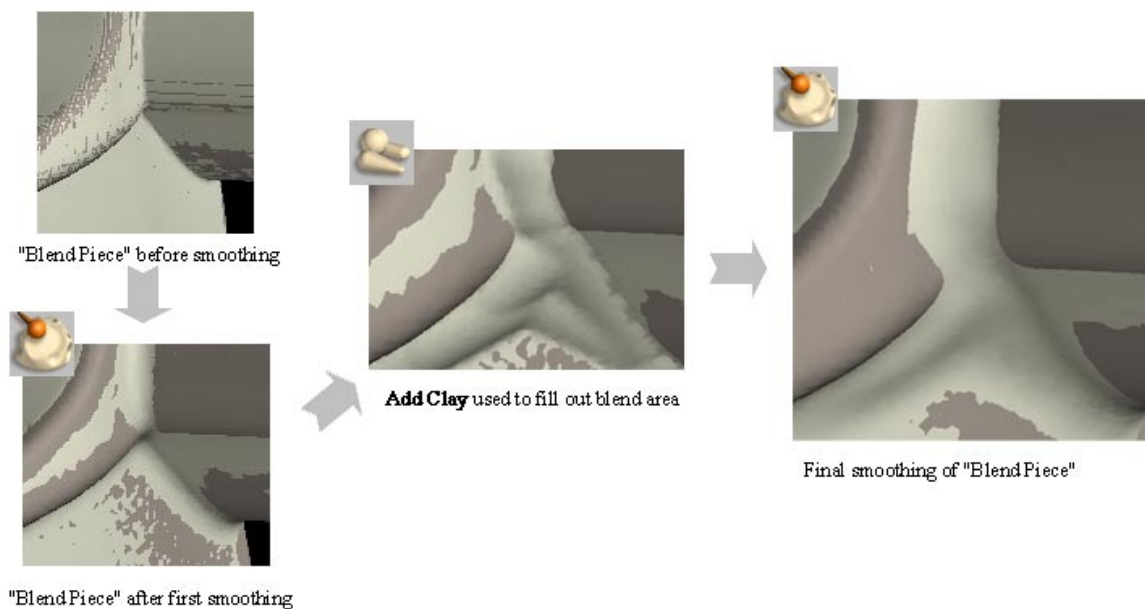
2. Image of cube hidden to better see combined blend/ sphere piece.



There you have it, two precise parts intersecting with both a smooth transition and sharp crease at a rough shape resolution that can be printed easily on an RP system. Simple, but effective. Using these techniques at varying resolution levels can easily produce previously unattainable results using FreeForm.

Increasing the Blend

1. If the transition created between the separate pieces needs to be increased or “softened”, more clay can be added to the blend piece at the transition area and then be re-smoothed.



Example of Multiple Piece Model

1. Image of human head model (in progress) with sharp creases around eyes, between lips and around the nose flanges created by using overlapping separate pieces.



2. Image of head model revealing separate overlapping pieces.

