

Interactive Haptic Painting

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IHP is a toolkit that allows user to dynamically change or embellish the surface of *any* 3D model of the user's choice. IHP supports large meshes composed of up to one hundred thousand polygons. Users can map any pre-existing texture (basically any image file) onto the 3D model and modify it real-time.

The Painting Experience

The user 'paints' the model with a virtual brush using the haptic phantom device. The virtual brush is pressure-sensitive and deposits varying amounts of paint according to the force applied by the user. The user can also vary the wetness of the paintbrush, lending itself to shading and calligraphic effects. As a result, the appearance of the brushstrokes can range from watery and diluted to thick and concentrated. The combination of these features helps create a highly immersive and convincing painting experience.

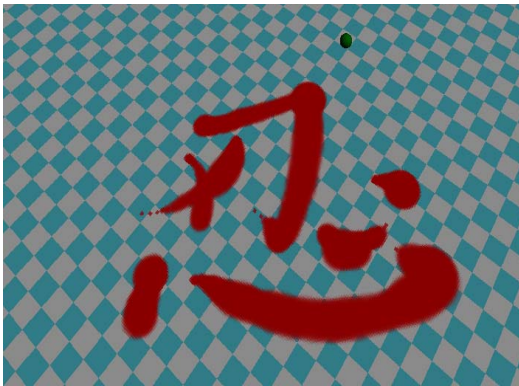


Fig 1. Painting with simulated brush

The Modeling Experience

IHP not only supports the editing of visual properties, such as color and shininess, but also tactile properties of the surface texture, such as viscosity, stickiness and roughness due to visible variations in the surface of the model.

To fully experience these effects, the user can substitute the brush for an embossing or etching tool. In order to make the feedback forces on the virtual tool more realistic for a user detailing a surface, we optimized some bump-mapping and multitexturing techniques. As a result, the user can *instantly* visualize and feel the

sensation of engraving or carving on an object, *i.e.* she sees and feels the bump variations as she carves.

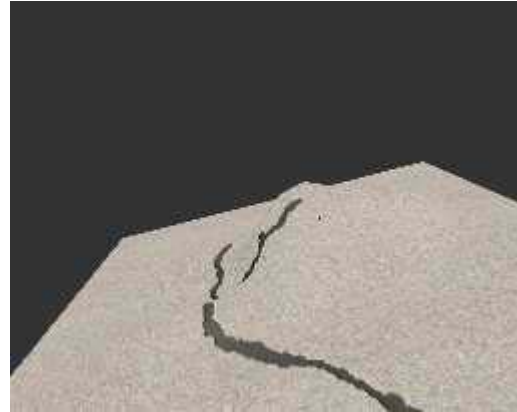


Fig 2. Carving a virtual landscape

Similarly, when the user slides along a textured surface with the virtual tool, she can feel any visible bumps or grooves on the surface of the model. We provide significant freedom with regards to texture specification; IHP can accurately reproduce the sensation of touching *any* material, so long as we are given the bump-mapped texture of the material and a set of friction coefficients. For our demo, all the bump maps of various materials (such as concrete, stone, sand, and plastic) were acquired online.



Fig 3. Carving on a concrete tombstone