



Figure 1



Figure 2

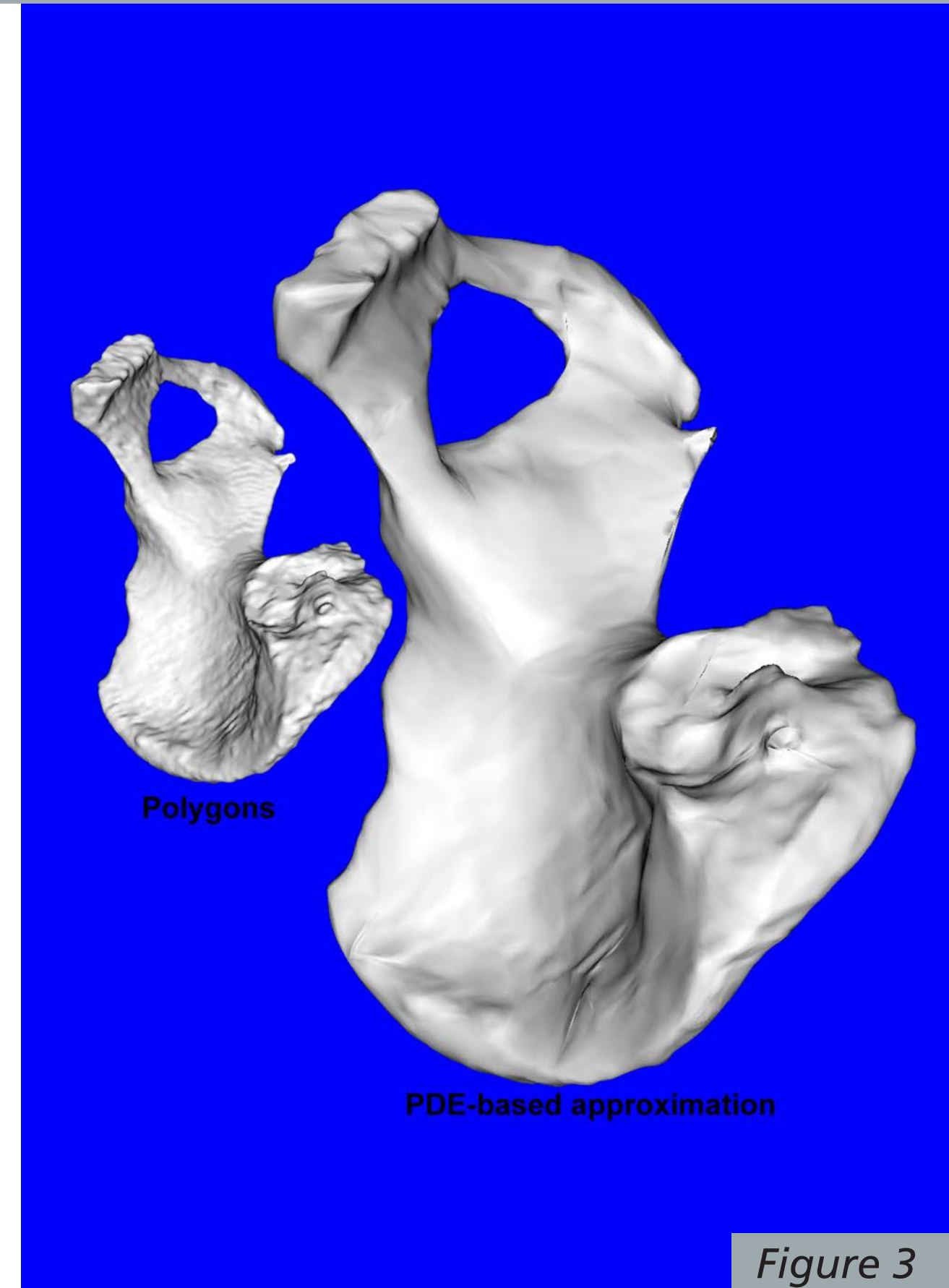


Figure 3

SHAPE MODELING

FUNCTION-BASED APPROACH

In function-based shape modeling, small mathematical functions rather than thousands of colored polygons are used to define geometry and visual appearance of virtual shapes. Implicit, explicit and parametric function definitions are used concurrently. The shape's geometry and 3D colors are defined separately in their own coordinate domains and then merged together to create the virtual object. We can define curves, surfaces and solid objects either by reconstructing them from real life data or by shaping them interactively from individual components. When doing interactive modeling, gradual local modification of the function model with its concurrent visualization lets us provide both the interactivity and any required level of detail leading to photo-realistic appearance of the resulting objects. The final shape is represented as

a relatively small function script that can be rendered on different visualization platforms as well as easily exchanged over the Internet in shared virtual environments. Special accelerating functions in the model provide the required fast function evaluation that is usually a bottleneck for function-based shape modeling systems.

Figure 1: Simulation of virtual embossing

Figure 2: A shape defined by implicit functions

Figure 3: PDE-based parametric approximation of a large polygon mesh reconstructed from MRI data. The function model consists of PDE coefficients and it is an order of magnitude smaller than the original polygon mesh.

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