3D MODELING AND ANIMATION OF THE VIRTUAL SURGERY PATIENT

John Qualter, M.S.[1], Miro Kirov[1], Marc M. Triola, M.D.[1],
Mary Ann Hopkins, M.D. M.Phil.[2], Martin S. Nachbar, M.D.[1]
[1]Advanced Educational Systems Laboratory, [2]Department of Surgery
New York University School of Medicine

In designing a new educational tool that allows a medical student to explore specific surgical procedures, the Department of Surgery and Advanced Educational Systems lab at New York University School of Medicine, have collaborated to develop a Virtual Surgery Patient (VSP). The VSP is a visually compelling anatomical landscape of the human form, uniquely created from custom 3D models specifically designed for learning.

Cadaveric tissue is not realistic in color and form to the tissue and organs observed in the operating room. In addition, demonstrating anatomic variations or pathology is difficult, unless present in the cadaver. In the operating room students have difficulty viewing the surgical field from their "over the shoulder" vantage point. Even if they do witness the procedure in full detail, identifying structures and comprehensive understanding of the surgical anatomy can be limiting. The use of 3D animation technology coupled with recent advances in medical imaging can provide a unique solution for students and offer a more thorough educational experience.

We have created lightweight 3D anatomic models, which can be animated to deform smoothly when demonstrating surgical procedures. The model's inherent ability to deform smoothly allows for reusing the geometry to morph to various pathologic states. The models also have an architecture that allows for enhanced texture mapping, so that anatomy can be displayed in a hyper-realistic manner. In an effort to create these high fidelity surface models for our educational purposes, we developed techniques for converting reconstructed volume data from MR, CT, and the Visible Human Project into a more universal modeling format. These new resurfaced models collectively comprise the VSP, which has now become a backbone for all our animation production.
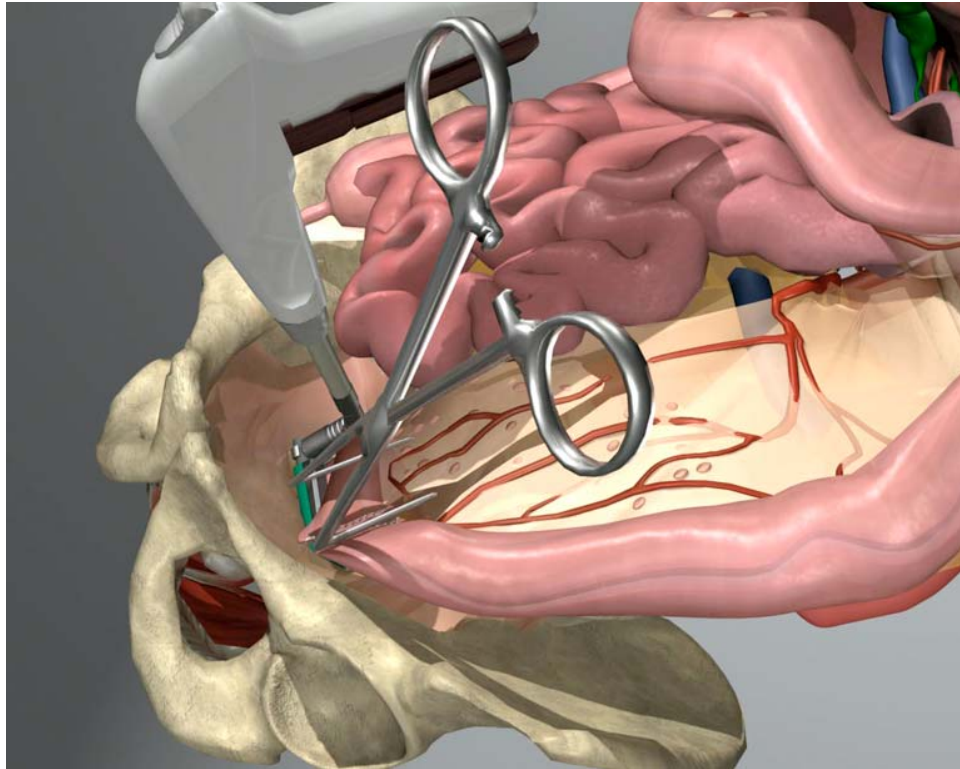
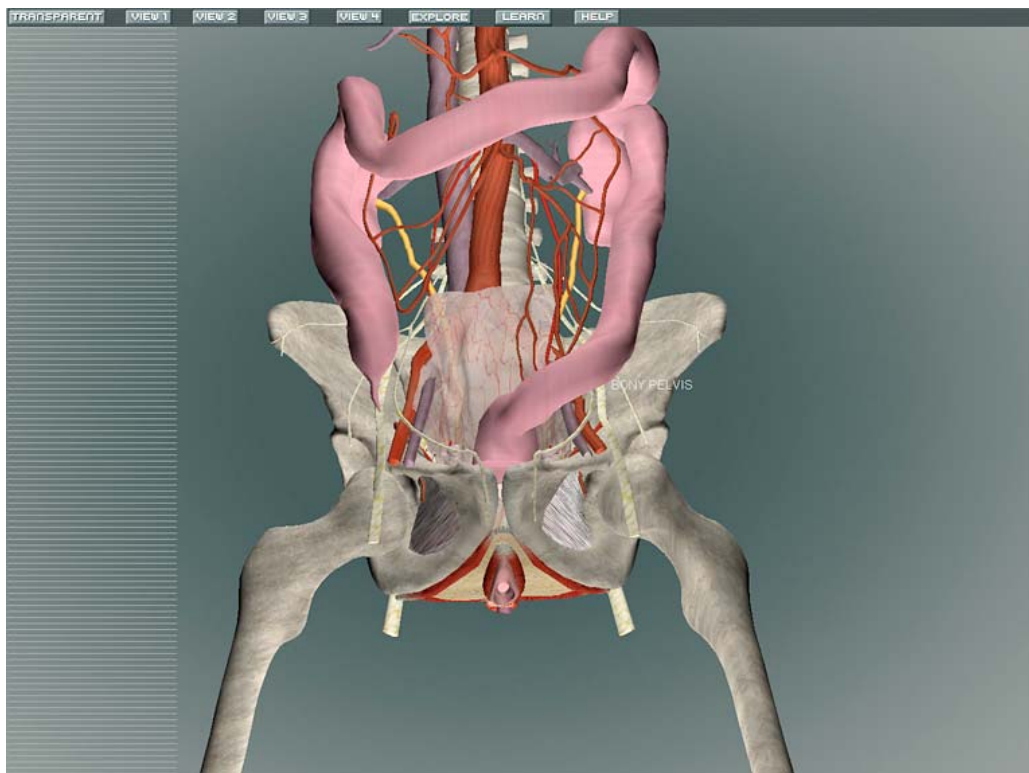Figure 1. Rendered frame from an animated colon surgery

Figure 2. Anatomy training learning environment for OB/GYN residents