**Virtual Environment for Simulating Medical Surgeries**


Functional Description and
Complete System Block Diagram


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**Introduction**

The market for medical simulators is growing drastically as an increase in technology is allowing these devices to come to life. Creating virtual environments for the medical industry can provide cost-effective training, a realistic surgery setting without live patients, and the ability for medical students to continually repeat and learn from these simulations.

The Phantom Omni Haptic Device from SensAble Technologies and various graphics software will be used to create a virtual environment for use in surgical simulations. The haptic device provides force-feedback allowing the user to operate and "feel" virtual objects as if they were physically touching them.

**Functional Description**

Multiple images are imported into software applications such as OpenGL and The FreeForm Concept System. Ideally, these images will be stacked to create a three-dimensional structure and then sent to a display for the user to view. This display will be the "eyes" for the user and the Phantom Omni Haptic Device will be the user's surgical tool, allowing them to "feel" and interact with the environment created in the display.

This project is heavily software-based; images will be manipulated and adjusted by software coding. More research in the areas of OpenGL and The FreeForm Concept System will be needed to set accurate and specific goals.
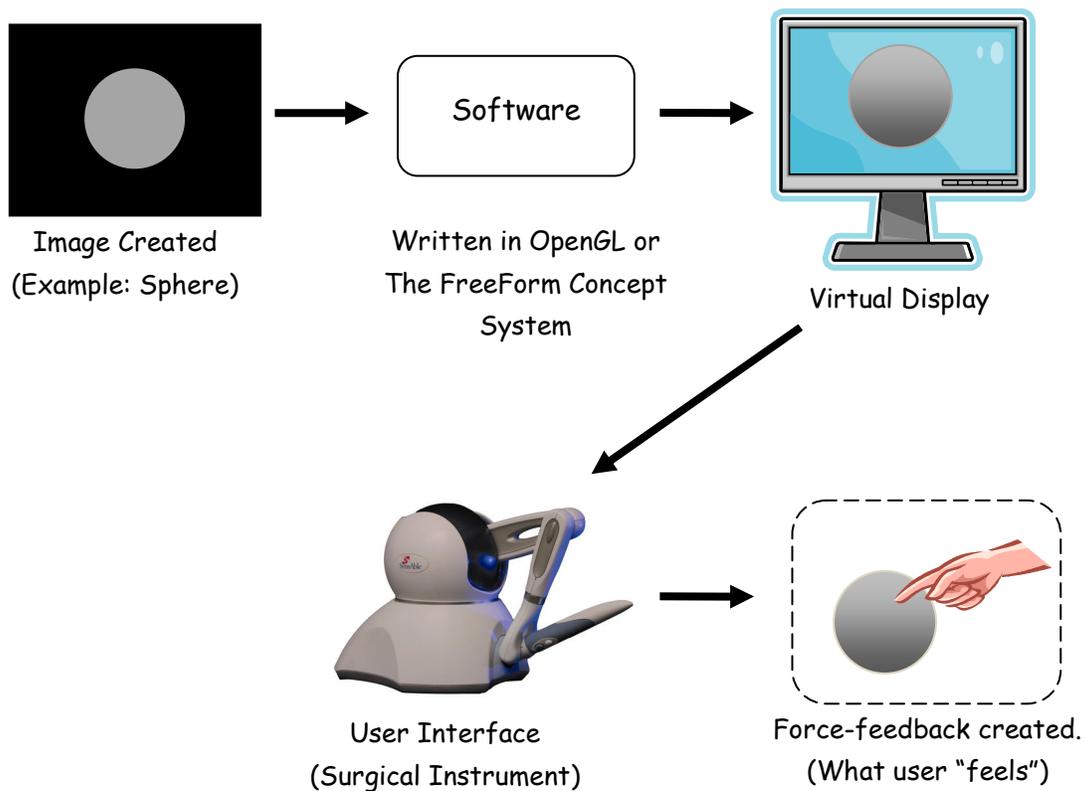


Figure 2-1: High Level Overall System Block Diagram

## Application

The application being used with this device is to simulate a debridement, or removal of foreign material, of the articular cartilage in the knee.  Numerous videos, images, and graphics coding will be used in creating this virtual and interactive surgery.
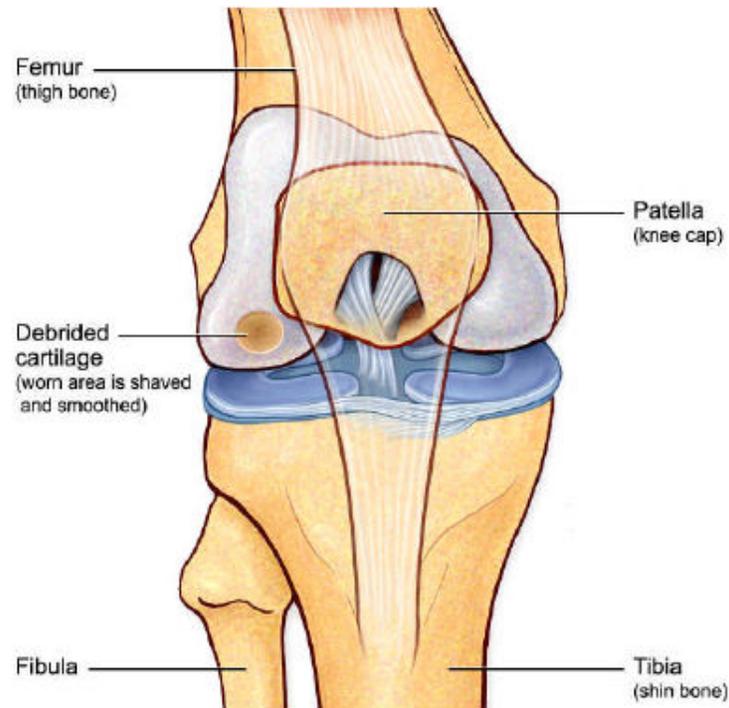


Figure 3-1: Debridement and repair of the articular cartilage.

**References Consulted**

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