Computed Tomography

Children’s Hospital Pre-Operative Planning Project

Working with physicians at the Women and Children's Hospital of Buffalo, CCR has developed a medical data visualization system that can be used for surgical planning and general patient education. This project was motivated by the hypothesis that computer visualization techniques could prove beneficial to the diagnosis and surgical planning for a specific patient with Pectus Excavatum (inverted sternum). After an initial and very successful proof of concept, CCR began developing a general-purpose software tool that can be used with many different types of medical imaging techniques, including CT and MRI scans.

Medical imaging data typically comes in the form of image sequences. For example, a CT scan of a chest produces a stack of 2-D images representing slices taken through the chest cavity. A typical scan consists of approximately 100 such images or slices. A session in a CT scanner may consist of multiple series of scans corresponding to different areas of the body or different scanning techniques. Thus, after a CT, the doctor may have many hundreds of images at their disposal to aid in the diagnosis. In looking for a tumor, for example, the physician or surgeon must find all the slices that contain the tumor and from these images construct, in their mind, a 3-D picture of the tumor.

By using volume rendering and iso-surface techniques, a more intuitive interface to the data is provided. Here, rather than viewing the CT data one
image at a time, the CCR software allows the doctor to "stitch" together tens to hundreds of the images to form a 3-D model of the desired region or object, which can then be easily manipulated (rotated, translated, scaled, etc). This makes it easy to see deformities, tumors, and other structures of concern to the doctor. This technique can be used as a diagnostic and surgical planning tool by the surgeon. Indeed, a surgeon at Children's Hospital in Buffalo is currently using this software to plan surgeries for two young patients with tumors. An added benefit of this software package is that it presents the diagnostic information in a manner that is readily understood by the patient and the patient's family.