4D Visualization

ABSTRUCT

Visualizable objects in biology and medicine extend across a vast range of scale, from individual molecules and cells through the varieties of tissue and interstitial interfaces to complete organs, organ systems, and body parts. The practice of medicine and study of biology have always relied on visualizations to study the relationship of anatomic structure to biologic function and to detect and treat disease and trauma that disturb or threaten normal life processes. Traditionally, these visualizations have been either direct, via surgery or biopsy, or indirect, requiring extensive mental reconstruction. The potential for revolutionary innovation in the practice of medicine and in biologic investigations lies in direct, fully immersive, real-time multi sensory fusion of real and virtual information data streams into online, real-time visualizations available during actual clinical procedures or biological experiments. In the field of scientific visualization, the term "four dimensional visualization" usually refers to the process of rendering a three dimensional field of scalar values. "4D" is shorthand for "four-dimensional"- the fourth dimension being time. 4D visualization takes three-dimensional images and adds the element of time to the process. The revolutionary capabilities of new three-dimensional (3-D) and four-dimensional (4-D) medical imaging modalities along with computer reconstruction and rendering of multidimensional medical and histologic volume image data, obviate the need for physical dissection or abstract assembly of anatomy and provide powerful new opportunities for medical diagnosis and treatment, as well as  for biological investigations.In contrast to 3D imaging diagnostic processes, 4D allows doctor to visualize internal anatomy moving in real-time. So physicians and sonographers can detect or rule out any number of issues, from vascular anomalies and genetic syndromes. Time will reveal the importance of 4d visualization.