

Three-dimensional Stereoscopic Exploration System for the Heart

Abstract

Coronary heart diseases (CHD) are one of the main causes of deaths in the United States. Although it is well known that CHD mainly occurs due to blocked arteries, many of the specifics of this disease are still subject to current research. It is commonly accepted that certain factors, such as a cholesterol high diet, increase the risk of coronary heart disease. As a consequence, people should be educated to adhere to a diet low in low-density lipoprotein (LDL or bad cholesterol). In order for children to become familiar with these facts, educational, explorative computer systems can be employed to raise some awareness. Hence, this presentation describes an educational computer game for children. While practicing their navigation skills, children can learn about the various types of blood cells and particles within the blood stream. A geometric model of the arterial vascular system of the heart was generated based on a CT scan, which considers vessels of different sizes. An interactive flythrough using a standard game controller facilitates the exploration of the interior structure of the vasculature. A blood flow simulation including several different particles within the blood stream allows the young explorer to understand their functionality. Atherosclerotic lesions can be modeled to add calcifications to the geometric model. Since the blood flow visualized by the particles within the blood stream adapts to those lesions, the user learns about the immediate effects of such calcifications on the blood flow. The computer game supports stereoscopic display systems. Through the use of, for example, active shutter glasses and large-screen plasma displays, a fully immersive gaming environment can be achieved. An early version of this computer game has been deployed as an interactive museum exhibit for children. The primary age group addressed by the science museum where it was displayed is 4-9 years.