

图形图像技术

虚拟手术中的快速碰撞检测算法

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摘要: 为了解决当前虚拟手术仿真中使用单一包围盒进行碰撞检测实时性不能满足要求的问题,提出了一种针对虚拟手术的基于层次包围体的快速碰撞检测方法。该方法主要应用了层次包围盒(BVH)的思想,同时根据不同对象的拓扑结构特征,采用不同的包围盒技术来表示。首先,用层次包围盒来表示手术工具,用层次包围球表示手术对象;然后,利用包围球和方向包围盒的相交测试快速排除不相交部分;最后,对于可能发生碰撞的部分再使用更为精确的三角面片相交测试来确定碰撞信息。实验结果表明,在相同的虚拟手术场景下,提出的这种方法较使用单一的层次包围盒具有更快的速度。

关键词: 碰撞检测 虚拟手术 包围球 方向包围盒 层次包围体

Fast collision detection method in virtual surgery

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Abstract: The paper proposed an efficient algorithm of collision detection by using Bounding Volume Hierarchy (BVH) in order to improve the real-time performance in virtual surgery. The main contribution of this work was to use the technology of mixed bounding volume hierarchy to represent different objects according to different topology structure. First, surgical instruments and objects were represented as hierarchy tree. Then the intersection test was implemented between sphere and oriented bounding box for eliminating disjoint parts fast. After that more accurate triangle collision test was used to determine the contact status in overlapping parts. Experimental results show that our algorithm achieves higher speed compared to the algorithm of single bounding box.

Keywords: collision detection virtual surgery bounding sphere Oriented Bounding Box (OBB) Bounding Volume Hierarchy (BVH)

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