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信息科学

高精度光学头部位置定位系统

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摘要： 针对头盔式虚拟现实系统中的头部位置跟踪，研究并实现了多摄像机下的高精度光学头部位置定位系统。通过设计初始标定方块来减小系统安装误差，使摄像机按正交方式布置，保持其光轴两两相互垂直。定位过程中以某一摄像机为基准，任意给定目标深度初值；依据摄像机成像模型计算出目标空间位置，再将该计算结果作为其他摄像机的目标深度初值进行循环迭代计算，收敛至给定精度后得到目标三维空间坐标值。最后以3个标记点空间位置为基础，依据其空间关系计算得到目标姿态角。对比实验表明，该定位方法定位精度高、计算速度快，静态位置误差为0.051 cm，动态位置误差为0.088 cm，明显超过电磁跟踪器定位精度；同时该定位系统成本低廉，不受外界金属和电磁环境干扰，可满足虚拟现实系统中高精度头部位置跟踪需求。

关键词： 头部跟踪 计算机视觉 虚拟现实 迭代

High accurate optical head pose tracker system

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Abstract: A high accurate optical head pose tracker system based on multiple-cameras was investigated to track the high accurate head pose of a virtual reality system. A calibration square was designed to eliminate the system installation error to allow the optical axis of a camera to be perpendicular every two cameras.In positioning, the depth value of the object was given arbitrarily by taking a camera for a criterion, then, other coordinate values could be generated by a camera model. The obtained results were taken as the initial depth and used in the loop iteration to compute the object's position. At last, the object pose could be calculated based on the position of three markers. Comparative experiments show that the algorithm has high accuracy and rapid convergence. The static error is 0.51 mm, and the dynamic tracking error is 0.88 mm,which is significantly higher than that of the electromagnetic tracker system. Meanwhile, the positioning system has low-cost and can not be disturbed by metal or electromagnetic environments. It can meet the high-precision position tracking requirements of virtual reality systems.

Keywords: head tracking computer vision virtual reality iteration

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