

摘要: 提出了一种以Rodrigues参数作为姿态描述参数的线阵CCD外姿态解算算法用于多线阵CCD空间目标外姿态测量系统,以解决传统姿态解算算法约束条件多、计算量大、实时性差等缺点。利用Rodrigues参数简洁高效的特点,根据多点合作目标组成的线段间的相交矢量关系推导出了一种新的基于Rodrigues参数的多线阵CCD外姿态解算模型。算法结合Rodrigues参数集切换理论避免了奇异性的发生,并给出了这种姿态解算方法的流程。仿真结果表明,与四元数算法相比,该算法在未损失计算精度的前提下,计算消耗时间减少了37.6%,实时性优于四元数法,并且避免了奇异性问题。

关键词: 外姿态测量 CCD测量系统 Rodrigues参数 参数切换 奇异性

Attitude calculation of multi-linear CCD exterior attitude measurement system based on Rodrigues parameter

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Abstract: An exterior attitude calculation method by taking Rodrigues parameter as the attitude representation parameter was presented to overcome the shortcomings of the constraints and complexity of traditional attitude calculation algorithms and to increase the real-time performance for the multi-linear CCD spatial object exterior attitude measurement system. A multi-linear CCD exterior attitude calculation model was deduced based on the high efficiency of the Rodrigues parameter and the relationship of the intersection vector between the line segments composed of point cooperation targets. In order to avoid the singularity in attitude calculation, a switching theory of the Rodrigues parameters is combined in the algorithm and the process of this attitude calculation method was also given. Experimental results indicate that the computational-complexity of the proposed algorithm is reduced by 37.6% as compared with that of the quaternion method on the premise of assuring precision, and it is superior to quaternion method in real-time performance. At the same time, it avoids the singularity problem.

Keywords: exterior attitude measurement CCD measuring system Rodrigues parameter parameter switch singularity

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