

论文

## 实时电子数字稳像系统并行处理的快速实现

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摘要

电子数字稳像系统待处理的数据量和计算量非常大,其实时性要求使得系统必须具有很高的数据处理速度。结合图像视频数据处理高度并行化、重复性处理的特征,在程序编制上,采用并行处理方法,利用单指令多数据流(Single Instruction Multiple Data, SIMD)、流水线SIMD技术和多线程设计方法。采用块匹配法进行运动估计,以总绝对差作为匹配准则,以菱形搜索与三步快速搜索相结合的综合搜索策略,减少了运算量,进一步加快了处理速度。同时,使用Kalman低通滤波方法去除图像的高频抖动,而保留了平滑的全局运动,保证了系统的有效性和鲁棒性。通过这些措施,在普通PC机上实现了系统的高效实时处理。

关键词 [图像稳定](#) [运动估计](#) [并行处理](#) [块匹配](#) [Kalman滤波](#)

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## Fast Parallel Implementation of Real-Time Electronic Digital Image Stabilization System

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Abstract

Electronic Digital Image Stabilization (EDIS) system has a large amount of data and intensive computation. The real-time implementation of EDIS system entails rapid processing of data. The characteristics of video and image series process are the data high parallelism and repeating computation. According to the requirements and characteristics of system, using efficient C++ with inline SIMD (Single Instruction Multiple Data) and multi-thread programming to achieve real-time performance of the system in conventional PC. The block-matching motion estimation, with SAD (Sum of Absolute Differences) criterion, with modified three-step search strategy in conjunction with diamond search technology, is used to reduce computation and accelerate the execution. The stabilization system uses Kalman filter to remove high-frequency image jitter with retained smooth global movements. The results of test show that it is possible to implement an efficient and robust real-time stabilization system in conventional PC.

Key words [Image stabilization](#) [Motion estimation](#) [Parallel processing](#) [Block-matching](#) [Kalman filter](#)

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