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### 基于DSP平台的机载高清视频编码器设计与实现

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### Design and Implementation of Airborne High Definition Video Encoder Based on DSP Platform

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**摘要** 针对无人机(UVA)航拍对高清视频的需求,设计并实现了基于数字信号处理器(DSP)平台的MPEG-4高清视频编码器,具有体积小、功耗低和可靠性高的特点。根据DSP片内资源设计了存储器分配方案,优化了编码过程中的数据流传输,降低了数据访问对编码速度的影响。针对视频编码算法中复杂度较高的部分,采用了基于预测的运动估计,减少了匹配搜索时间;提出了改进的变长编码方案,大幅提高了编码速度;提出了一种提前判断全零系数块的充分条件,有效减少了离散余弦变换(DCT)和量化计算。实验结果表明,该编码器对720P格式(1 280 pixel×720 pixel分辨率)视频的编码速度在20帧/s以上,并且峰值信噪比(PSNR)高于35 dB,具有良好的画面质量和较低的码率。

**关键词:** 数字信号处理器 MPEG-4 视频信号处理 实时系统 高清 优化

**Abstract:** To enhance the capacity of video capturing and ground reconnaissance of an unmanned aerial vehicle (UAV), an efficient MPEG-4 high definition video encoder is designed and implemented on a digital signal processor (DSP) platform, which is characterized by small volume, low power consumption and high reliability. Firstly, the data flow scheme of video encoding is optimized by allocating the on-chip memory of the DSP reasonably, which reduces the impact of data access on encoding speed. Secondly, prediction-based motion estimation is adopted to accelerate the search of matching blocks. Furthermore, optimized variable length coding and predicting all-zero coefficient blocks are proposed to improve coding speed and reduce discrete cosine transformation (DCT) and quantization computation respectively. Experimental results show that, for the video sequence with 720P (1 280 pixel×720 pixel resolution) format, the optimized encoder can achieve an encoding speed of over 20 frame/s, and the peak signal to noise ratio (PSNR) is higher than 35 dB, with satisfactory visual quality and relatively low bit rate.

**Keywords:** digital signal processor MPEG-4 video signal processing real time system high definition optimization

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