System Realization and Video Watermark with Spatial and interframe Information

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요 약

본 논문은 비디오 워터마크 알고리즘을 적용한 비디오 시스템 구현에 관한 것이다. 시스템은 압축 알고리즘과 워터마킹 알고리즘을 실시간으로 처리하기 위해 DSP 프로세서를 기본으로 하여 구성하였다. 비디오 워터마킹 알고리즘은 공간영역과 프레임간의 정보를 이용하여 워터마크를 삽입하는 방법인다. 실험 결과, DSP에서 D1 영상 한 프레임 당 처리 시간이 약 32.1ms 소요되었다.

ABSTRACT

System realization and video watermarking using spatial and interframe information is presented in this paper. The system is constructed with DSP processor to process compression and watermark algorithm with real time. Video watermark algorithm is used the watermark insertion using the spatial and interframe. As a results, the processing time of D1 image per frame is 32.1msec in DSP.

Keywords
Video Watermark, DSP, Video System, Spatial, Interframe

1. Introduction

Recently, a large amount illegal reproduction is increasing because various multimedia service and developing internet. The copyright problem came out because of the illegal reproduction. So, necessity of the security system technology is incrementing for protection of the stabilization, confidence, copyright of multimedia contents and progressing encoding research of digital data in association with necessity of the security system technology. The research about protection of digital data was processing using watermark technology among the method of encoding of digital data. Digital watermark technology has protected digital data effectively by the method of hidden special code value in multimedia data. Now, All digital data of image and audio is applying watermark technology.[1-6] This paper implements real time video system that inserting and compressing video watermark using spatial and interframe

II. System realization

2-1. Watermarking

Watermarking is inserting watermark to digital
data and executing after compression in video system. The method of watermark is inserting space and frequency domain for compressing data. In case of inserting space domain, the advantage is available insert simply and various watermark information to original image. As compression image insert to watermark, the weak point is steam size bigger than original image, In case of decoding image, occur the loss of original image and watermark. And the watermark be remove and change by easy filtering and a transformation of signal. To make up for this weak point, insert to frequency domain.

2-2. System architecture

![Video System Block](image)

Fig. 2. Video System Block

In general, the construction of video system makes up the module that receive the signal and process the algorithm and the module that store the compressed data and transmitted data like Fig. 2. is general video system block. The construction of signal processing module inputs the created analog signal from camera and microphone to the video and audio decoder like Fig. 2. Video and audio decoder sampling the input data and to make digital data. DSP processor process the inserted digital data as the preprocessing of video and audio. After, the video and audio data compress that is applied compression algorithm and video watermarking algorithm. The large operating routines convert to assembly code that is adapted processor and the code realized the soft pipeline code in MPEG4 algorithm and video watermarking algorithm.

III. Experiment and Results

Fig. 3 is shown the board’s picture that implemented video system in this paper. This system is implemented the MPEG4 compression
algorithm and video watermarking algorithm. The camera input image used the D1(720 x 480) frame.

Fig 3. Video system

The experimental image is used the stop image and the moving image that have 60% movements. Experimental results, The table 1 is shown the processing time when compress one frame by MPEG4 and input watermark and decoding image and abstracting video watermark. The processing time that inserting and abstracting video watermark is 2.0ms like table 1. Therefore, the user have to reduce the processing time of MPEG4 algorithm and watermarking algorithm for process the encoding and decoding at once.

Table 1. Experimental results

<table>
<thead>
<tr>
<th>Coder / Image</th>
<th>Firm Object</th>
<th>Moving Object(60%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encoder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preprocessing time</td>
<td>1.5ms</td>
<td>1.5ms</td>
</tr>
<tr>
<td>MPEG4 compressing time</td>
<td>12.3ms</td>
<td>19.3ms</td>
</tr>
<tr>
<td>Video watermarking inserting time</td>
<td>0.6ms</td>
<td>0.9ms</td>
</tr>
<tr>
<td>Postprocessing time</td>
<td>0.4ms</td>
<td>0.4ms</td>
</tr>
<tr>
<td>Frame/second</td>
<td>14.8ms</td>
<td>22.1ms</td>
</tr>
<tr>
<td>Decoder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preprocessing time</td>
<td>0.4ms</td>
<td>0.4ms</td>
</tr>
<tr>
<td>MPEG4 reconstructing time</td>
<td>5.0ms</td>
<td>8.1ms</td>
</tr>
<tr>
<td>Video watermarking extracting time</td>
<td>0.8ms</td>
<td>1.1ms</td>
</tr>
<tr>
<td>Postprocessing time</td>
<td>0.4ms</td>
<td>0.4ms</td>
</tr>
<tr>
<td>Frame/second</td>
<td>6.6ms</td>
<td>10.0ms</td>
</tr>
</tbody>
</table>

IV. Conclusion

This paper presents the real time system applied video watermarking algorithm to the video system with spatial and interframe. Experimental results, the processing time that inserting and extracting video watermark takes round 2.0ms on the 60% moving image. This result leads to realize real-time video system because of 32.1ms totally processing time for one frame. However, in case of moving image time 60% over, the system needs optimizing algorithm and improvement more to be increased MPEG4 processing time for fast real time video system realization.
References


