AO2b-01

MPEG-4 SOFTWARE DECODER

Developing a well-structured MPEG-4 Player for Windows Platform with MMX technology

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**Overview**

MPEG-4 is an upcoming visual-audio data compression standard developed by MPEG. In our project, we aimed to build an MPEG-4 software decoder and player for the MS Windows environment. The goals we accomplished include the following:

- developed the video decoder from ground and optimized its performance
- constructed a multi-threaded MPEG-4 player with a user-friendly GUI
- embedded audio decoder into our software to provide audio output functionality

*System Block Diagram*

```
<table>
<thead>
<tr>
<th>video streams</th>
<th>audio streams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Decoder</td>
<td>Audio Decoder</td>
</tr>
<tr>
<td>visual data</td>
<td>audio data</td>
</tr>
<tr>
<td>Video Frame Buffer</td>
<td>Audio Frame Buffer</td>
</tr>
</tbody>
</table>

Player

GUI Display  User’s interaction
```
Detailed Design

Video Decoder
In MPEG-4 video standard, a video is represented by a video object layer (VOL). Each frame in the video is represented by a video object plane (VOP), which consists of 16x16 macroblocks. The raw pixel data are stored in blocks within macroblocks in YUV format. This defines the basic structure of our video decoder.

Audio Output Mechanism
Since the existing audio decoder writes audio data in .wav file, we had to redirect its output in such a way that it writes the data to our audio frame buffer so that we can play it directly through our audio playing module.
**GUI of our software**

![Software GUI](image)

- Movie Selection
- 24/32 bits color conversion
- Control buttons

**RESULT**

**Performance of our video decoder**

![Performance Chart](image)

<table>
<thead>
<tr>
<th>System</th>
<th>Compression Ratio</th>
<th>Decoding Rate (fps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P4 1.3GHz</td>
<td>114 : 1</td>
<td>13.11</td>
</tr>
<tr>
<td>P3 866MHz</td>
<td>114 : 1</td>
<td>13.35</td>
</tr>
<tr>
<td>K6-2 450MHz</td>
<td>114 : 1</td>
<td>13.24</td>
</tr>
</tbody>
</table>

*Used for performance analysis.*