Department of Electrical and Electronic Engineering
Final Year Project (2001 – 2002)
Poster cover page

Project Title: MPEG-4 Software Decoder
Project ID: AO2a – 01
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Our Final Year Project is to build an optimized MPEG-4 software-based audio-visual decoder which includes error-resilience functions. Moreover, a graphical user interface is implemented so that any decoded audio, video and their combination can be displayed in Microsoft Windows environment.

**Overview**

<table>
<thead>
<tr>
<th>Optimization Approach</th>
<th>Explanation</th>
<th>Function applied</th>
<th>Speedup increase</th>
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<tr>
<td>Algorithm-based</td>
<td>Using a fast algorithm can result in a significant improvement in terms of decoding efficiency.</td>
<td>Inverse Discrete Cosine Transform (IDCT) &amp; Inverse Modified Discrete Cosine Transform (IMDCT)</td>
<td>30% for both individual audio and video decoder</td>
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<td>High-level Instruction-based</td>
<td>Changing some codes rather than the whole structure</td>
<td>Modified functions for sprite decoding (one type of MPEG4 video coding format)</td>
<td>540% for individual video decoder</td>
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<td>Low-level Instruction-based</td>
<td>Using Intel MMX assembly languages</td>
<td>new data structure and functions for reading data in input bitstreams, e.g. getBits</td>
<td>180% on average for individual decoders</td>
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To implement the error resilience functions in our video decoder, Resync Marker is utilized to support error resilience functions. In order to detect and correct errors in the audio decoder, cyclic redundancy checks and forward error correction codes are applied.

The Comparison of the decoded output of an error video bitstream

Original bitstreams without errors:

Bitstreams with an error in the first frame, decoding through the MPEG-4 reference decoder without any error resilience function:

Bitstreams with an error in the first frame, decoding through our MPEG4 reference decoder with error resilience functions (white circle indicated the errors)
A simple flow-chart of our GUI design is depicted in figure 1. Our individual video decoder is constructed first as a reference of our final MPEG-4 GUI player.

Our individual video decoder can display a video sequence of YUV format and has the following interactive functions:

- viewing the individual components, i.e. Y, U or V and comprised components
- going to a particular frame directly, and
- playing the file frame-by-frame.

A screen-shot of our system player is shown in figure 2. The player can support many functionalities, such as movie playing control and screen size control.

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**Figure 1: Simple Flow Chart of our System Player**

**Figure 2: The Outlook of our individual video player**

**Figure 3: The Outlook of our system player**