REAL-TIME VIDEO
H.264 STREAMING SERVER ON DSP

Group Members:

YUK Ka Man (02125971)
CHU Yuen Kwong (02192687)
CHENG Ka Ying (01651313)

Project Supervisor: Prof. Oscar AU
**Aim**

The aims of this project are to implement H.264 encoder on DSP TMS320DM642 and to optimize the speed of the encoder. Together with the use of a web camera, this encoder on DSP can capture video, encoded the data into H.264 format and then sent to any windows PC through the Internet.

**TMS320DM642 Video / Imaging Fixed-Point Digital Signal Processor (DSP)**

It is a specialized microprocessor which is optimized to perform audio and imaging applications with targeted broadband infrastructure. It enables High-Quality, Multi-Channel, Multi-Format Video on Demand Applications like broadband set top-box or real time Multi-Channel Video Processing as in IP video phone.
**H.264 standard**

H.264 is a video and audio CODEC (coder and decoder) standard conformed and developed jointly by two video compression standard committees: ITU-T and MPEG. H.264 was based on the draft on H.26L in developing a new standard for low bit rate visual communications, offering significantly better video compression efficiency.

**System Block Diagram**

- **Input Process**
  - Video Data
  - Processed Video Data
  - Video Encoder
  - Encoded Video
  - Network Layer
  - Streaming Server

- **Encoded Video Bit Stream**

- **Decoder and Player**

  - Video Decoder
    - Processed Video Data
    - Decoded Video Data

  - Player
    - Video Data
    - Network Layer
Video capture, encoder and networking are successfully implemented on DSP. User can plug in a web camera and capture video. DSP will encode the video data into H.264 format and send to the internet using RTP network.

The encoder has been optimized to give a better performance. Two methods of optimization are used as mentioned in previous chapter. The overall result after optimization is 17 frames per second.

\[
\text{Frame rate} = \frac{\text{Clock rate in DSP} \times \text{number of frame encoded}}{\text{Total cycles used}}
\]

Clock rate of DSP = 720MHz

<table>
<thead>
<tr>
<th></th>
<th>Before optimization</th>
<th>After optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of frames</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Number of cycles used</td>
<td>284210526315</td>
<td>12521739130</td>
</tr>
<tr>
<td>Overall frame rate</td>
<td>0.75</td>
<td>17.25</td>
</tr>
</tbody>
</table>

Time taken by different components