MPEG1 & MPEG2

Goal:

The goal is to study and compare the performances of different configurations of MPEG1 and MPEG2 when compressing video.

Introduction:

We use *VCDemo* with its modules *MPEG Video Encoder* (*MEnc*) and *MPEG Video Decoder* (*Mdec*).

MEnc performs a MPEG1 (resp. MPEG2) video coding of an uncompressed color video, and produces a standard compressed video stream (without the MPEG2 transport level).

Mdec performs the decompression and generates the uncompressed video. It displays it and can also display the video before compression and the video coding error.

In the configuration interface of *MEnc*, the most important parameters that can be set are:

- the bitrate in *Mbps*;
- the GOP structure and its size;
- the motion estimation method;
- the format (e.g frame or field coding for MPEG2).

When encoding a sequence, some information are displayed:

- Display of the current image being coded (so in coding order);
- Useful informations (e.g number and percentage of MB encoded using the different methods).

To do:

A – MPEG1 coding

We use video *Vectra* (color sequence, 21 frames, CIF (352 x288), 4:2:0 progressive format)..

A1. Basic Coding

We test a basic form of MPEG1 coding, as close as possible to H.261 coding. The rate is set at *384 kbps*. Choose the GOP in order to be close to the H.261 GOP structure.

What is the main difference?

Analyze the performance in both visual and PSNR quality.

A2. MPEG1 Coding with a constant at *1.15 Mbps* bitrate

The motion estimation is set with a maximum value of 10 pixels. Use the GOP structures (6 structures are proposed), and analyze for each of them the performances in terms of visual

quality and in terms of PSNR.

Compare the results. What do you conclude about the effect of the GOP structure?

A3. Coding with different bitrates

Choose the longest GOP structure, and compare the visual and objective qualities (PSNR) of the decoded images for the following bitrates: *0.128; 0.384; 0.768; 1.15; 2.0 Mbps*.

Is a *1.15 Mbps* bitrate is enough to encode the sequence?

A4. Impact of the maximal amplitude of the motion estimation

We use the same structure GOP and same bitrate of *1.15 Mbps*, but vary the maximum possible amplitude of the MB motion vector component MB (use at least 3 values).

What is the most appropriate value for this video? Conclusion?

B- MPEG-2 coding

First see the figure 1: this frame extracted from an interleaved sequence where an object is moving, illustrates the border issue that takes into account by MPEG2.

Figure 1

We use 2 videos: *Vectra* (progressive), and *Mobile* (interleaved).

B1. Comparison between frame coding and field coding

We set: bitrate rate at *1.15 Mbps*, most advanced and longest GOP structure, maximal amplitude for the motion vector.

We test and compare the two coding modes of MPEG-2: the frame (progressive) mode, *vs* the field mode. Compare the performances both in visual and PSNR terms. Explain and conclude. Is, the choice of the first (even or odd) field, important here?

Compare the results, in particular those related to the search window size, with the results with the mono-resolution approach and full search mode.

B2. Coding at different bitrate

Choose the most advanced and longest GOP structure, and the maximal amplitude for the motion estimation.

Assess the visual and objective qualities (PSNR) of the decoded images for the following bitrates: *0.768; 1.15; 2.0; 3.5 Mbps*. Conclusion?

For the *1.15 Mbps* bitrate, vary the GOP structure (2 structures) and its length (2 lengths). What the effect of these parameters. Conclusion?

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