

Multimedia Communications
Homework #2, Jan 5, 2011, Due: Jan. 18, 2011

Note: Please hand in the results (should be typed in the Word format) to the TA (許志仲 m121754@gmail.com).

MPEG-2 Video Encoding:

1. Use the two provided video sequences, apply the MPEG codec to test the following tradeoffs:
 - a. Bit-rate and SNR at IBPBPBPBI and IBBBBBPBBBBPBBBBI arrangement
 - b. Bit-rate and SNR at two different scalings of the default quantization matrix

H.263 video encoding

2. Video coding at different bit-rates (128kb/s and 56kb/s):

Open a DOS command window and use the following commands to encode at 128kb/s.

```
del snro (if it exists)
encode -i miss_am.qcif -a 0 -b 50 -k 0 -r 128000
```

(The above command will encode miss_am.qcif video from frame#0 to frame#50 at 128kb/s. The output stream is stream.263. Also note that the parameter -k 0 means that it does not skip any frame. If you do not include -k0, it will code the 0th frame, then 3rd, then 6th etc)

```
move snro psnr_64k
move stream.263 stream_128k.263
```

Use the following commands to encode at 56kb/s.

```
encode -i miss_am.qcif -a 0 -b 50 -k 0 -r 56000 (encode the video at 56000 bits/second)
move snro psnr_56k
move stream.263 stream_56k.263
```

Now, psnr_128k file stores the PSNR data for 128kb/s and psnr_56k file stores the PSNR data for 56kb/s. The PSNR file may look something like 31.71 30.22 31.66 31.62 ..., which means the PSNR of the first frame is 31.71, the PSNR of the second frame is 30.22, ...)

- a. Using Matlab, type commands

```
load psnr_128k
load psnr_56k
plot(psnr_128k); hold; plot(psnr_56k,':')
```

to show the figures of psnr_128k and psnr_56k. Does the video coded at higher bit-rate give you better video quality (higher PSNR)?

- b. Use the commands

```
decode -o6 stream_128k.263
decode -o6 stream_56k.263
```

to view the video coded at 128kb/s and 56kb/s, respectively, where -o6 is for window display. You may use: "decode -o6 -f5 stream_128k.263" to display the video at 5 frames/s.

Give a subjective evaluation and compare the video quality of these two video files. What artifacts do you observe?

3. Video coding with different quantization (finer quantizer with QP = 5 and coarser quantizer with QP = 15)

Use the commands

```
del snro (if it exists!)
encode -i miss_am.qcif -a 0 -b 149 -k 0 -A 15 -q 15
```

```
move snro psnr_q15
move stream.263 stream_q15.263
which will encode the video with Quantization Parameter = 15.
```

type commands

```
encode -i miss_am.qcif -a 0 -b 149 -k 0 -A 5 -q 5
```

```
move snro psnr_q5
```

```
move stream.263 stream_q5.263
```

which will encode the video with Quantization Parameter = 5.

Using Matlab, type commands

```
load psnr_q15
```

```
load psnr_q5
```

```
figure
```

```
plot(psnr_q15); hold; plot(psnr_q5,':')
```

- a. Show the figures of psnr_q15 and psnr_q5. Does the smaller Quantization Parameter give better video quality?
- b. What are the compression ratios for these two compressed bit-streams (i.e., size of test.qcif / sizes of stream_q5(15).263)?

4. Video coding with different motion search range (comparing a search range of +/-15 to +/-3)

Use the commands:

```
del snro ( if it exists)
```

```
encode -i miss_am.qcif -a 0 -b 149 -k 0 -s 15
```

```
move snro psnr_s15
```

```
move stream.263 stream_s15.263
```

This will encode the video with a motion search range of +/- 15 pixels (-s 15).

Type the commands

```
encode -i miss_am.qcif -a 0 -b 149 -k 0 -s 3
```

```
move snro psnr_s3
```

```
move stream.263 stream_s3.263
```

which will encode the video with a motion search range of +/- 3 pixels (-s 3).

- a. Using Matlab, type the commands

```
load psnr_s15
```

```
load psnr_s3
```

```
figure
```

```
plot(psnr_s15); hold; plot(psnr_s3,':')
```

to show the figure of psnr_s15 and psnr_s3.

- b. Does the wider motion search range give better video quality? Explain the results.

For the lab report, you should print out some typical frames of video images so that we can evaluate your coding performance.