**Comp4932 Assignment 2 – H.261**

**Purpose**: Explore JPEG and H.261 compression techniques

**Description**: You are to develop a working version of H.261 compression (simplified). For the JPEG portion you must adhere to the JPEG standard except for the Entropy step where you may just apply RLE to the entire quantized 8x8 block. For the motion vector calculations you may implement any of the three algorithms discussed (benefits of using a faster algorithm is debug time reduction). Allow user to specify the value of p (search area) from 1 to 15. For simplification your algorithm only needs to work with 2 video frames (passed in as bitmaps or jpeg images). The first frame should be JPEGed, the second frame should use the motion vectors (using the first frame as the reference frame) and the chosen value of p and apply your DCT/quantization&RLE to difference blocks. Block size should be 8x8 (for simplification) for motion detection (8x8 for JPEG). RLE should be done in a zig-zag pattern. You may count the DC portion with the AC when RLE. Results of compression performance should be added to status bar, use width\*height\*3 as original image size and the resulting image size after compression. Both images must be stored (written to hard drive) as one using your own format and be uncompressed after user opens your compressed 2-frame “video”. Marks awarded for PROOF (via demo) of **each step working** (no marks for non-working coded steps).

Steps

1. Intra-frame: RGB->YCrCb->subsampleCrCb->DCT 8x8 blocks->quantize->RLE
2. Inter-frame: (assumes data in YCrCb and subsampled) motion detect & difference blocks->store motion vectors->DCT difference image blocks->quantize->RLE

**Bonus Marks**

*Everything in regular assignment must be fully working for ANY bonus marks*

1. 10 marks for using LWZ for Entropy compression AFTER RLE have been applied. DC components should be DPCM and LWZ compressed separately.
2. 20 marks for using either Arithmetic or Huffman (modified) to both DC and AC components and DPCM applied to DC components, AFTER RLE. You may not do both 1 and 2
3. 10 marks for working with unlimited number of frames, using 1 reference frame per 10 frames (I-frame = JPEGed, 9 P-frames) and stored in your own format for entire “video” plus animation for playback.

**Marking Guidelines**

# Function/Requirement Mark

Subsampling (CrCb) 5 (forward & reverse)

Quantization (8x8 DCT, YCrCb) 15 (forward & reverse)

Entropy encoding RLE & save/open 15 (forward & reverse)

Motion Vectors 15

Difference blocks & DCT/Quantized/RLE 35 (forward & reverse – works with MV)

**Milestones**

|  |  |  |
| --- | --- | --- |
| Functionality | Date | Mark |
| RGB->YCrCb->subsampled (Both directions) | Feb 15 | 5 |
| Quantization (8x8 DCT) and RLE with save/open(Both directions) | Mar 1 | 5 |
| Motion Vectors (drawn over image using boxes to show blocks and arrows to show direction) – one direction only | Mar 1 | 5 |

**Due: March 8 in class – Demoed and submitted.**