Motion Compensated Processing [1]

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THIS LABORATORY SESSION COUNTS FOR 7% OF THE TOTAL 4C8 MARK

Lab Information

Submission Requirements

In this lab, you will be required to compile a report that answers specific instructions included in the report. The report should be typed up and submitted electronically using the **PDF file format** via the module's blackboard page by the specified deadline. Remember to put your name and student number on the top of your reports.

Penalties for Late Submission

- less than 15 minutes past the deadline - no penalty.
- greater than 15 minutes and less than 2 hours past the deadline - loss of 25% of the final mark.
- greater than 2 hours past the deadline - loss of 50% of the final mark.

Plagiarism Policy

Any submitted code or answers that can be seen to be plagiarised from other sources will result in 0 marks being awarded for that section of the lab and may result in you being awarded 0 marks for the entire assignment. Anti-plagiarism software will be used on submitted materials.

[1] This lab was originally written by Prof. Anil Kokaram & Dr. David Corrigan & Dr. Gary Baugh.

1 The Block Matching Algorithm

The Matlab file `bm_lab_template.m` contains the skeleton of a Block Matching algorthm with just the error calculation missing. It uses a full search strategy. The matrix `error` is supposed to hold the MAE corresponding to each vector tested for a particular block.
☐ Edit the file to calculate the MAE for each vector in the place indicated. In your report, show clearly the *code snippet* that you added in the `bm_lab_template.m` file.
☐ Edit the file to display the motion compensated error for the whole frame (stored in `dfd`) as Figure 4.

The data that you will use initially is in `qonly.360x288.y`. It is a sequence of frames from a Bond movie stored as raw data. Each pixel is 8bit, and each frame is stored one after the other sequentially in a binary file. Each frame is stored in the same way as a raw image would be.

1.1 Performance

It is typical to evaluate the performance of a motion estimator by plotting the average motion compensated error in some way versus the frame number. The motion compensated frame difference at each pixel site is already stored for you in `dfd`, noting that the edges are ignored. Each entry in that matrix therefore shows $e(h,k) = I_n(h,k) - I_{n-1}(h+v^x_{n,n-1}(h,k), k+v^y_{n,n-1}(h,k))$ at each site (h,k). Here the motion vector mapping position (h,k) in frame n into the previous frame $n-1$ is $(v^x_{n,n-1}(h,k), v^y_{n,n-1}(h,k))$, where the horizontal component of motion is $v^x_{n,n-1}(h,k)$ and $v^y_{n,n-1}(h,k)$ is the vertical component. The MAE over the whole frame between frames n and $n-1$ is then

$$E_{n,n-1} = \frac{1}{HK} \sum_{h=0}^{h=H-1} \sum_{k=0}^{k=K-1} |e(h,k)| \tag{1}$$

☐ Edit the Matlab file to calculate this error for the first 30 frames in `qonly.360x288.y`. Plot a graph of $E_{n,n-1}$ Vs frame below.