



EE608 - Digital Image Processing

Assignment 5

Assigned Date: 05/04/2023

Due Date: 19/04/2023

Problem 0: Panorama Stitching

1. Take multiple images with some overlap. Perform image stitching and panorama construction. Clearly describe the steps in your implementation. Write down your observations at each step. (10) (Use OpenCV or any Library) [steps: 1.SIFT-feature extraction, 2.Feature Matching, 3.RANSAC algorithm, 4.Geometric matrix estimation, 5.Image Registration]

Problem 1: Motion Estimation

In this problem you will implement the most critical part of the video codec the motion estimator. Do the following:

1. Use the 3-step search to find motion vectors (check slides for description). (10)
 - Use mean absolute distance (MAD) as your metric.
 - Step 1: Search at 8 location ± 4 pixels around current macroblock including (0, 0) (relative to current macroblock).
 - Step 2: search at 8 location ± 2 pixels around best match location in Step 1 including best match location.
 - Step 3: search at 8 location ± 1 pixels around best match location in Step 2 including best match location.
2. Plot the motion vector at each macroblock. You can use the arrow function in matplotlib. (1)
3. Generate the motion compensated predicted frame using the motion vectors and the first frame. (3)
4. Compute the error between the second frame and its motion compensated predicted version and display it.(1)

Instructions:

- Do not use built-in functions.
- Divide each frame into non-overlapping macroblocks of size 16×16 pixels. Note that the images are of size 176×144 .
- Generate motion vectors at each macroblock in the second frame from the first.

Problem 2: Optical Flow

- 1.[Theory] - Define Optical Flow Equation? Explain Lucas-Kanade algorithm?
2. [Coding] - Take two videos 1) Slow motion video 2) Fast moving video. Compute optical flow between consecutive frames for the entire video? Visualize optical flow maps and Comment on the magnitude of the optical flow for both the videos? [Use Open-CV/Any Python library]

Problem 3: Wavelet Transform

1. [Theory] - Explain 2D-Wavelet Transform & 2D-Inverse Wavelet Transform?
2. Implement Wavelet Transform using the library (OpenCV/Pywavelet)? Implement image-denoising algorithm using the Wavelet Transform? (<https://pywavelets.readthedocs.io/en/latest/ref/2d-dwt-and-idwt.html>)