

CompE565, Semester 2020

HW JPEG based Image Compression

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Introduction

In this homework we worked on video compression. With a standard format of IPPPP for GOPs, we had to predict the P frames with the I frame (the reference frame). It was really interesting to see how the error frames can reconstruct the P frames.

Procedural Section

In the readme.m, you will see there are four core functions. There are two scripts, setup.m and SaveOutputs.m. These two layout the solution path and save specific variables that we choose.

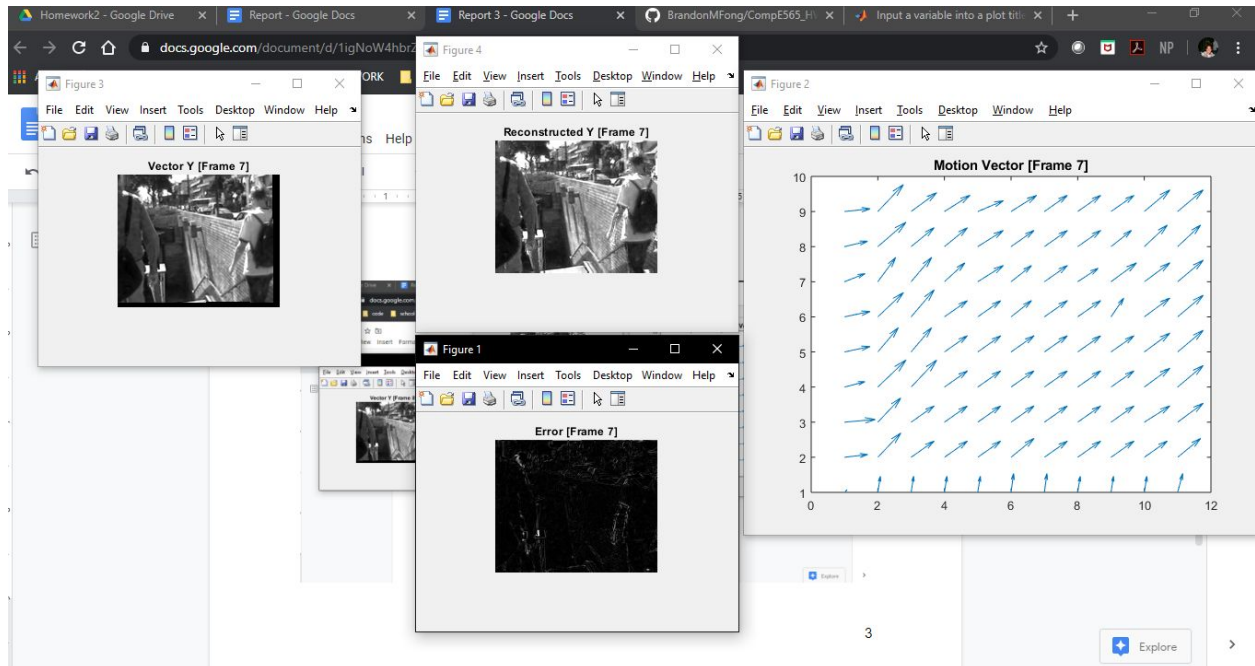
In the GetVideo.m, we initialized the read method for the .avi file. The script checks if the version of matlab can handle reading the .avi file. After the script clarifies that it can read the .avi file, then it initializes a video variable in the project's scope.

In the MotionEstimation.m script, we initialize the generation of the I and P frames. This script calls the search method that generates the search windows that help calculate the motion vectors. The search method returns the motion vectors and the error image. Using these two value sets, we can add them to the original I frame to predict the P frames we want.

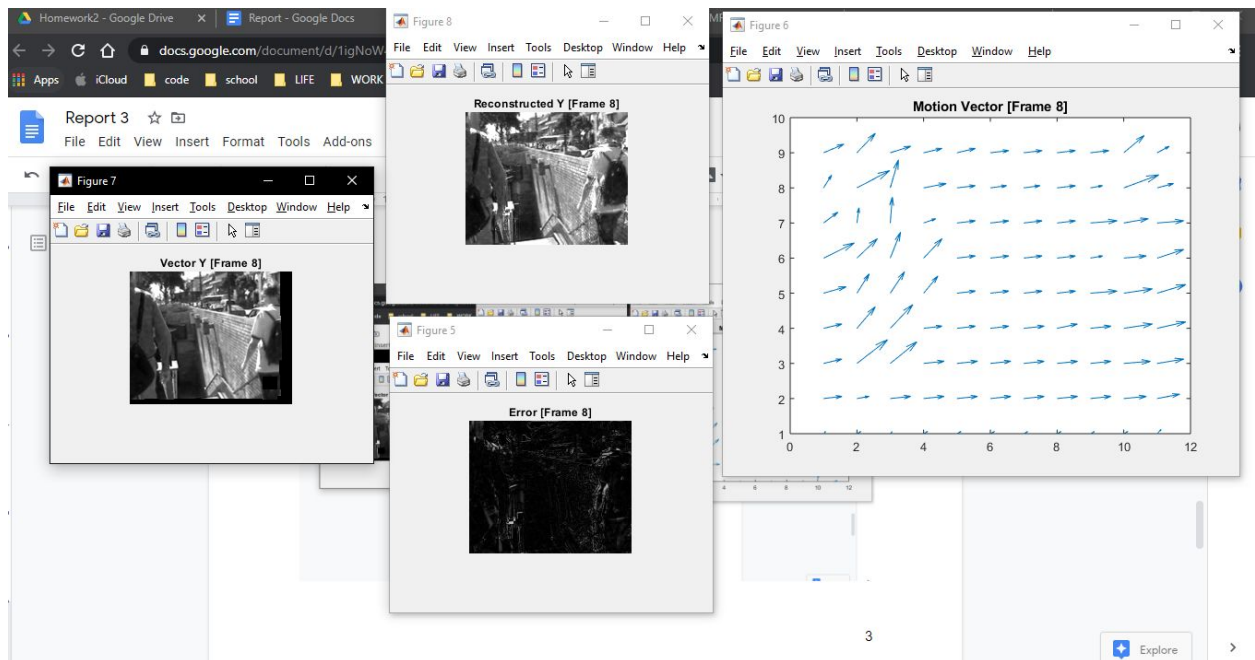
Our program uses exhaustive search algorithm with a search window of 32x32 pixels. That is 961 searches per target macroblock, which is 16x16 pixels, 99 macroblocks per frame and 4 frames were used. This was a very computationally heavy project; however, due to the low resolution of the frames and the computational power of today's computers, it was feasible to use this algorithm.

Results

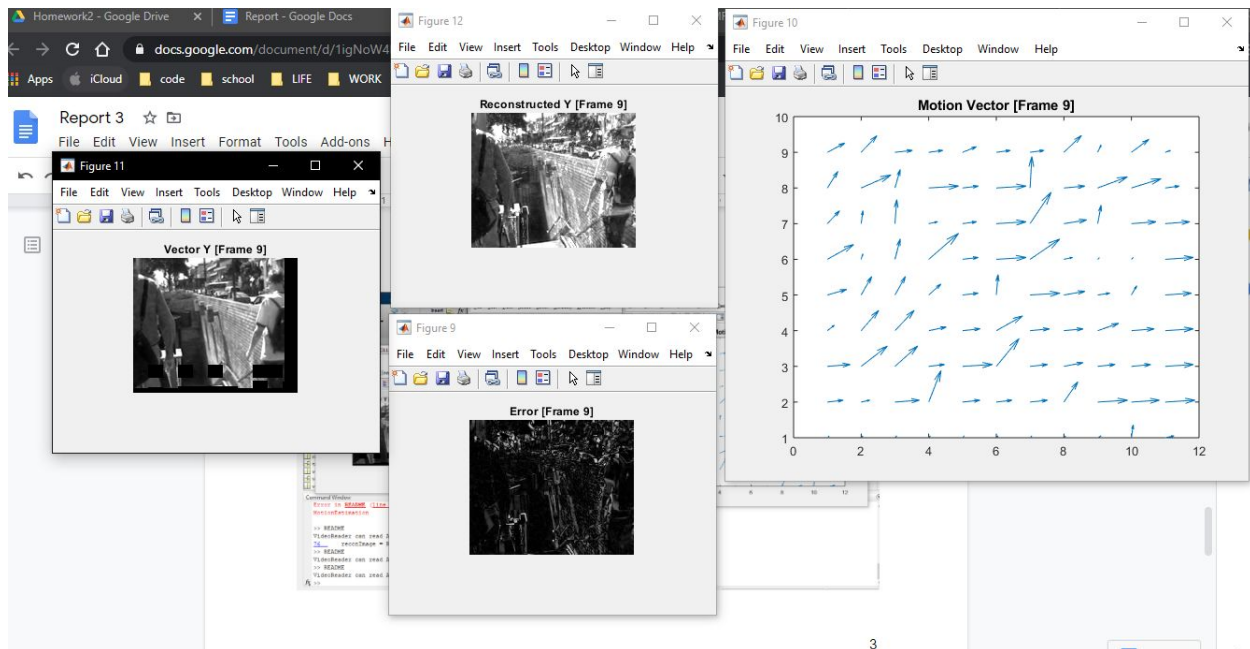
Frame 7



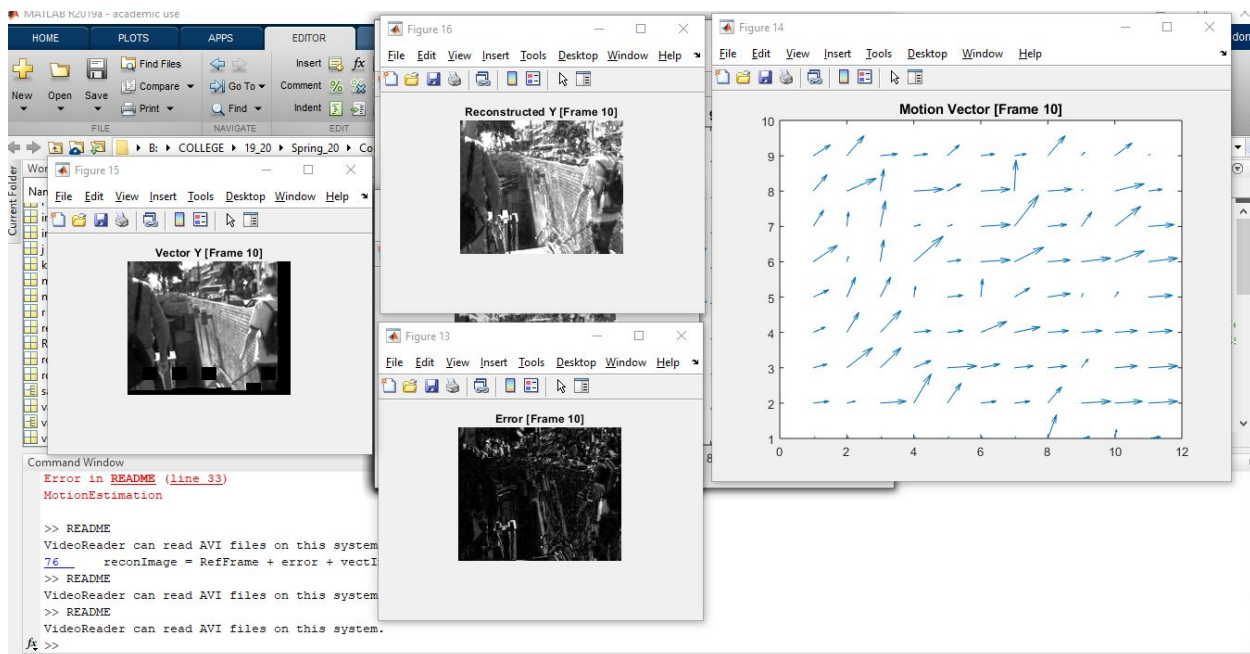
Frame 8



Frame 9



Frame 10



Conclusion

Our reconstructed image is visible but it is too similar to the reference frame. The frame was constructed but it is not predicted. If my partner and I had more time, we would be able to debug this and figure out how to add the vector frame to the reference and the error frame.

We learned a lot in this project. We learned more valuable functions that help us work with video files. With the knowledge we gained here, now that we can extract each frame we are able to conduct DCT and quantization to each frame. This is what we are expecting for Homework 4.