EL304: Final Project Report

Motion Tracking

By Video Enhancement with Spatial Filters

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Project Goal

The goal of this project is to enhance videos in the way so that the moving objects could be detected. Highlight the pixels of the edges of moving objects, which can be achieved through manipulating the spatial domain pixel values of video frames.

Project Background

Motivation

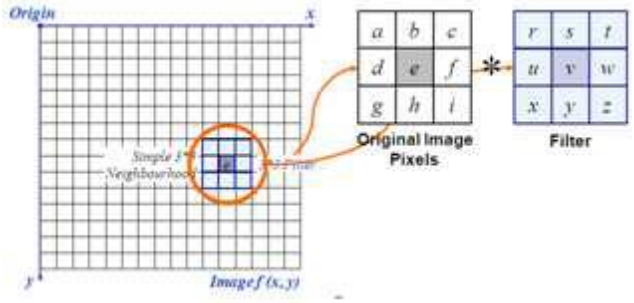
Many techniques of image and video enhancement have been listed in literature and most of them manipulate the spatial domain pixel values. Spatial domain techniques include point to point mapping of pixel values between the original and the enhanced images (contrast stretching), mask processing, histogram equalization etc. And for detecting only the moving pixels in the video frames, spatial analysis comes in very handy.

Background work and State of Art techniques

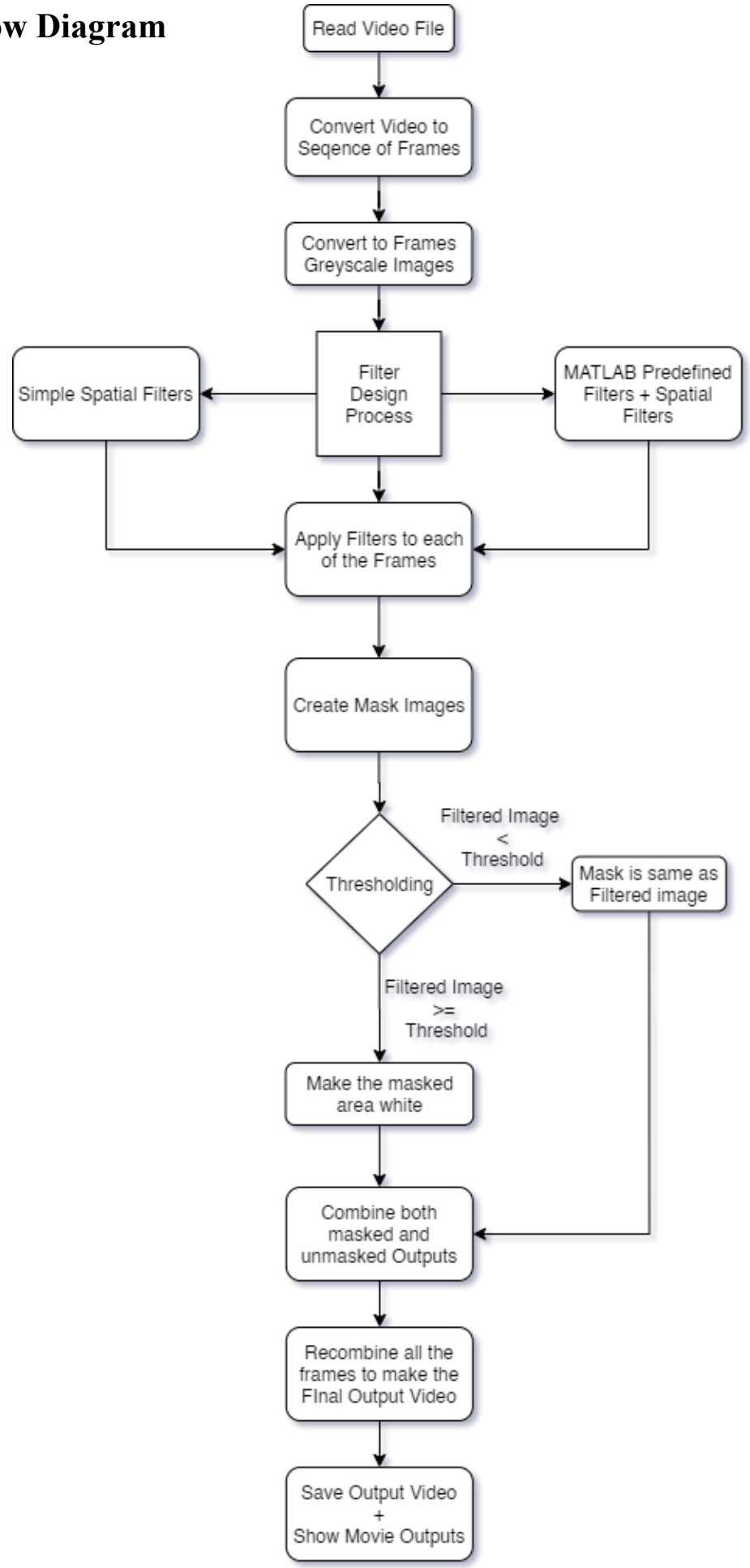
Enhancement methods for image improvement range from simple contrast stretch techniques to filtering and image transforms. The most common technique includes spatial filters which manipulates the spatial domain pixel values. In addition to that MATLAB's Image and Video Processing toolboxes were as much as useful in this project for using much complex predefined filters and then correlating all the masked frames with the filtered ones. And converting and reconverting of video to frames and filtered frames to output video.

Spatial Filters

Filter term in "Digital image processing" is referred to the sub image. Spatial filtering term is the filtering operations that are performed directly on the pixels of an image. The technique is used for changing the intensities of a pixel according to the intensities of the neighboring pixels. Using spatial filtering, the image is transformed based on a kernel H which has certain height and width.



Flow Diagram



Further Improvisation

Since most of the spatial domain coefficients of an image have non-zero values the total number of computations to be performed is directly related to the image size. However, in portable devices energy consumption is a key issue and reducing the number of computations at the algorithmic level will result in substantial energy savings. Many images are compressed using the JPEG standard which uses Discrete Cosine Transform (DCT) for image compression. Manipulating data in the DCT domain is an energy efficient image enhancement technique.

Summary and Future Work

Enhancing each frame of the video is quite a heavy task and this could be solved by compressing each of the frame using DCT and then applying Spatial filter to enhance the video much more effectively and efficiently. By combining both the techniques, Spatial Filtering and DCT this project could be used in portable devices or robotics where energy efficient solutions are required.

MATLAB Code & OUTPUTS

All of the codes and other files could be found on the link given below:

https://github.com/Beezey/Motion-Tracking