

NAME : JOSE JOSEPH THANDAPRAL
NUID NO. : 002102407
COURSE CODE : CS 5330
COURSE NAME : PATTERN RECOGNITION AND
COMPUTER VISION
CRN : 36458
FACULTY : PROF. BRUCE MAXWELL



NORTHEASTERN UNIVERSITY, BOSTON
PROJECT 1

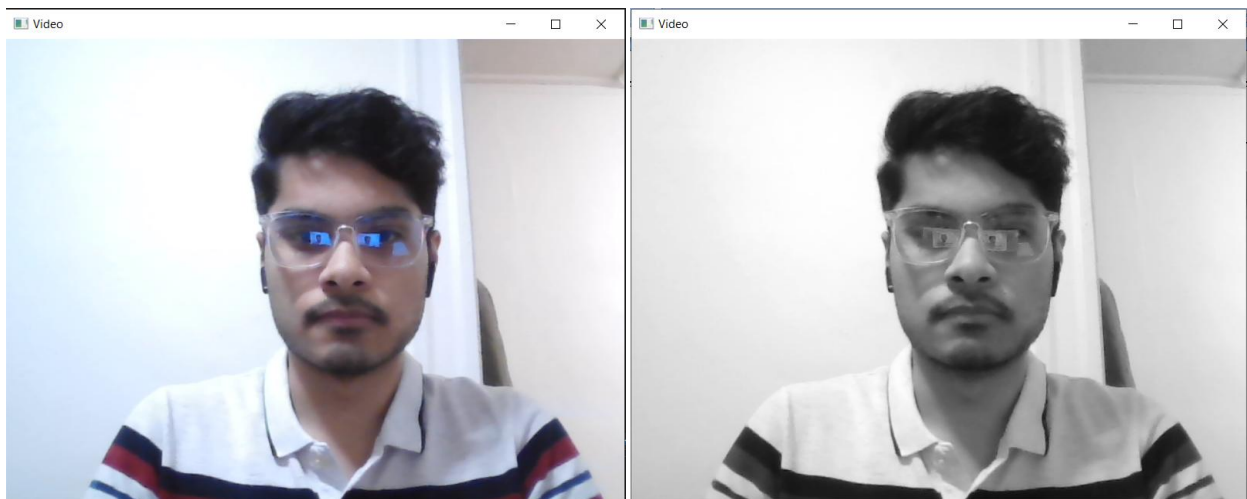
OBJECTIVE

The report includes the results and observations of the first project involving using the OpenCV package to open, capture, manipulate and write images using various filters and convolution. The filters implemented below produce the following effects on the original image: grayscale image(using cvtColor() in OpenCV package), grayscale image(using defined function taking average of 3 color values and assigning to each color space), blurred image using separable Gaussian filters($[1\ 2\ 4\ 2\ 1]$ and $[1\ 2\ 4\ 2\ 1]^T$), X and Y sobel images as 1x3 filters, gradient magnitude image, blurred and quantized color image, live video cartoonisation(involving blurring, quantization and gradient magnitude images) and the negative of original image. Further, the programming allows the user to save the original color frame on pressing the 's' key.

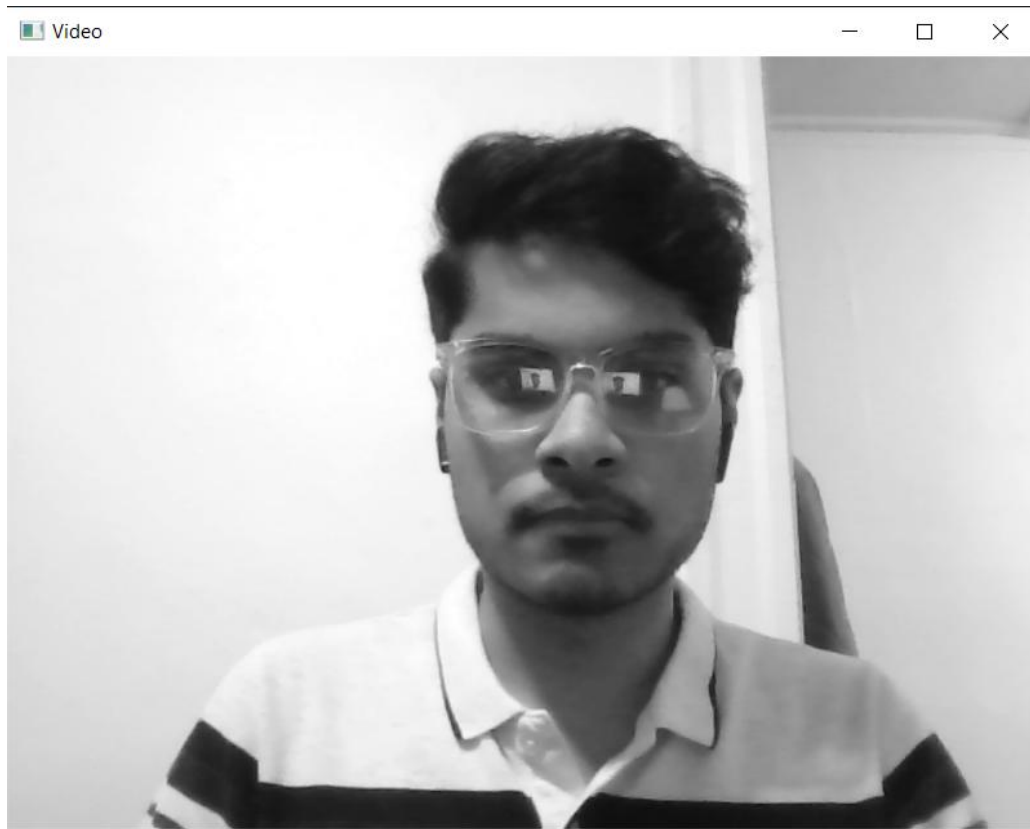
NOTE: The implemented code for the filters on live video frames does not include a filter.h file as the filters are defined in filter.cpp inside the same Visual Studio Code project solution. The function prototypes declared at the top of vidDisplay.cpp call the required functions from filter.cpp

RESULTS

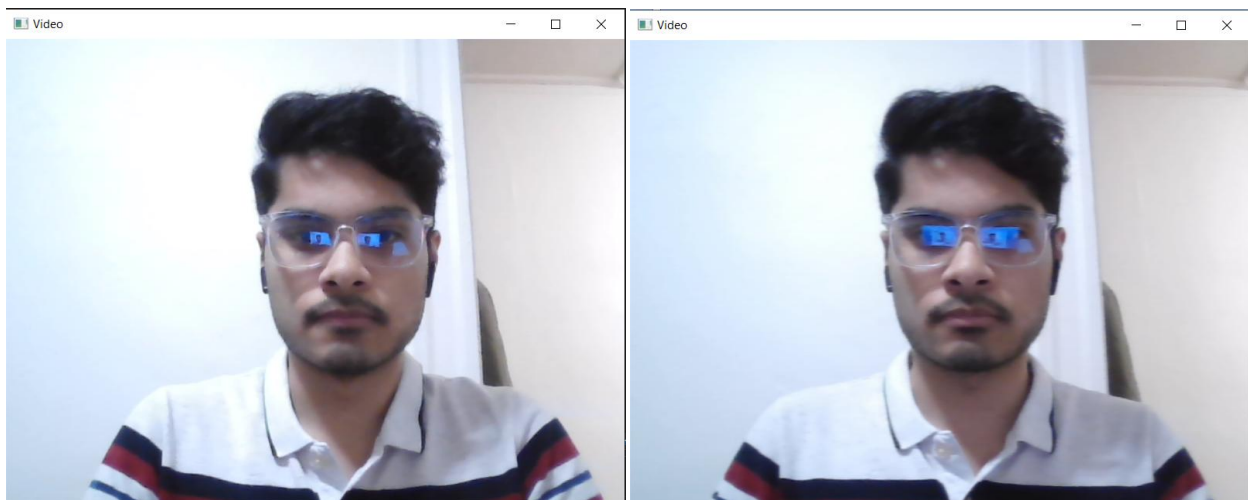
Required Image 1: The original and cvtColor version of the greyscale image



Required image 2: customized greyscale image from function



Required Image 3: the original and the blurred image



Original

Blurred

Image from 3x3 Sobel X filter

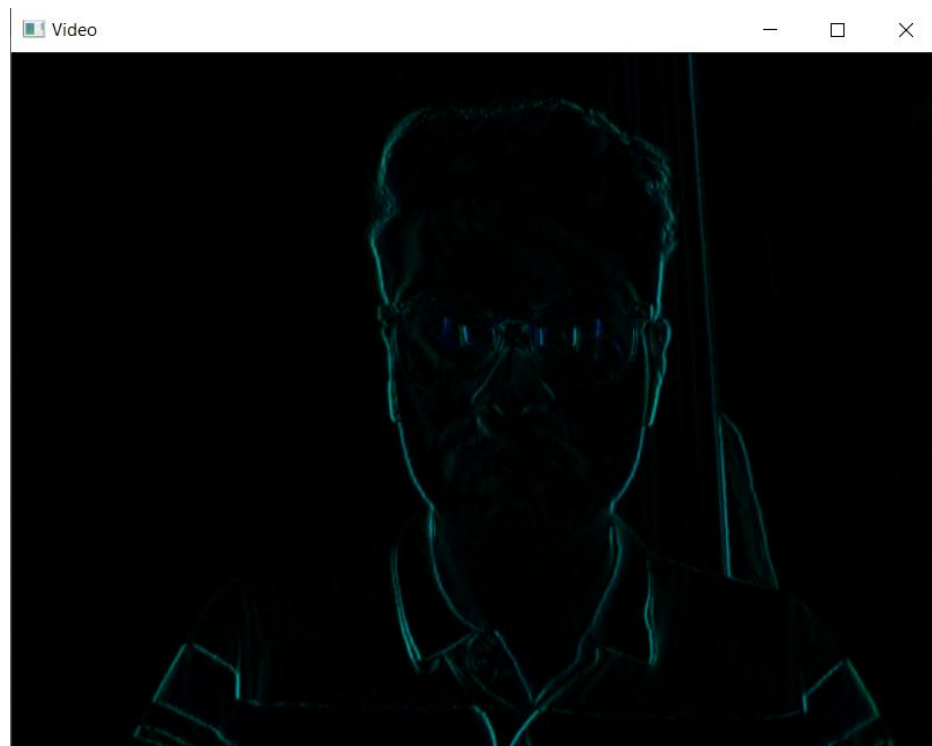
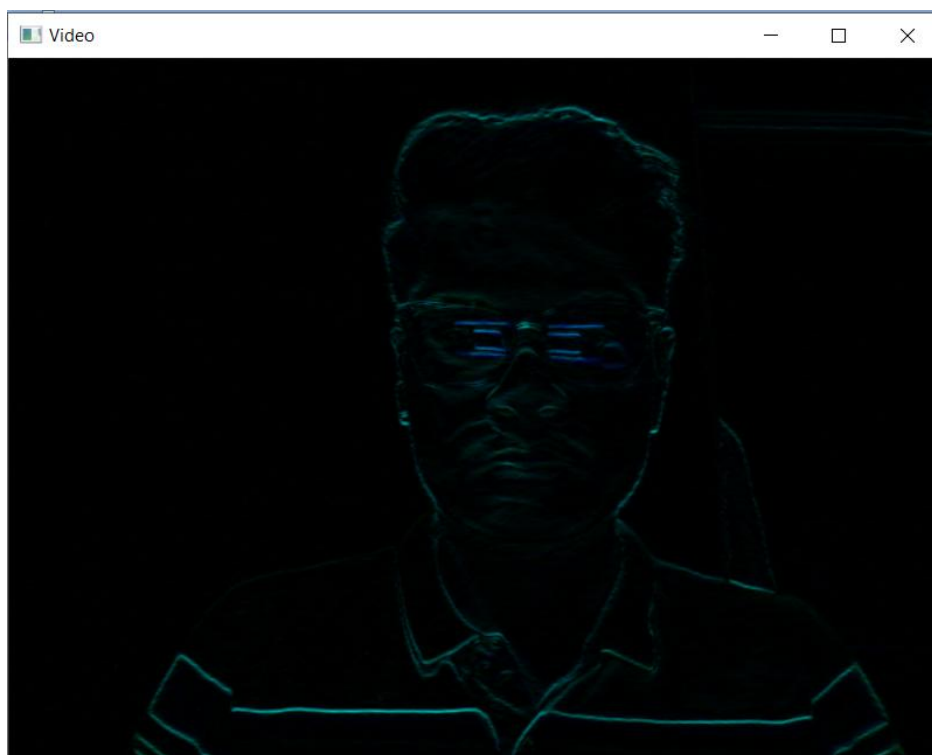
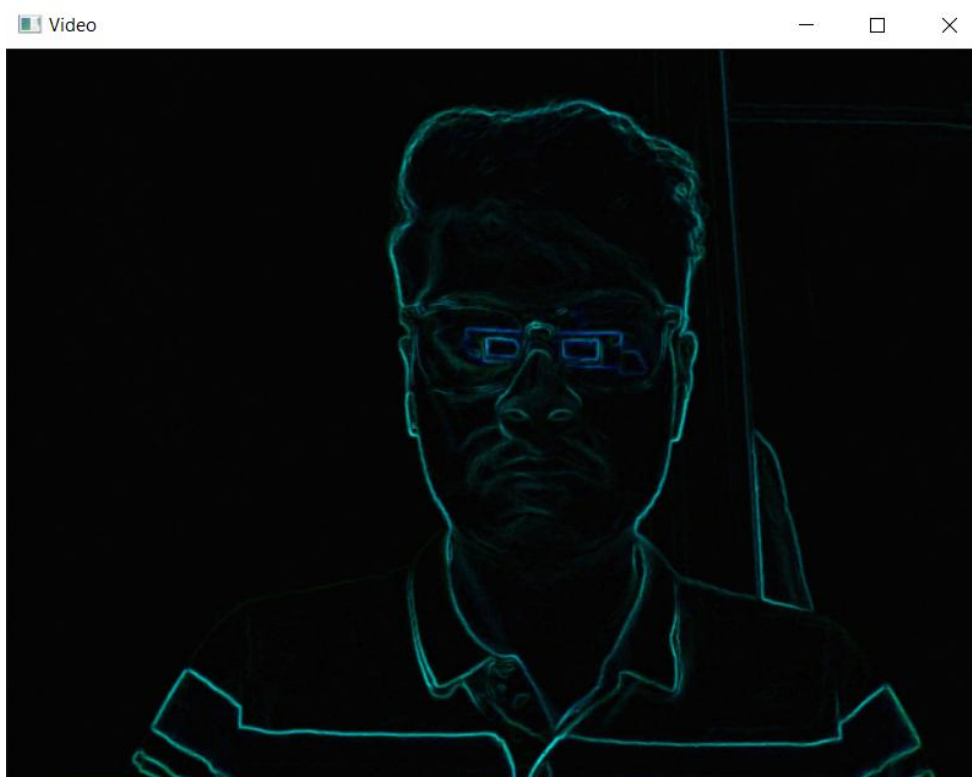


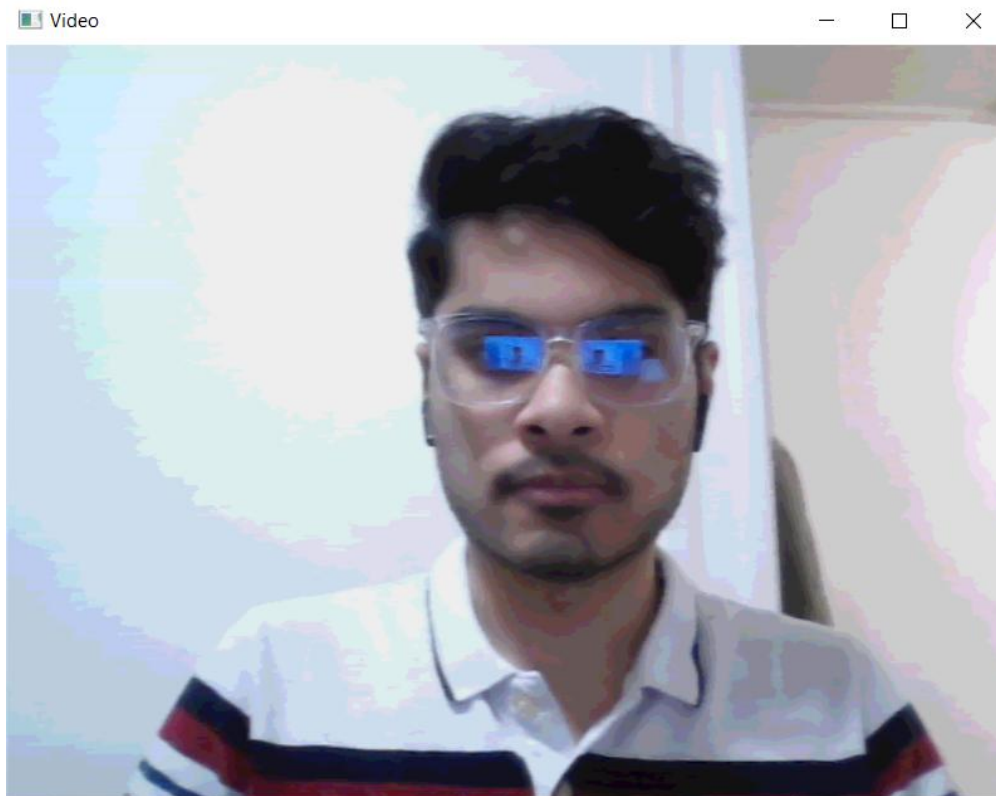
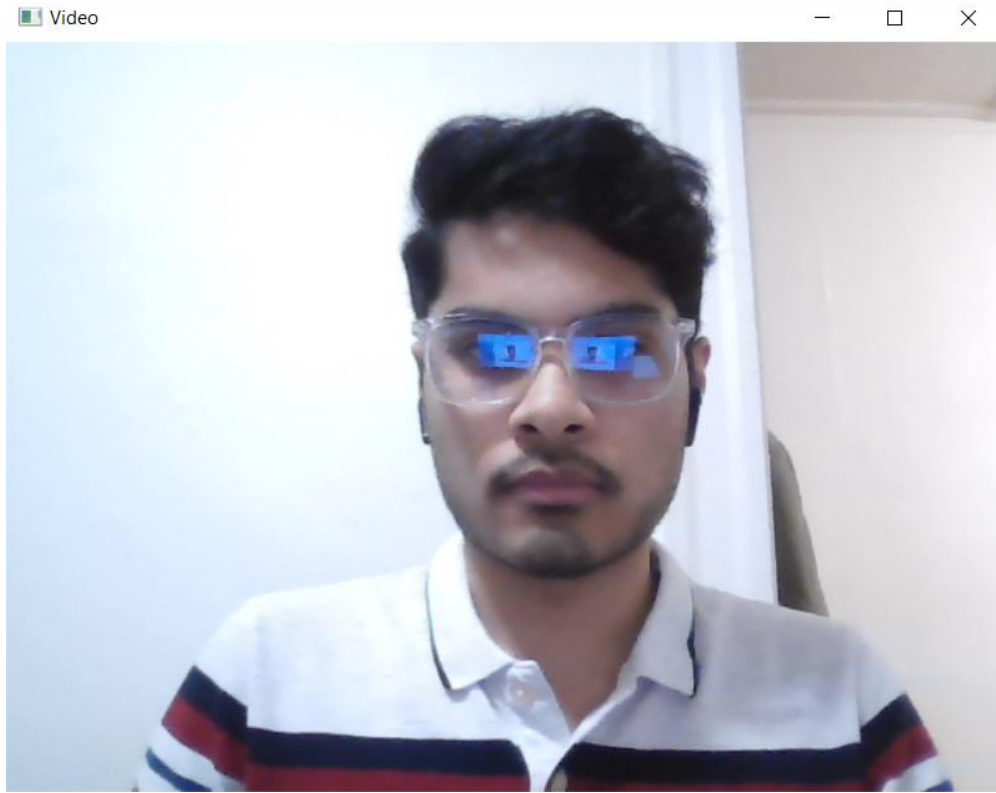
Image from 3x3 Sobel Y filter



Required Image 4: the original and the gradient magnitude



Required Image 5: the original and the blurred/quantized image.



Required Image 6: the original and the cartoonized image in your report.

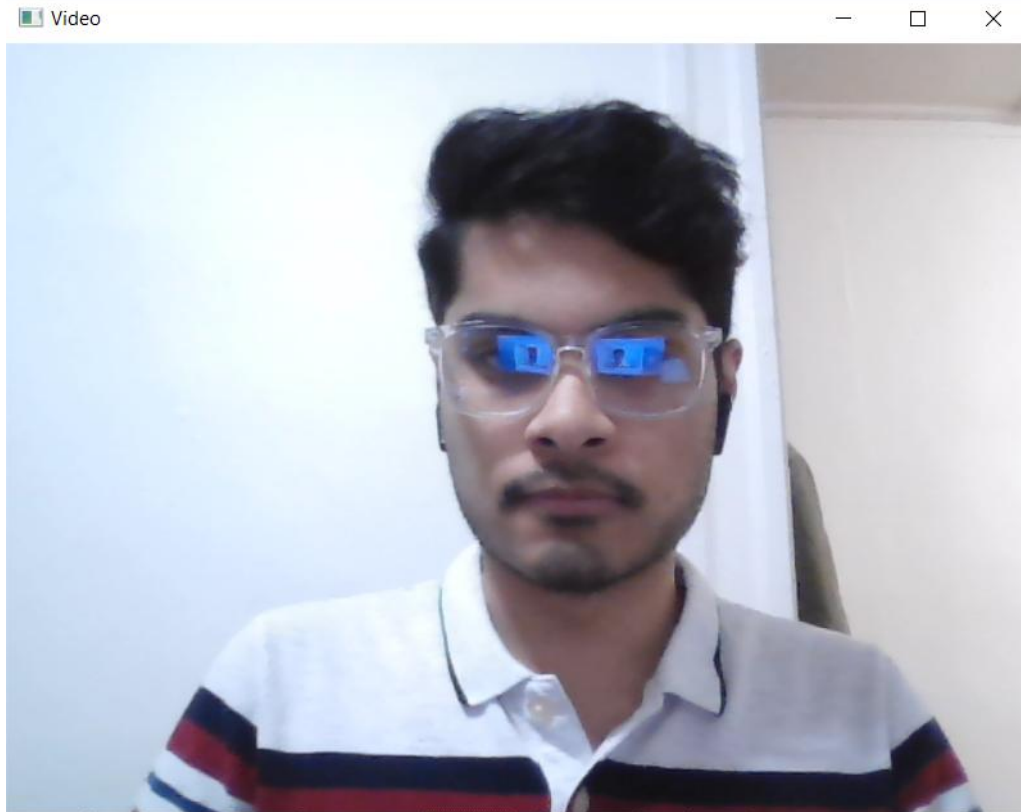
Video



Video



Required Image 7: the original and the modified(negative) image in your report



REFLECTION:

The tasks in the project gave an insight into the mathematical operation of convolution, the efficiency of splitting an $n \times n$ filter into $n \times 1$ or $1 \times n$ filter to be convolved with the image and also the different effects the filters have on images such as blurring, quantization etc. The individual pixel color channel manipulation and associated math also helped understand grayscale image conversion.

ACKNOWLEDGEMENT AND REFERENCES:

- [Computer Vision: Algorithms and Applications, 2nd ed. Links to an external site.](#), Rick Szeliski
- <https://www.youtube.com/watch?v=KuXjwB4LzSA> : 3Blue1Brown video on convolution
- OpenCV documentation :
https://docs.opencv.org/4.x/d7/dfc/group_highgui.html#ga5afdf8410934fd099df85c75b2e0888b