

CS5330-Project-1-Report

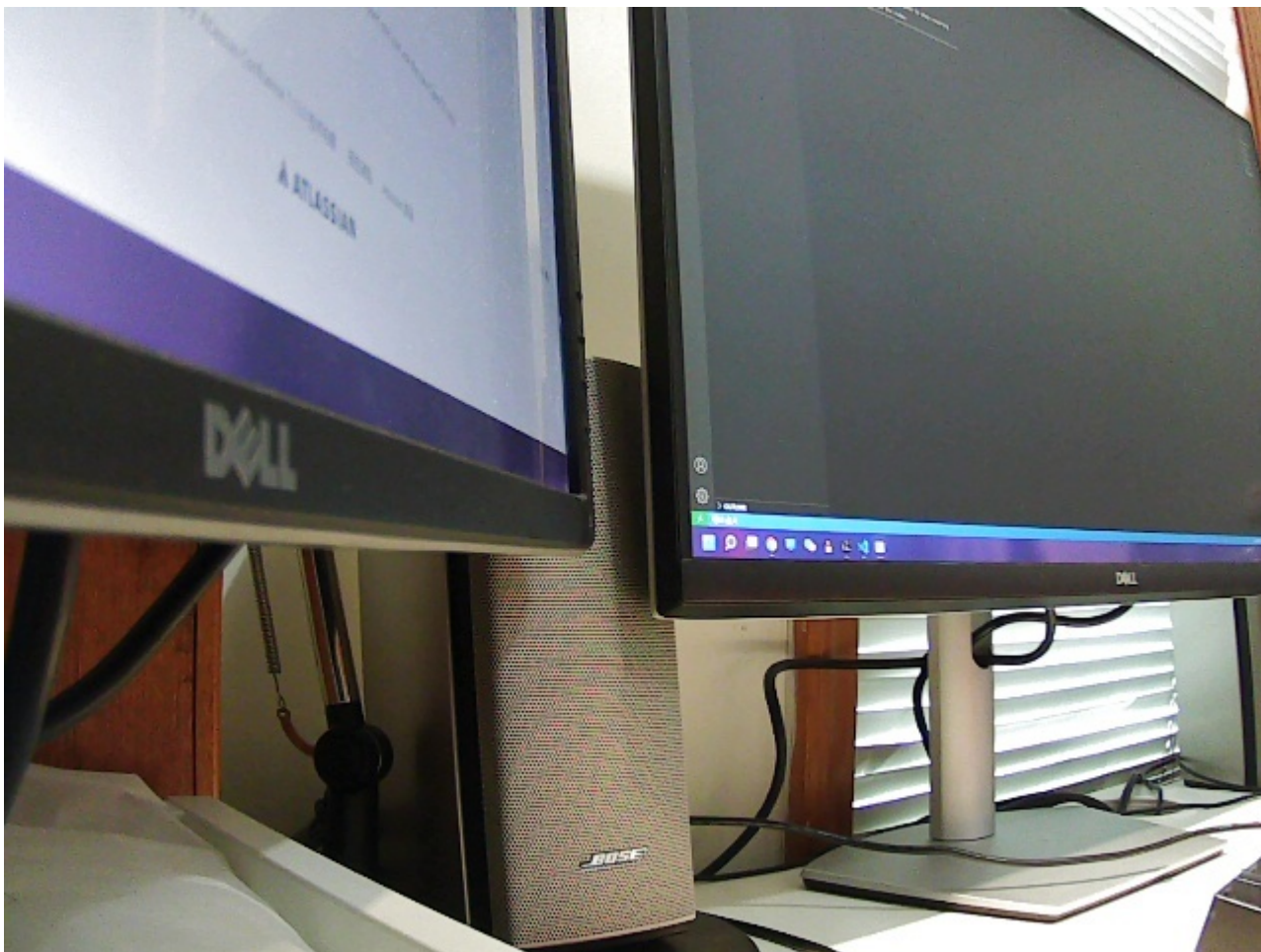
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Summary

For this project, the main purpose is to understand how the opencv module works in C++, and acknowledge why the operations can modify the image or video. The filters implemented in the project include: Gaussian blur filter which blurs the image/video, Sobel X filter and Sobel Y filter which detect the horizontal and vertical edges where has a strong magnitude, quantize filter which shrinks the amount of colors in the image or video. Also, the cartoonize filter, which is combined by blur filter and quantize filter. As for the last task, which is picked by ourselves, I chose to implement the capability to allow users to adjust the brightness and contrast. All filters or effects implemented will not only be applied to the frame, but all frames, which means the entire video. All filters work properly and effectively: all operations are done pixel by pixel, and separated filter does a faster job. From the manipulations made by the filters, I learned how do pixels get changed not only their values but also the data types. Moreover, I think I got a deeper understanding about the data type, or say the carriers that make the manipulations, like how does Mat type stores the data of an image, and how to access them, since during my working, it's not rare to change the data type of the values inside the Mat type accordingly.

Core Project

The first image is the saved image by pressing 's', which is the unmanipulated version.



The second one is the grayscale version implemented by opencv build-in function.



The third one is the grayscale version implemented by manually compute the value of grayscale for each pixel according to it's original colors of three channels. The equation that calculates the value of grayscale is weighted, so there's no big difference between the one computed from build-in functions.

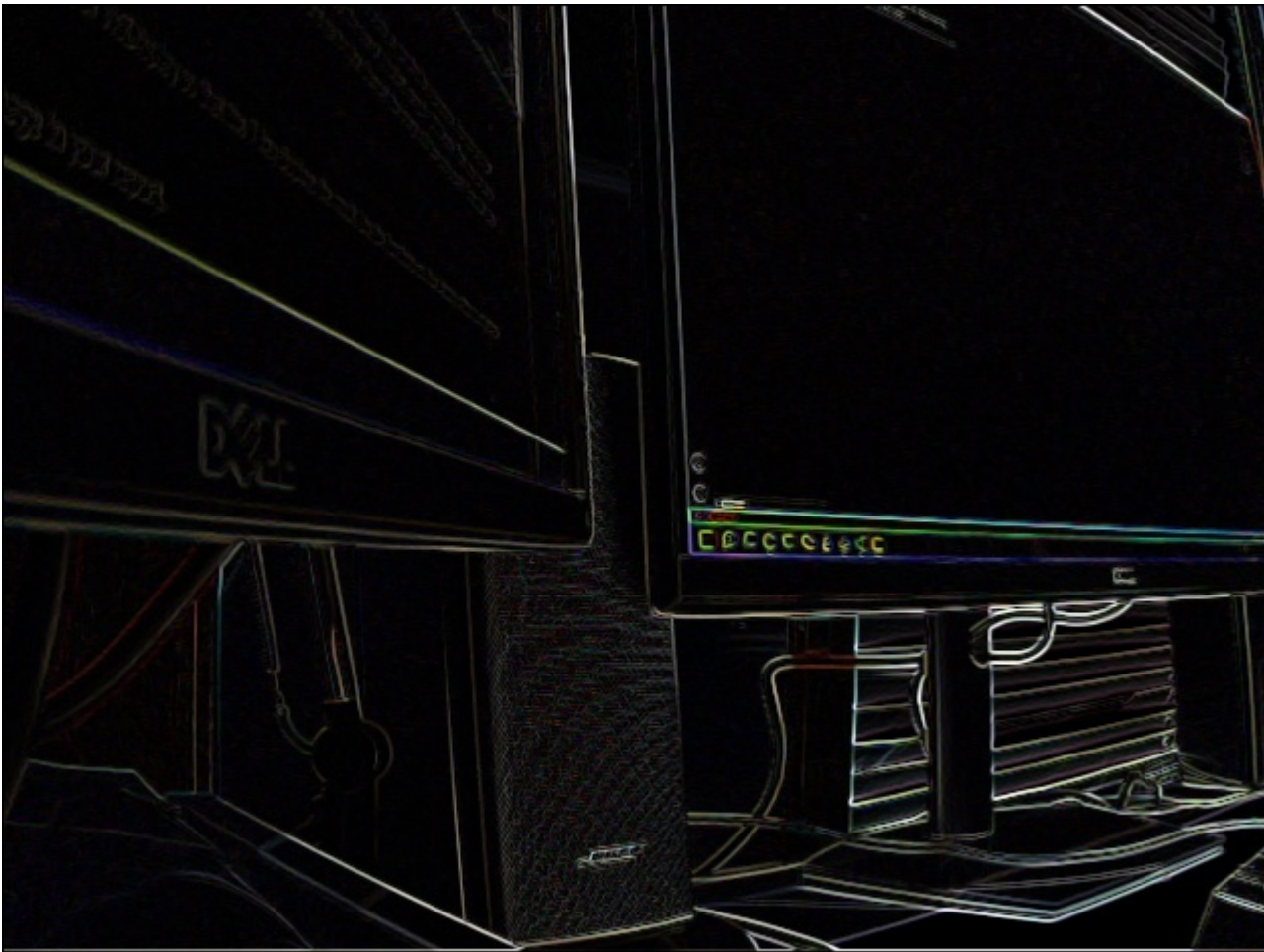


The forth one is blurred image by Gaussian blur filter.

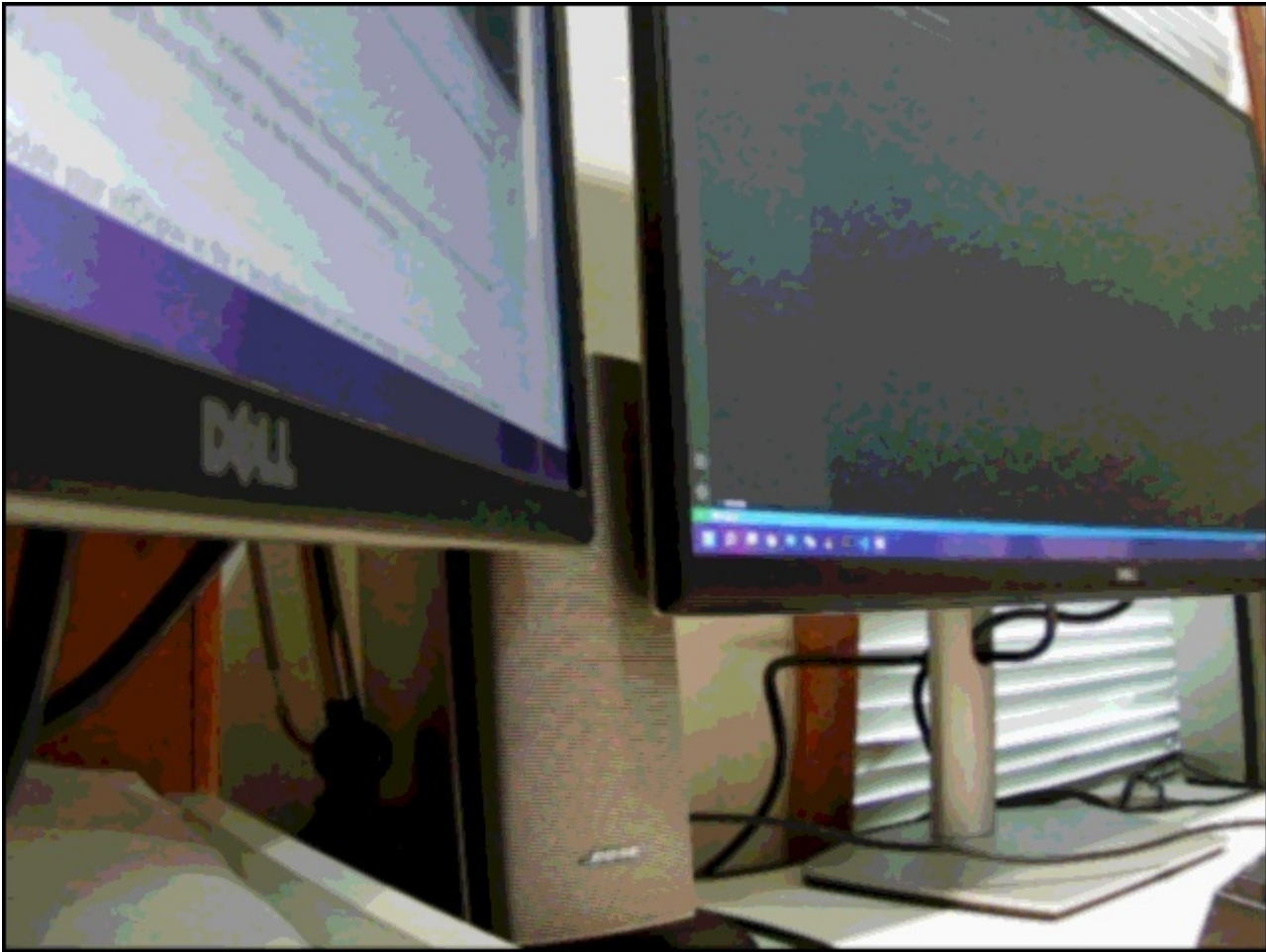


For the fifth one, I got three images from Sobel X filter, Sobel Y filter, and magnitude image.

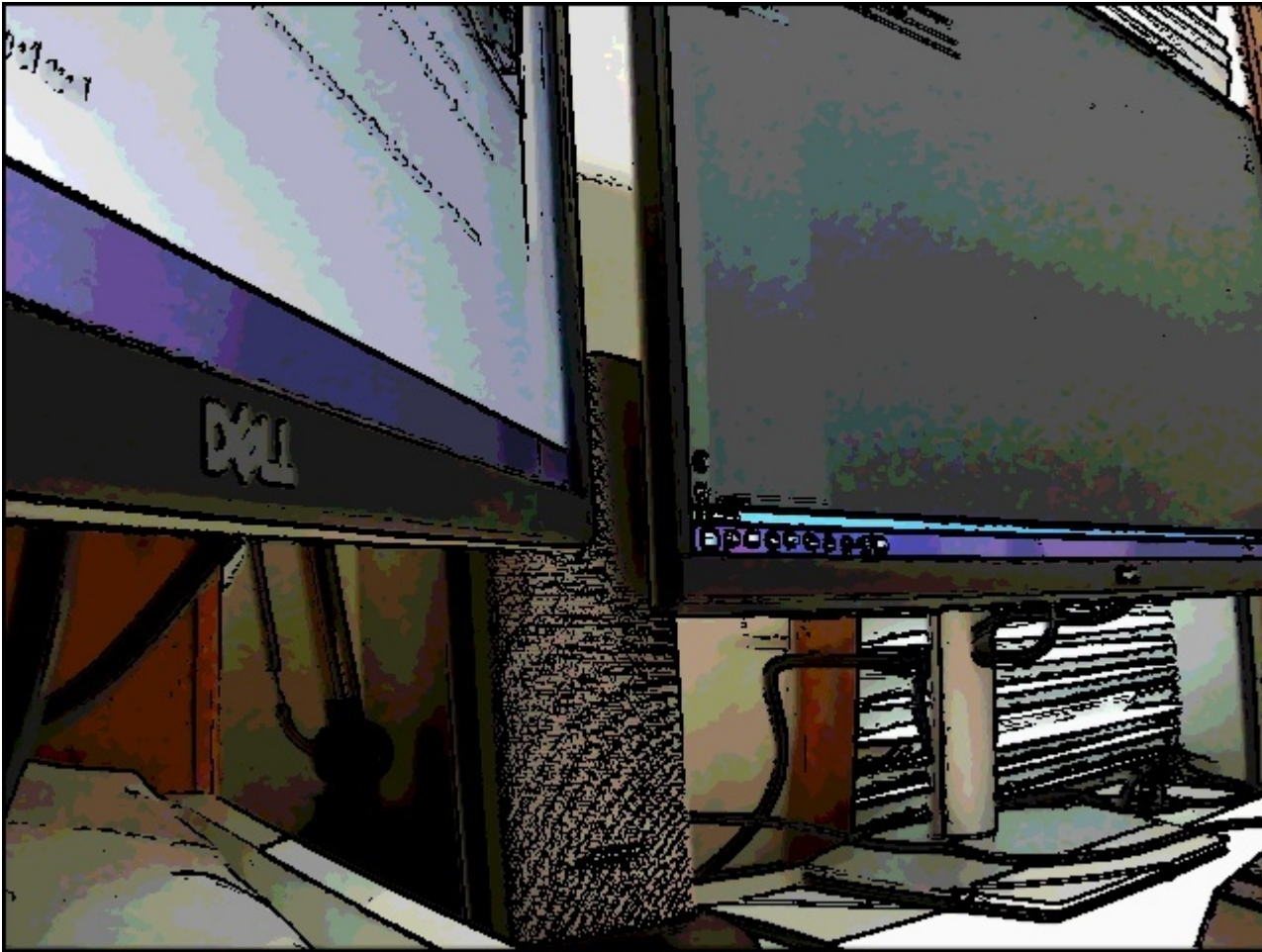




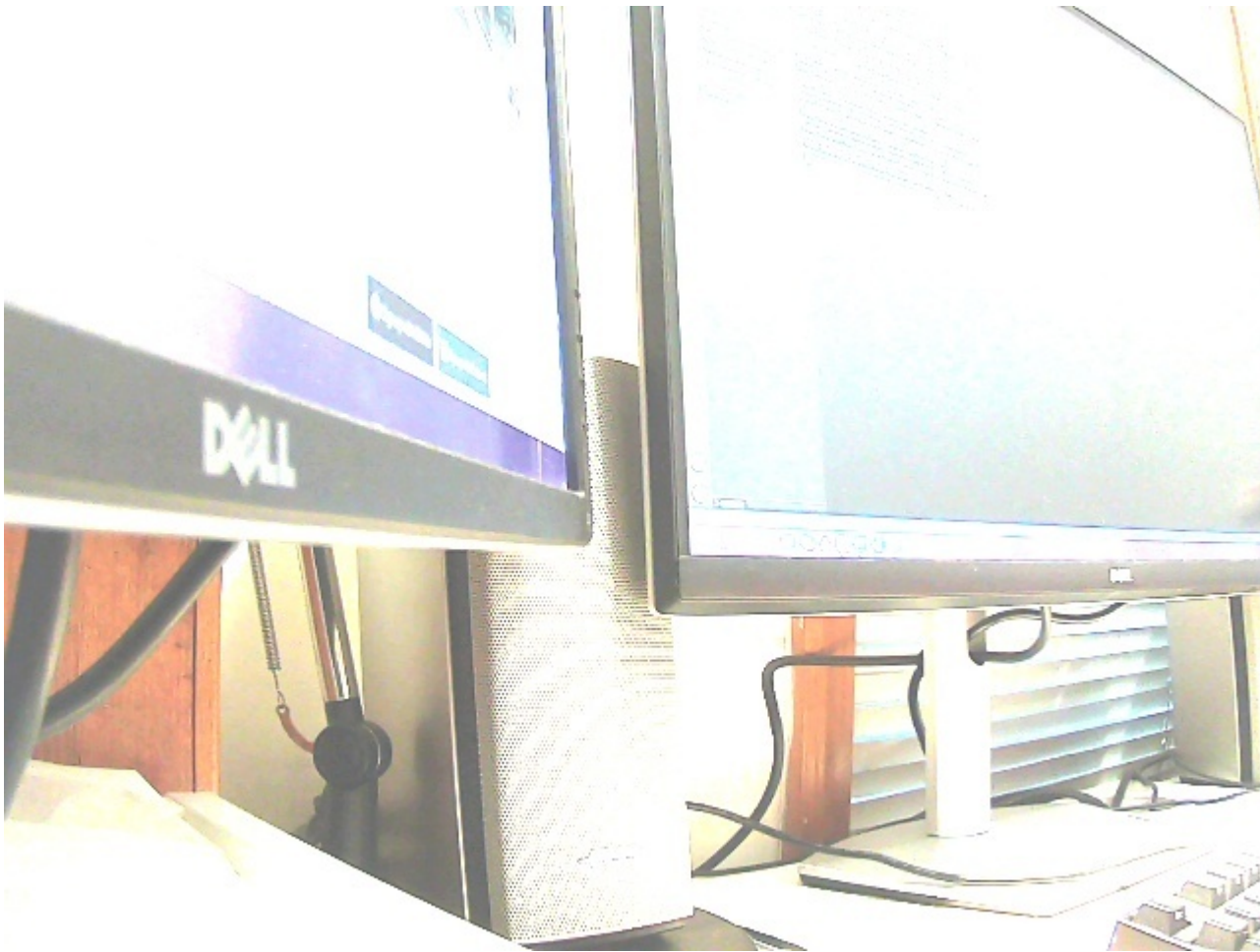
The sixth one is the image that was blurred and then quantized according to quantize level 10.



The seventh one is the cartoonized image, according to quantized level of 10, and threshold of 15

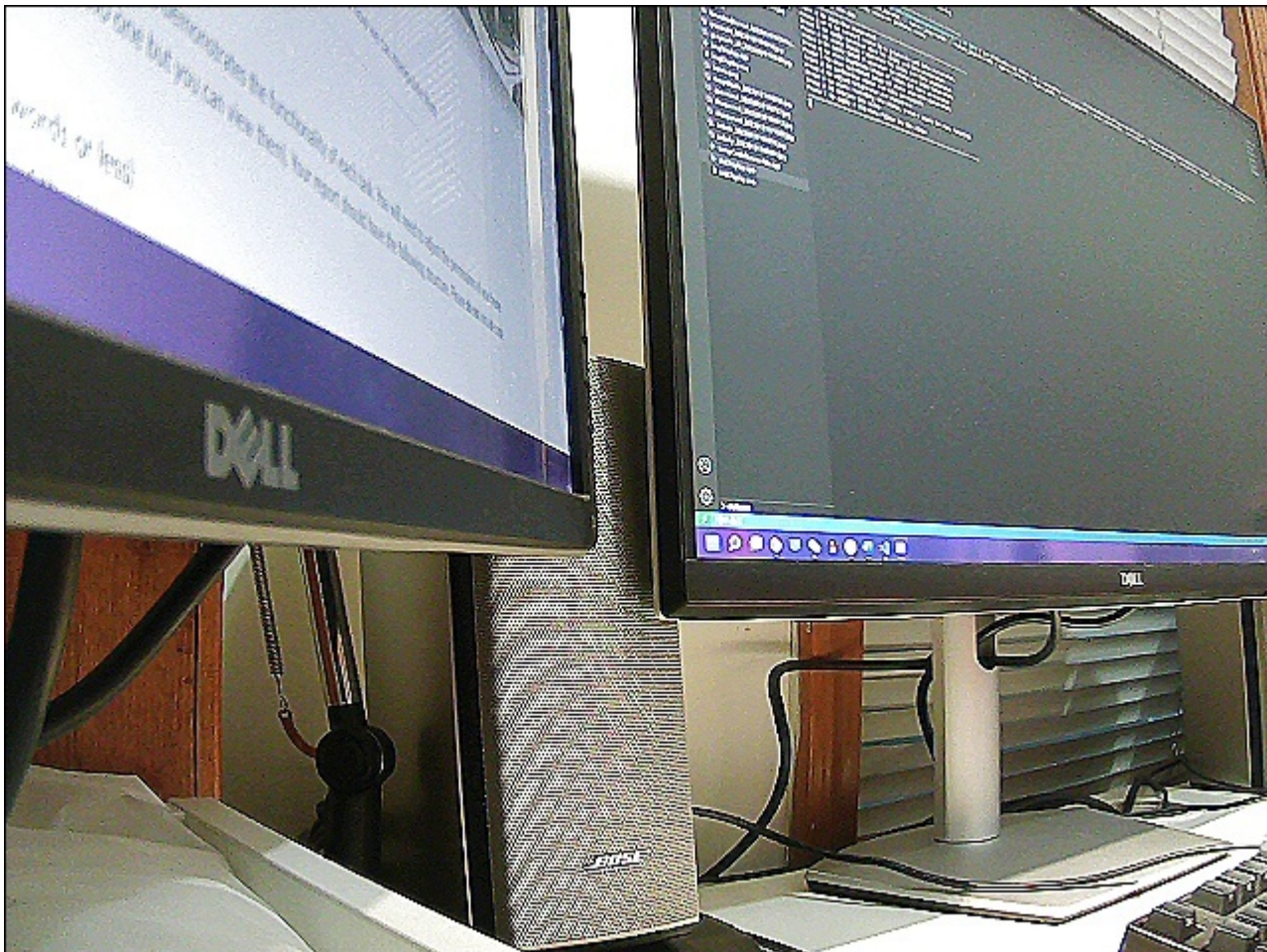


The eighth one is image with low contrast, high brightness

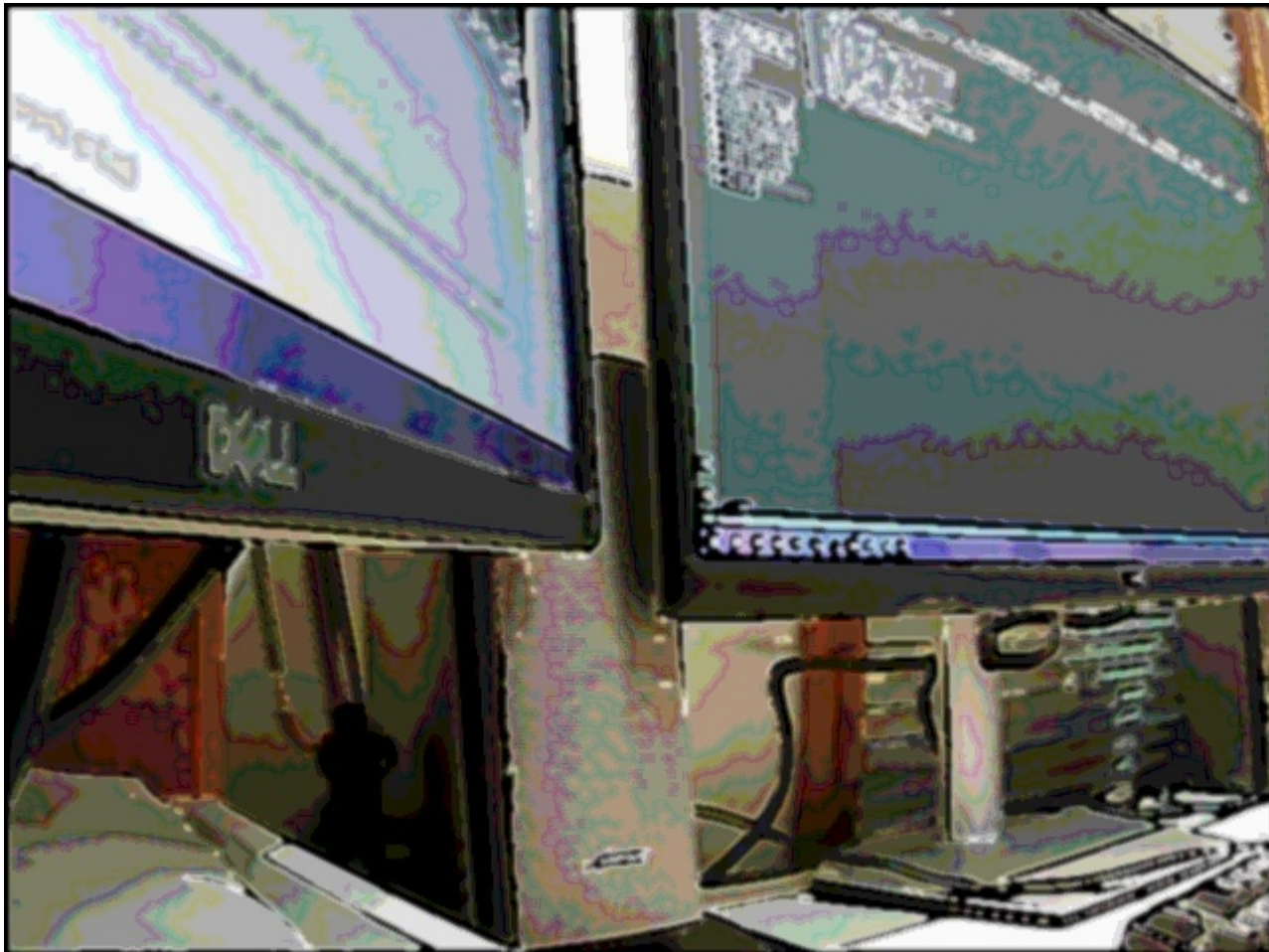


My Extensions

I scratched a sharpen filter which sharpens the image. The following images are the comparison between original image and sharpened image.



Second, I implemented a new filter by combining previous filters as one. The following images are the comparison between original image and new image.



Also, I added one more function that allows users to select whether they want to edit the live video or a selected still image when the program gets started. Image edition has the same filters to the video edition.

The last extension I achieved it to save a cut of video with different effects applied. The following is the link to video recorded.

<https://drive.google.com/file/d/1AKeAzD8AV5x4QKIFxD4GUQDHRpmNZOiv/view?usp=sharing>

Acknowledgements

I searched a lot on opencv about how do the filters be applied to the images, and many searches on geeksforgeeks about some C++ syntaxes.

Reflect

The project makes me to understand how do the data types act in the image or video operations. There are many times that I input a type and output another type. At that situation, I must make the correct conversion between the images, or the final image might be shown in a totally different size or wrong at something. Furthermore, the project forced me to have how does the data of an image be stored in the Mat data type, many operations at pixel level require me to access the correct data or extract the correct data from Mat. For example, my output has been rotated once, because my rows and cols was reverted.

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