Image Blur

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Preparation and Research

TGA Image

One of the two main topics that needed a research is properties of the TGA file format. This is necessary to read all the possible data for future work with pixels as well as to write a file properly, without missing anything. So TGA file format is usually consists of two main parts: TGA File Header and Image/Color Map Data.
The Header is storing 5 properties of the image:

- Length of image ID
- Whether the color map is included
- Image type (Compression and color types)
- Color map specification
- Image specification (Dimension and format)

Image/Color Map Data includes:

- Image ID
- Color map data
- Image data

The above information was taken from Wikipedia, Truevision TGA (https://en.wikipedia.org/wiki/Truevision_TGA)

Blur Algorithms

The second topic that was researched is possible algorithms for blurring images. It was found out that there are 3 main algorithms for such purpose.

Box blur (https://en.wikipedia.org/wiki/Box_blur)
Box blur is a linear filter. Main idea of which is to change pixel value in a resulting image to the average value of neighbor pixels from input image.
Median blur (https://en.wikipedia.org/wiki/Median_filter)
This is non-linear technique. The main idea of the median filter is to run through the signal entry by entry, replacing each entry with the median of neighboring entries.
Gaussian blur (https://en.wikipedia.org/wiki/Gaussian_blur)
Gaussian blur is another algorithm for smoothing images. It recalculates pixel value by applying Gaussian formula to each, that takes into account neighbor pixels and their importance decreasing with pixel distance from targeted one increasing.

Due to the fact that Median filter best works with reducing noise, and this is not a main objective by task definition, this option was eliminated. Gaussian blur performs better work for radial blurring and edge detection in comparison to box. Despite Gaussian is slower, it was chosen as quality of final image was prioritized.

Description of the program overall

The program is separated by 4 main parts. ‘Main.cpp’ is responsible to combine the rest together and run the program. TGAImage and WriterTGA a processing reading the image data and writing the updated image to a new file. GaussianBlur contains blur algorithm implementation. The code has accompanying comments to explain all the processes step by step.

Memory usage and organization
Nearly all arrays and vectors that are present in the code are created locally in the function, meaning that memory frees when function is complete. There are no dynamic arrays in the program. All the objects created in main function are later deleted through destructor.

Input restrictions

Source and output images path should be entered as following:
Path/source_image_name.tga and Path/output_image_name.tga
Coefficient of blur should be between 0 and 1.
Program supports only .tga files, however, both 24 bits and 32 bits images are valid.
Maximum image size should be 200x200 px.

Compiler version
Apple clang version 12.0.0