

30.11.2020

GAZI UNIVERSITY Faculty of Engineering
Computer Engineering
INTRODUCTION TO IMAGE PROCESSING
CENG471
Assignment 1

Overview

The aim of this project was to separate the images in the three-color channels and automatically format them and align them with each other. After alignment, images need to be added to the red, green and blue channels to create a single-color image.

Method

I obtained each image by dividing the overall image into three. The margins of each channel image are removed by 10% cropping from both sides to create modified images with alignment. Cropping removes border areas that are not part of the actual image. Since these edges are different in each channel, the edge breaking process can confuse the alignment measure. Cropping the image in this step is not important. However, better results are obtained when cropped.

The easiest way to align parts is to search extensively on a window of possible displacements, score each using some image matching measure, and get the replacement with the best score. I also applied the alignment ranging from [-15, 15]. I used "for loop" for this. My program has aligned the pictures by repeatedly scrolling and scrolling according to the best score I have achieved with the NCC algorithm.

Image matching is achieved by moving the R and G channels over the B channel with a certain movement and using a metric to determine which position of the R and G channels on the B channel is best. I aligned it using the normalized cross-correlation NCC algorithm. Normalized correlation is one of the methods used for template matching, a process used for finding incidences of a pattern or object within an image. It is also the 2-dimensional version of Pearson product-moment correlation coefficient [1].

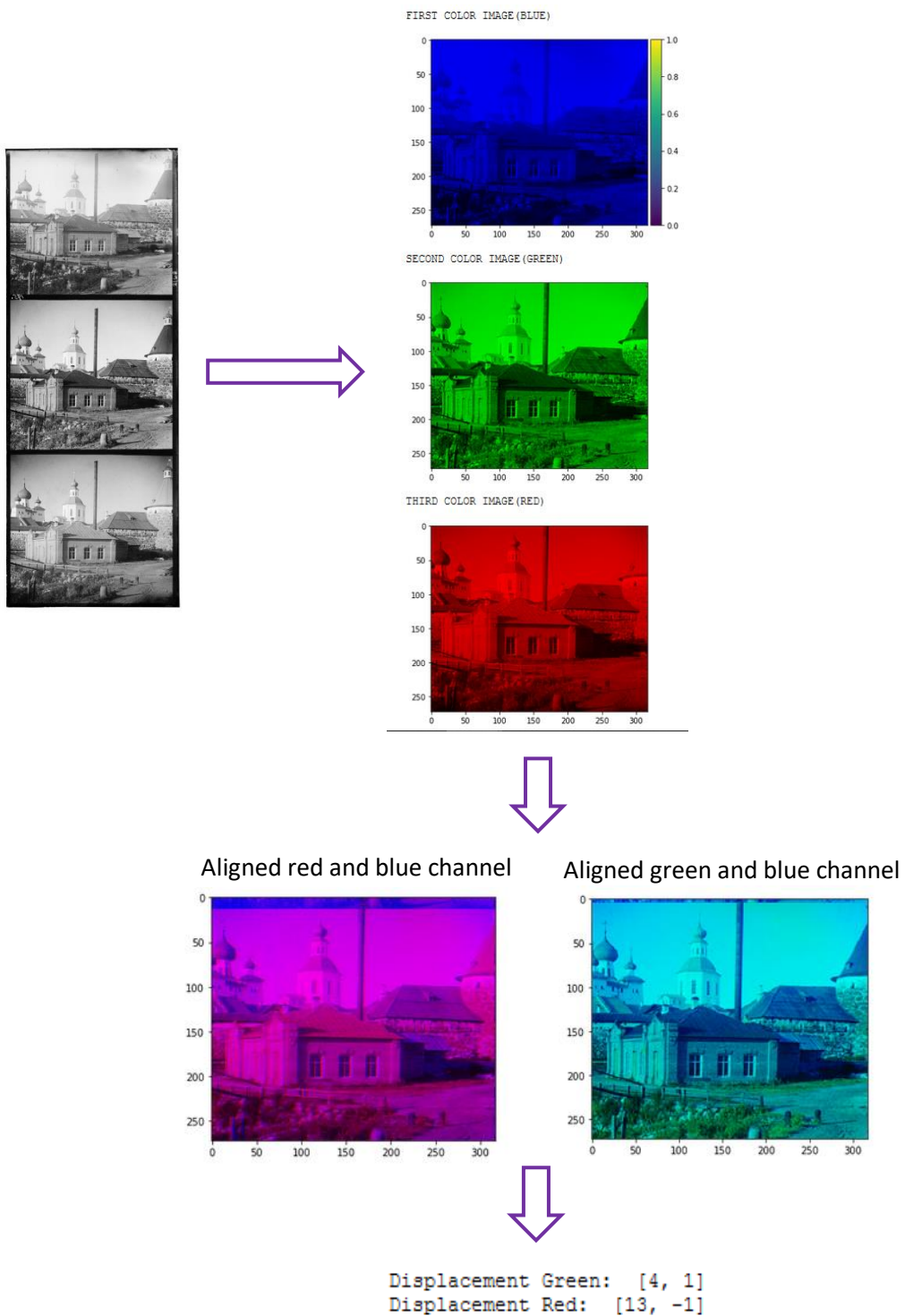
Result

The algorithm used, NCC, was not good in place when generating the best score. For this reason, there were shifts in some places. More advanced algorithms can be used to correct these shifts. In this way, this situation is eliminated. Below are the stages of the pictures:

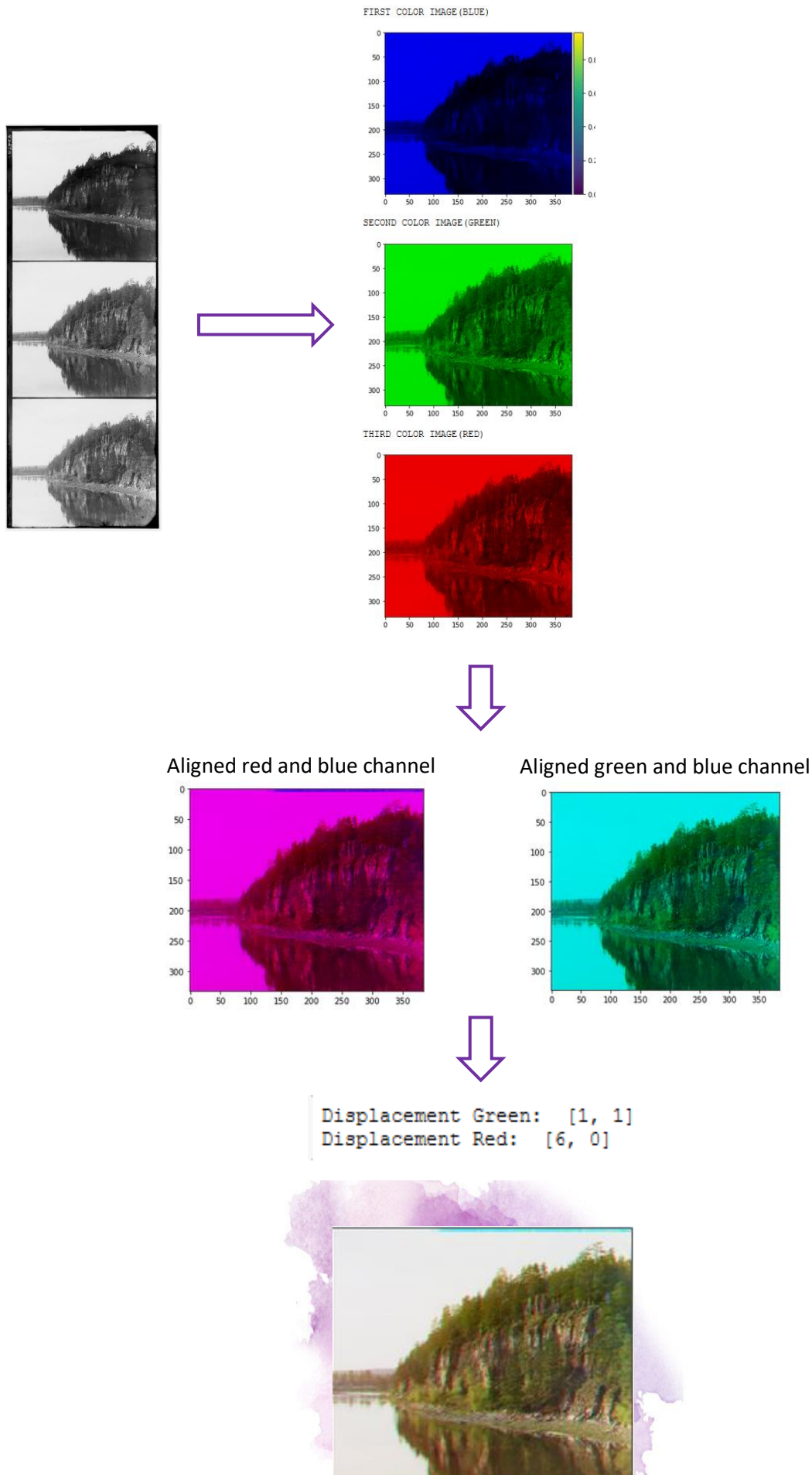
Reference

[1] [https://en.wikipedia.org/wiki/Cross-correlation#Normalized_cross-correlation_\(NCC\)](https://en.wikipedia.org/wiki/Cross-correlation#Normalized_cross-correlation_(NCC))

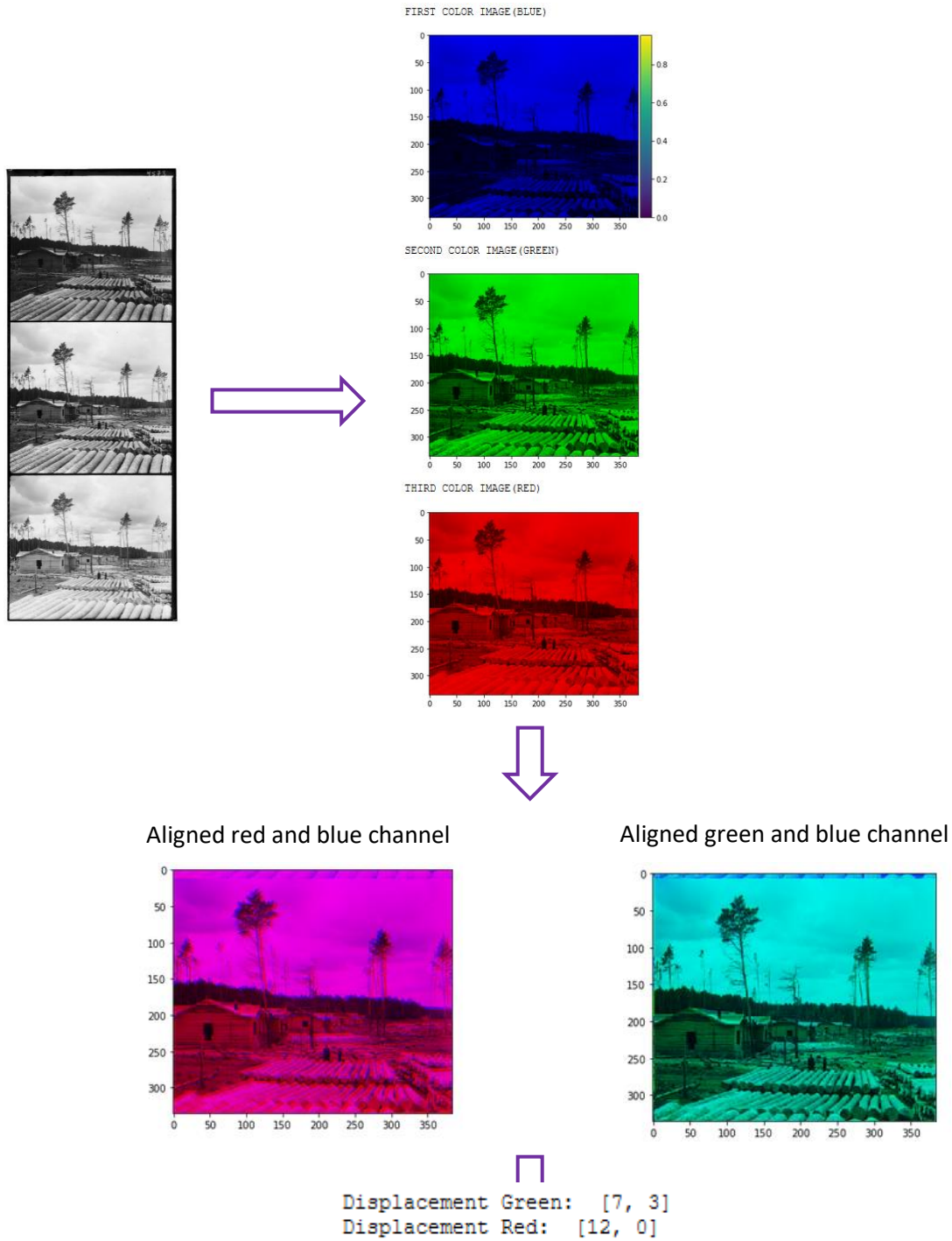
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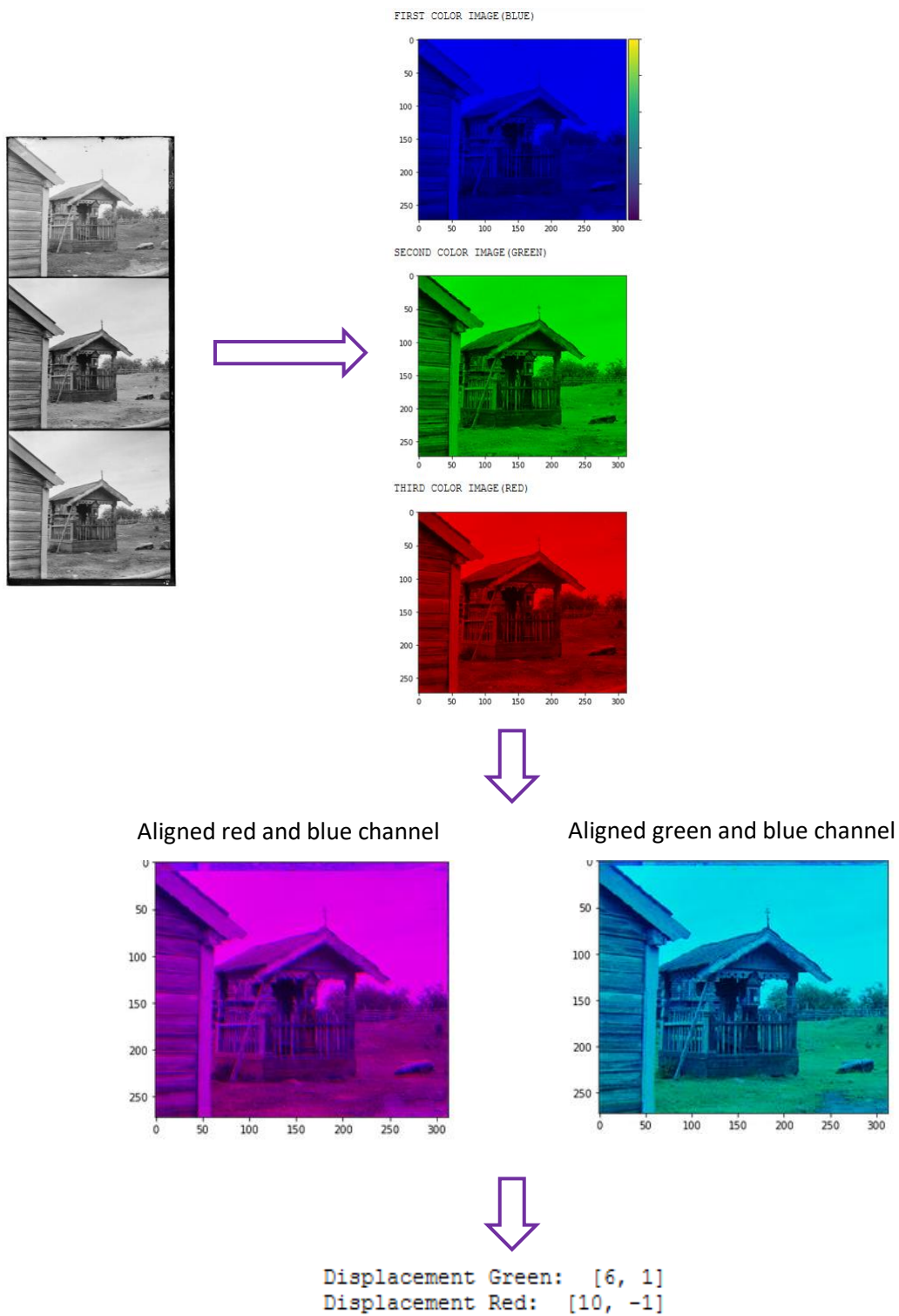
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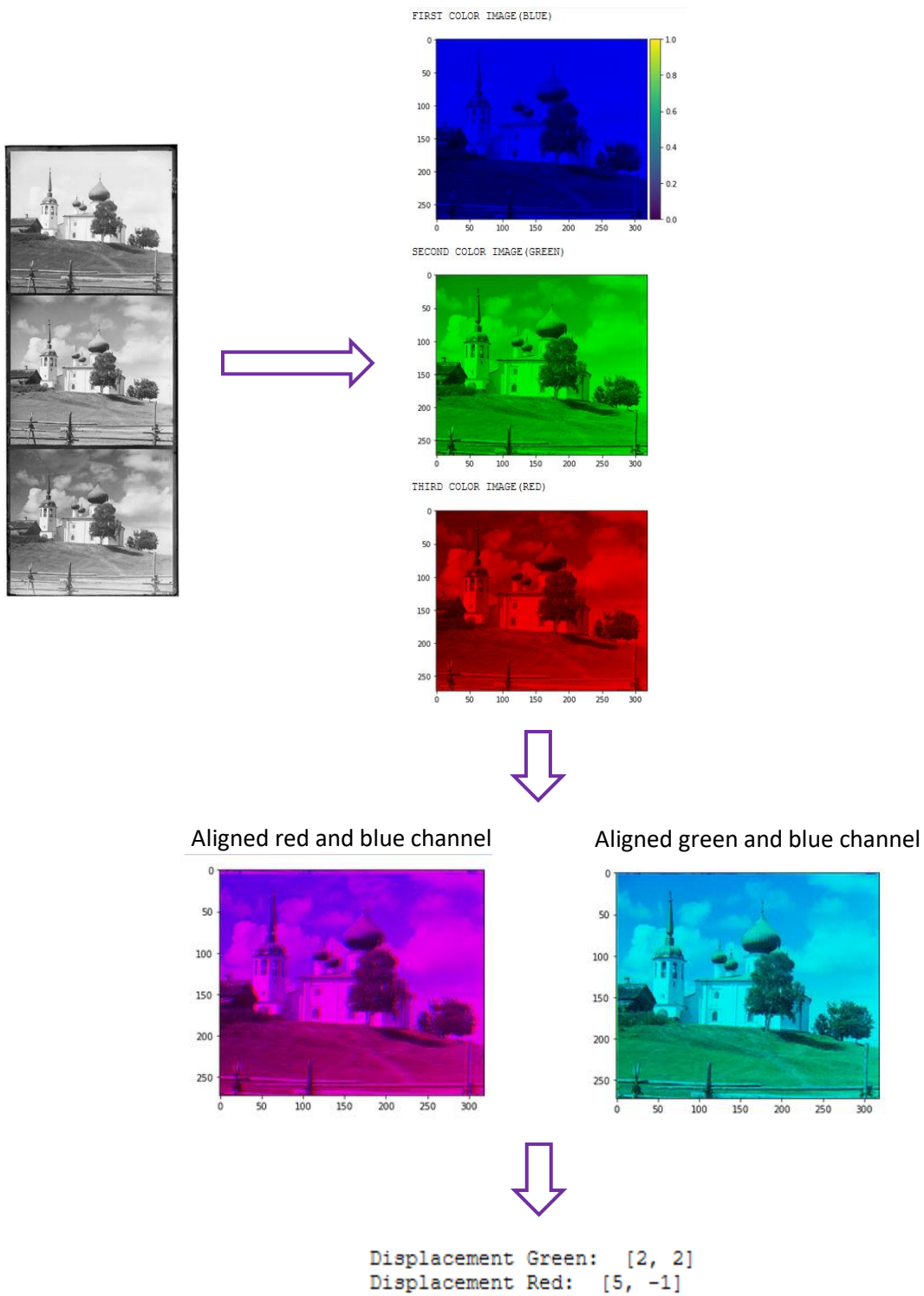
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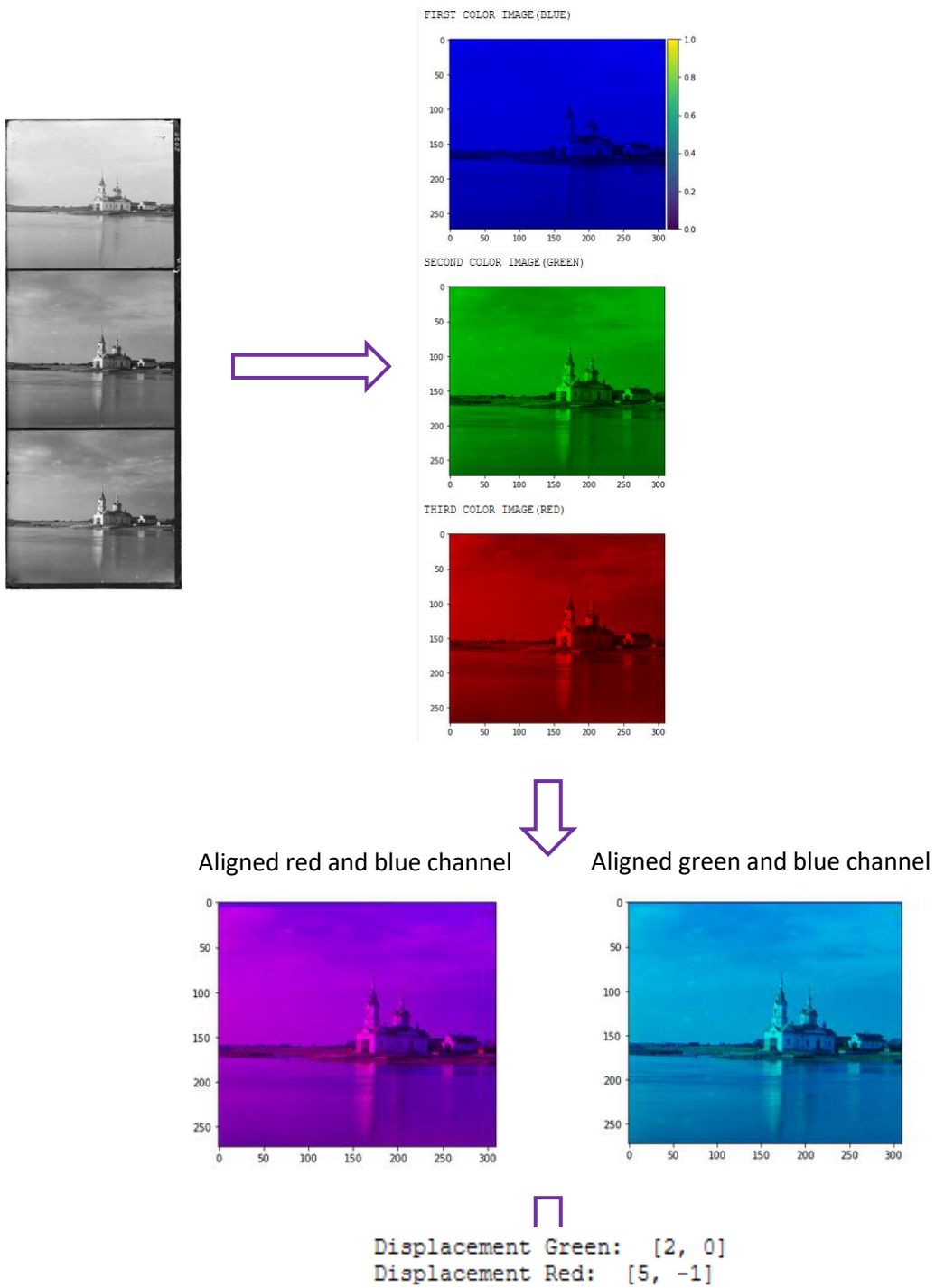
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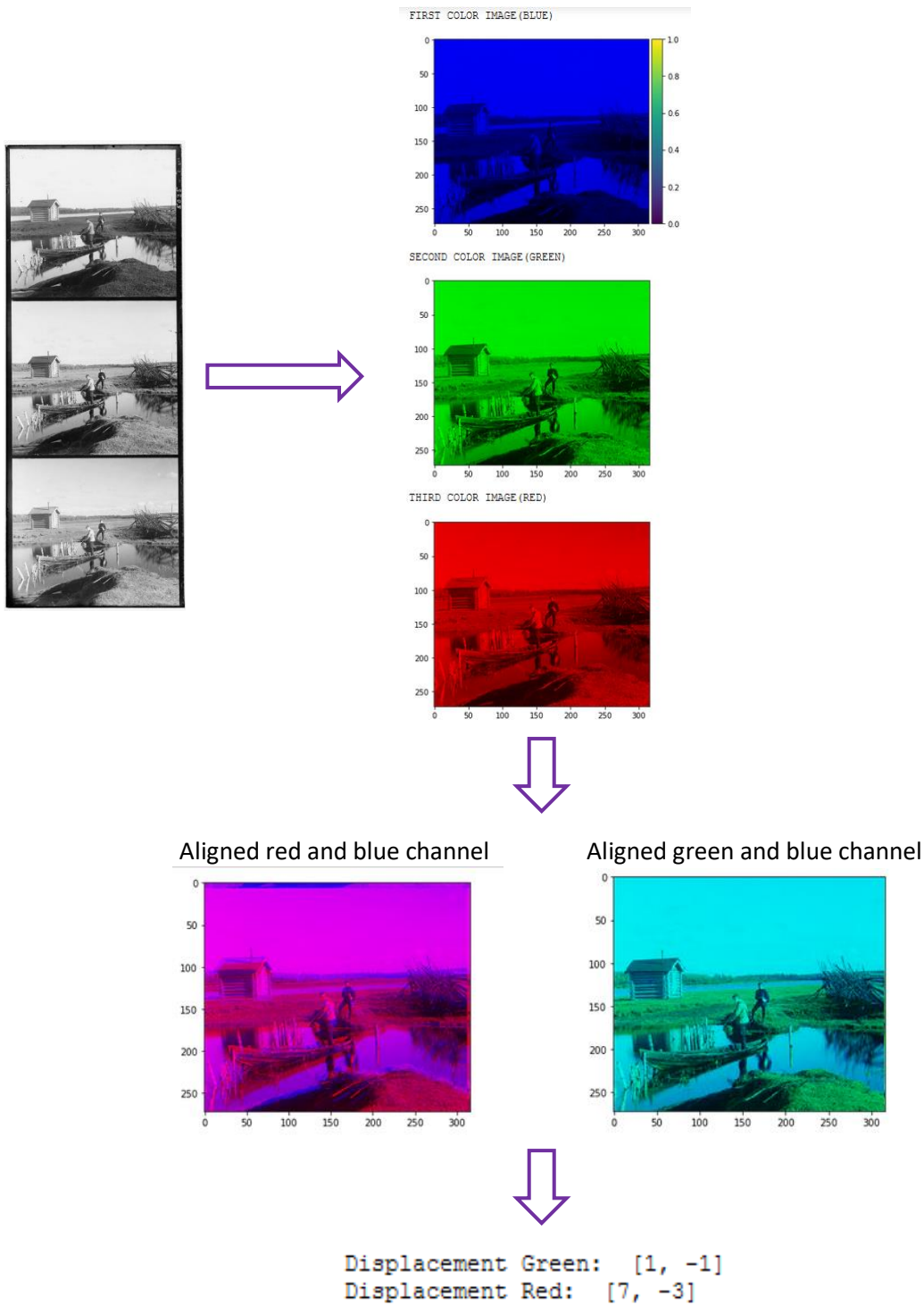
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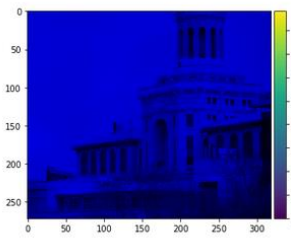
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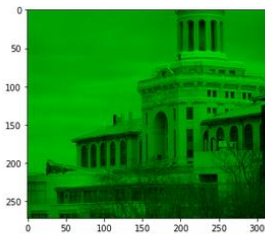
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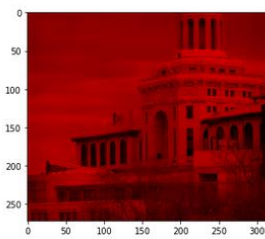
FIRST COLOR IMAGE (BLUE)



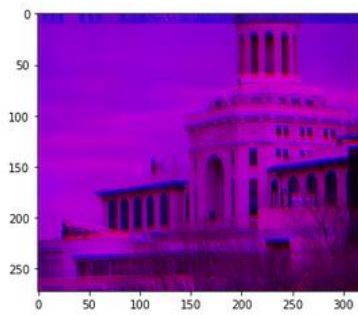
SECOND COLOR IMAGE (GREEN)



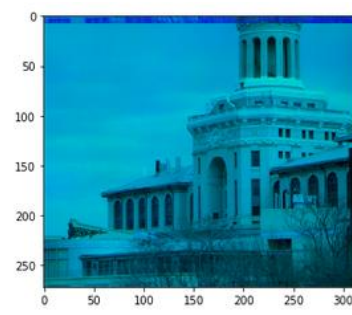
THIRD COLOR IMAGE (RED)



Aligned red and blue channel



Aligned green and blue channel



Displacement Green: [8, 0]
Displacement Red: [10, -1]

