**Lab 3: Colorizing the Prokudin-Gorskii photo**

**collection**

**Report**

**Problem statement**

**Task 1:**

The first task is to take each of the six images, align the three plate images as three color channel images and save the resultant color image.

**Task 2:**

The second task is to align the images by exhaustively searching over a chosen window using SSD and NCC.

**Implementation:**

**Task 1:**

* The image is read as a matrix.
* The image is divided into three parts by cropping the image and stored in separate matrices.
* The color image is generated by concatenating the images by placing them as different layers in a container.

**Alignment Shift:** None

**Task 2:**

**SSD:**

* The blue, green and red images for every image is obtained from the task 1.
* A suitable window of size 200x200 is chosen in red, blue and green images.
* An offset range of [-15 ,15] is chosen in both x-axis and y-axis.
* Keeping the blue image window as constant, for every offset the green image window is adjusted and the Sum of Squared Differences of the windows are found.
* The offset for the minimum ssd among the sound ssd is the alignment shift.
* The above two steps are repeated for blue image and red image.
* The images after shifting are concatenated to produce a color image which is more aligned than the Task 1 results.

**Alignment Shift:**

Image1:

Green: (-2,-5)

Red: (-1-9)

Image2:

Green: (-2,-4)

Red: (-1,-10)

Image3:

Green: (-3,-7)

Red: (-6,-14)

Image4:

Green: (-1,-4)

Red: (-1,-13)

Image5:

Green: (-3,-5)

Red: (-4,-11)

Image6:

Green: (0,0)

Red: (-1,-5)

**NCC:**

* The blue, green and red images for every image is obtained from the task 1.
* A suitable template of size 50x100 is chosen in blue image.
* The normalized cross correlation for the chosen template and the green image is found by using **normxcorr2 function**.
* The offset is identified by subtracting the template from the obtained peak values.
* The difference of the offset and template’s initial position is the alignment shift.
* The above two steps are repeated for blue image and red image.
* The images after shifting are concatenated to produce a color image which is more aligned than the Task 1 results.

**Alignment Shift:**

Image1:

Green: (-3,-6)

Red: (-2,-11)

Image2:

Green: (-3,-5)

Red: (-3,-10)

Image3:

Green: (-4,-8)

Red: (-5,-15)

Image4:

Green: (-1,-5)

Red: (-2,-14)

Image5:

Green: (-4,-6)

Red: (-4,-12)

Image6:

Green: (-1,0)

Red: (-2,-6)

**Conclusion**

Thus the images were aligned using SSD and NCC techniques and the shift values are reported for the given images.

**Reference:**

https://www.mathworks.com