Assignment 2

Detection of Smear on a camera lens

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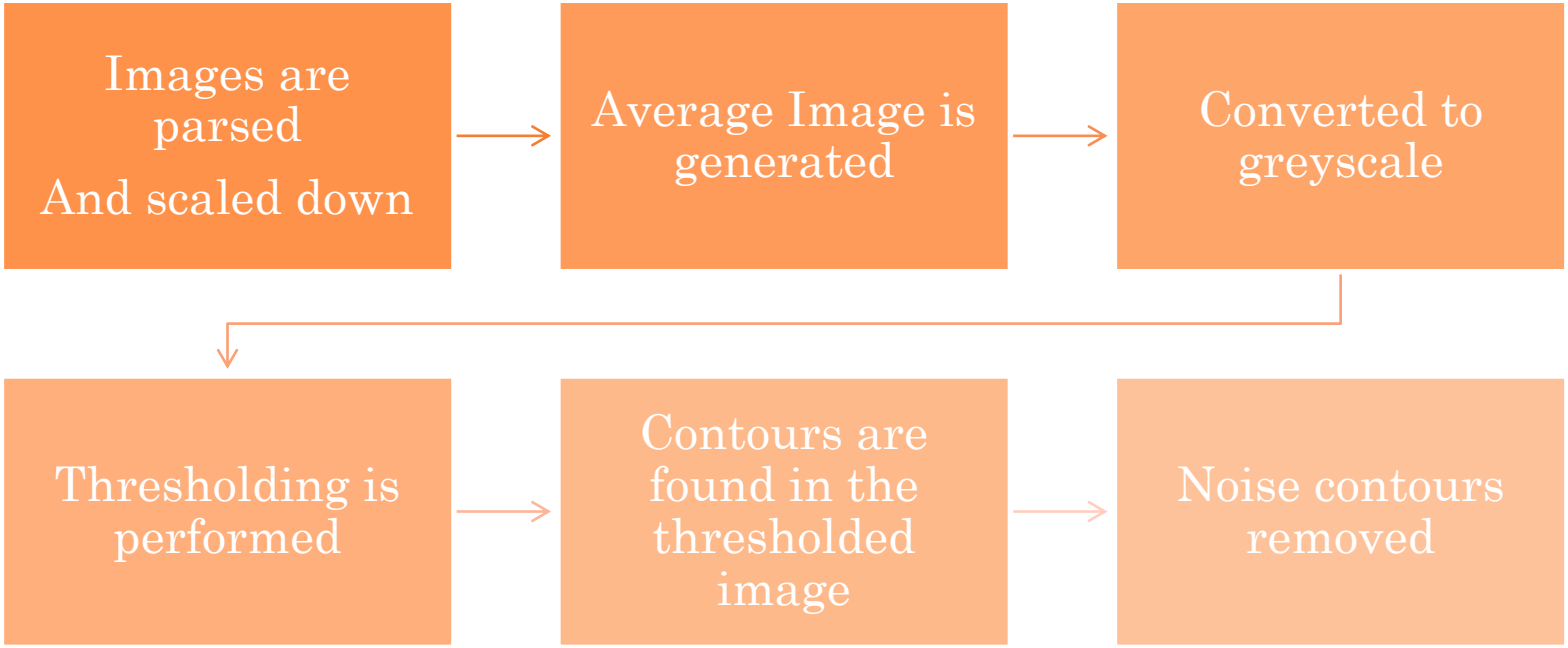
AIM:

- To detect the smear on the camera, if it exists, using a given set of images.

Analysis

- The smear is present in all the images at the same position and the background is changing
- The smear should be there in the average of all the images whereas the background would just become noise
- After running this algorithm it is found that the noise is of similar kind across all test cases
- After filtering out noise whatever is left behind should be the smear
- If there is nothing remaining after filtering out noise, the smear is not present in the image

Steps taken Solution



Creating an average image:

- Code is written in Python, libraries used are Numpy, Scipy an OpenCV.
- A function is used which will detect if there exists a smear or not.
- All the jpeg directories are accessed from which the required list of images are found.
- Images are resized.
- An array is created to store the average value of images for which, first, its total number is obtained from the list.

Average Image

Average with Smear

Average without Smear

Grey-scaling, thresholding and finding contours:

- Average image is generated after performing the required calculation.
- Grayscale image is obtained from the averaged image i.e. averaged RGB image is converted to grayscale image.
- After which, adaptive thresholding is performed and the image is scaled with 255.
- Edges in this threshold image are detected.
- Then, the contours are found in this edge detected image and these contours are sorted based on their size from big to small.

Removing the noise contours

- There is an iteration performed over these contours for approximation.
- If there are four point contours detected in the image, then, it is considered as the screen.
- In order to avoid the contours formed around noise, area of the contour is taken into consideration, such that only those portions will get detected which have an area almost equal to the area of the contour.
- A final image is obtained after performing all the above operations which has detected the existence of the smear and has masked it, if, it exists.

Image with noise contours removed

Running The Program

- Packages Required:
  - Nympy
  - Scipy
  - Opencv
- Command line to run the program
  - `python detect_smear.py -d "C:\Users\suraj\Downloads\sample_drive\sample_drive\cam_3" -r True`
- Output files
  - Stdout: Smear detected or not
  - Final_result.jpg: Smear on the input image
  - Mask_img.jpg: A mask showing position of smear

Final Result