Instructions

For each question, describe the series of operations you take. Explain for each step, your motivation for selecting an operation, the impact of the operation, and visualize the intermediate outputs. If you are unable to solve a certain question, show your attempt and explain your motivation. For this assignment, you may use any computer vision algorithms; however, the questions are solvable with only the ones studied in lecture. Results are graded qualitatively; you are not required to reproduce any of the example outputs.

Qiuxia Lin is the TA in charge of this assignment. Post questions on Canvas or attend the FAQ session during the regularly scheduled Lab on Feb. 27 or 28.

Please Hand In to Canvas > Assignments > Assignment1:

- A report with your answers and visualizations of the image outputs embedded in the report. Name your report Assignment1Report_AXXX.pdf where AXXX is your student number.
- Your source code in the form of a python notebook and intermediate and final image files a .zip named Assignment1Code_AXXX.zip, where AXXX is your student number.

Part 1:

Consider the corrupted image (`corrupted.png`) in Fig. 1(a).

(a) corrupted image (b) recovered enhanced image (c) person crop

Figure 1. Image Samples for Part 1.

1. How can you recover a noise-free and well-contrasted image similar to Fig. 1(b)? (**3 marks**)
2. Consider the crop (`crop.png`) of Fig. 1(c). Are you able to segment the person with the trolley from the background with simple thresholding? If so, which threshold should you use and how did you obtain this threshold? If not, describe why. Support your answer with visualized outputs. (**1 mark**)

Part 2:

Consider the image of the tile mosaic (`FranklinMascot.jpg`) in Fig. 2(a).

(a) original tile mosaic image (b) red to green conversion (c) sample mask image

Figure 2. Image Samples for Part 2

3. Describe how to convert the red tiles into green ones, similar to the example of Fig. 2(b). In your solution, specify your definition of a red tile. (**2 marks**; +**1 bonus** if you target only the red tiles in the clouds and book and exclude tiles on the bird).
4. Count the number of white tiles in the image. A tile is considered white if the average intensity of the tile pixels are greater than (a) 237 and (b) 245. Show a mask of your found tiles, similar to Fig. 2(c). (**3 marks**)
5. Count the number of red square tiles in the image. Consider using your results from Q3 to initialize. A tile is considered square if the edges are straight lines of the same length and corners are right angles. Consider a tolerance of 10% on length and 3 degrees for the corner angles. Show a mask of the found tiles. (**3 marks**)

Hints: Consider different variants of superpixelling and Hough transform. Select your search scope and loops wisely for computational efficiency.