e-Yantra Robotics Competition (eYRC 2019-20)

Task 0.2 - Supply Bot

Introduction

The objective of this task is to:

1. Perform the basic Image Processing tasks like read and display an image.
2. Understand the basics of an image as a multi-dimensional matrix.
3. Perform basic operations on given images.

Problem Description

Remember that all file and folder paths in your program should be relative. The images to work on are present in **"Images"** folder. All your files must be generated in **"Generated"** folder. Write your code in the placeholder file, *"main.py"* located in the **"Codes"** folder. Your *"main.py"* file must solve all the parts at once.

The images present in the **"Images"** folder are:

- *bird.jpg*
- *cat.jpg*
- *flowers.jpg*
- *horse.jpg*

Part A

For each image, the team is required to identify and save certain properties of image as mentioned below:

1. Name of image with extension (but without full path)
2. Dimensions of the image
3. Value of color (**order: B, G, R**) triplet at the $(\frac{M}{2}, \frac{N}{2})$ location in the image, where M = number of rows and N is the number of columns.
   Note: Indexing in Python starts from 0, so though M is an integer, Python row count goes from 0 to M-1

Output:

You should generate a *"stats.csv"* file, comma separated, in the **"Generated"** folder with the following format. Every row in the *"stats.csv"* file will represent a record having the above information and in the described order:

1. filename
2. height of the image
3. width of the image

4. number of channels in the image

5. intensity value at pixel location $\left(\frac{M}{2}, \frac{N}{2}\right)$ for each channel

For example, consider the image *"bird.jpg"* of height $300px$ and width $400px$ with 3 channels. The intensity value at the centre pixel location $(150, 200)$ for each channel is $(255, 130, 45)$. Thus, the record for such a file should resemble the figure below:

	A	B	C	D	E	F	G
1	bird.jpg	300	400	3	255	130	45
2	cat.jpg	300	500	3	200	240	100
3	flowers.jpg	300	300	3	250	120	120
4	horse.jpg	450	500	3	235	135	169

Note: Please do not add spaces while generating *"stats.csv"* file. Also, please refrain from adding headers. Do NOT edit *"stats.csv"* after it is generated.

Part B
Read the image *"cat.jpg"*. Set channels Blue and Green to 0. Save the image as *"cat_red.jpg"* in the **"Generated"** folder. This helps us visualize the red component of the image.

Part C
Read the image *"flowers.jpg"*. This is an image with 3 channels.

Add another channel, *alpha channel*, and set its value to 0.5. Save the resultant image as *"flowers_alpha.**png**"* to **"Generated"** folder. This increases the overall transparency of the image from 0% to 50%.

Part D
Read the image *"horse.jpg"*. One way to encode per-pixel information or colors is the color vector, i.e. (R, G, B), (B, G, R), etc. Another is the HSV/HSL representation.

- H stands for Hue
- S stands for Saturation
- V/L stans for Value/Level (intensity)

Here, we will compute the Level (intensity) component of every pixel. The formula to do so is:

$$I = ((0.3 \times Red\ Component) + (0.59 \times Green\ Component) + (0.11 \times Blue\ Component))$$

Thus, compute intensity value for every pixel and save the image (1-channeled) as *"horse_gray.jpg"*.

Warnings

1. IMPORTANT: The code and documents you submit should be YOUR work in YOUR WORDS. To avoid any copyright violations, you must NOT copy phrases or code snippets directly from manuals or web.
2. The team should NOT mail or upload the document, code or folders anywhere else, except on the portal.
3. Teams failing to submit the document, code or folders by the deadline will lose the marks for this task.
4. e-Yantra WILL NOT entertain any request for extension of deadline for uploading the task.
5. e-Yantra holds complete discretion to disqualify a team if any foul play is suspected.