German University in Cairo
Faculty of Media Engineering and Technology
Winter 2022

DMET 501 – Introduction to Media Engineering

Project

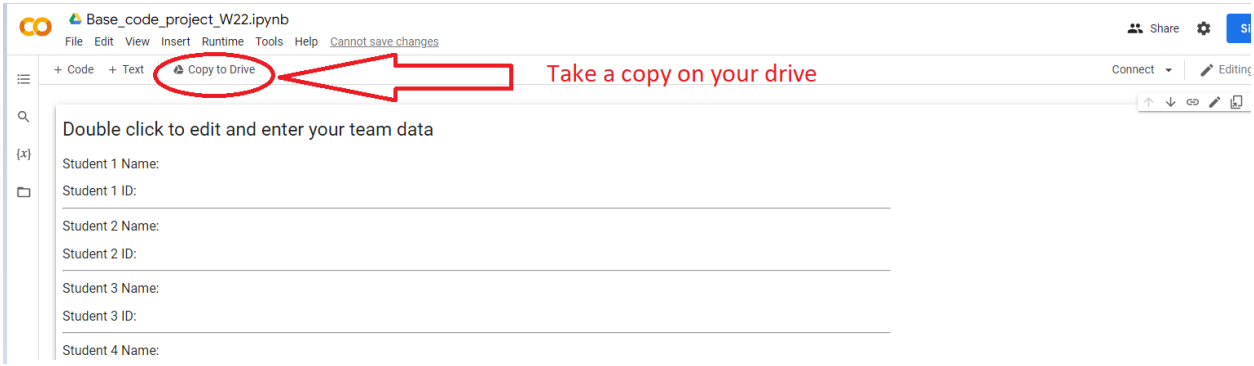
(Due on December 30th, 2022 at 11:59PM)

Read the **WHOLE** description **carefully** for all the requirements before starting.

In this project you are going to implement **run-length encoding** on an image using **the Python notebook** given in the below link. You required to take a copy of this notebook and write your own solution and submit your code along with the image you used.

https://colab.research.google.com/drive/10YPzzD1PAuUjB2Xd2DSJxr9egF_7XNd2?usp=sharing

KINDLY DO NOT CHANGE ANY FUNCTION SIGNATURE OR HELPER FUNCTIONS IN THE NOTEBOOK.



Also, at the end of the document you will find the description for the helper functions you can use in any of the tasks Please, check them out before writing your code. Also, you can use any predefined functions you like.

There will be private test cases so, try to make your code as generic as possible and you have to stick to the output format.

In this project you are required to have a **photo of yourself and/or your colleague(s)**.

DMET 501 – Introduction to Media Engineering

Project

(Due on December 30th, 2022 at 11:59PM)

Task 1

In this task you are required to apply quantization on the image using **9 Levels**.

Function Signature : `def show_image_information(image):`

Input: The image you read using `Image.open('/content/image.jpg')`

Expected Output: **return the unique colors before and after quantization each as a list.**

Task 2

In this task you are required to **compute the consecutive runs** for each row of your **quantized image**. This is not the Run-Length Encode, meaning that if a color appeared more than once not continously in the same row, it will have **separated/different runs.**

The format of a single run should be a tuple that looks as follows:

(row,first coumn of the run, last column of the run, color)

Example:

```
[(0,0,0,2),(0,1,3,1),(0,4,5,2),(0,6,7,1),(1,0,5,2),(1,6,7,3)]
```

Function Signature : `def compute_runs(image, unique_values):`

Input: `image:` the quantized image , `unique_values:` a list of colors after quantization

Expected Output: **a list of tuples each being a single run using the format mentioned above and similar to the example.**

DMET 501 – Introduction to Media Engineering

Project

(Due on December 30th, 2022 at 11:59PM)

Task 3

In this task you are required to **compute the Run-Length Encode** for the **quantized image**. You may use your output/function implemented in **Task2. However, you don't have to.** If a color appeared more than once not continously in the same row, it will have only 1 tuple representing all the runs in the row.

Example:

```
[(0,1,3,6,7,1), (0,0,0,4,5,2), (1,0,5,2),(1,6,7,3)]
```

Function Signature : `def compute_RLE(image, unique_values):`

Input: `image:` the quantized image , `unique_values:` a list of colors after quantization

Expected Output: **a list of tuples each being a single run using the following format.**

(row,{first coumn of the run, last column of the run}*, color)

HELPER FUNCTIONS

These functions are to help you write your code, you are not obliged to use them.

```
def get_size(image):
```

Get the dimensions for the image (width, height).
Example Output: `(61, 61)`.

DMET 501 – Introduction to Media Engineering

Project

(Due on December 30th, 2022 at 11:59PM)

```
def get_pixel_value(img,col,row):
```

Get the intensity of a single pixel.
Example Output *color at pixel (col=2,row=4) in img* : 150.

```
def quantization(image, n):
```

Quantize the image colors to n levels.
Output: Image after quantization as a list.

```
def get_unique_values(image):
```

Get the unique values of colors in an image.
Ouput: pair of (list of unique colors in image, length of the list of unique colors in image).

```
def extract_row_color(arr,row,color):
```

Takes as an input a list of tuples having the format discussed in Task2 and extracts/filters the tuples having the same row `row` and same color `color` and return them in a list.
Input Example:

```
arr=[(0,0,0,2),(0,1,3,1),(0,4,5,2),(0,6,7,1),(1,0,5,2),(1,6,7,3)]
extract_row_color(arr, 0, 1)
```

Output Example:

```
[(0, 1, 3, 1), (0, 6, 7, 1)]
```

```
def merge_row_color(filtered, row, color):
```

Takes as input a list of tuples having the same row & same color, returns a merged tuple for the start/ finish of the run.
Input Example:

```
filtered=[(0, 1, 3, 1), (0, 6, 7, 1)]
merge_row_color(filtered, 0, 1)
```

Output Example:

```
(0, 1, 3, 6, 7, 1)
```

DMET 501 – Introduction to Media Engineering

Project

(Due on December 30th, 2022 at 11:59PM)

Best of luck! ☺

Submission guidelines

1. **Please submit the project on the following form**
   https://forms.gle/aayey8B8YEaRctZy7
2. **The project can be done in teams 2 to 4 members (Students have to be with the same TA tutorial groups).**
   a. Hadeel: T11, 14, 15, 17, 18, 19, 24
   b. Ramez: T10, 12, 13, 20, 22, 25, 26
   c. Samar: T6, 7, 8, 9, 16, 21, 23
3. Please submit your notebook **(.ipynb)** in a zipped folder along with the used image **(.png/.jpg).**
4. The **name** of the submitted zipped file is [T-XX_52-XXXXX]. Choose the ID number of 1 team member.

   For example: [T-01_52-12345].zip

Not following the mentioned guidelines or editing the original notebook (funciton signatures/names/inputs/returns), the project will not be graded.