



Cairo University



Faculty of Computers and  
Artificial Intelligence

# STRUCTURED PROGRAMMING (CS112)

(Assignment 3)

By:

Doaa Ali El-Sayed Mohamed  
[alid38168@gmail.com](mailto:alid38168@gmail.com)

(ID: 20211034)

Ahmed Yasser Mohamed Mohamed  
[ahmed.yasser7937@gmail.com](mailto:ahmed.yasser7937@gmail.com)

(ID: 20211010)

Ahmed Ahmed Hamed Ahmed  
[Ahmedplayer16@gmail.com](mailto:Ahmedplayer16@gmail.com)

(ID: 20211003)

Dr. Mohammad El-Ramly

## Task 2: Filters

Doaa Ali (20211034)

### Filter 3: Merge images (algorithm)

- 1- Take the two images from the user.
- 2- Loop on pixels in both images, and take each pixel from the image and its opposite in other image.
- 3- Take the average of two pixels and save it in a new image.

### Filter 6: Darken and Lighten Image (algorithm)

- 1- Take the image from the user.
- 2- Ask user if he wants to darken or lighten
- 3- If darken : ( 0 means black)
  - a. Loop on pixels in the image.
  - b. Update the value by divide it by 2.
- 4- If lighten: ( 255 means white)
  - a. Loop on pixels in the image.
  - b. If its value  $\geq 128$ :
    - i. Update the value and make it = 255.
  - c. Else :
    - i. Update the value by multiply by 2.

Ahmed Yasser (20211010)

### Filter 1: Black and white filter (algorithm)

1. Load the Image
2. Loop for each pixel in the image
3. Get the average of the pixels
4. Loop for each pixel in the image
5. Compare each pixel with the average
6. If pixel > average
  - a. Assign the pixel to 255
7. Else
  - a. Assign the pixel to 0
8. Save the image
9. End

### Filter 4: Flip image (algorithm)

1. Load the image
2. Ask the user if he wants a vertical or horizontal flip
3. If user wants a vertical flip
  - a. Loop for each Column in the image and replace the last columns with the first columns
  - b. Save the image
4. Else if user wants a horizontal flip
  - a. Loop for each row in the image and replace the last rows with the first rows
  - b. Save the image
5. End

Ahmed Ahmed (20211003)

#### Filter 2: Invert image (algorithm)

- 1- Take input from user as name of image.
- 2- Declare 2d array and insert every pixel into it.
- 3- Loop through every element of the 2d array:
  - A- If it is black make it white.
  - B- If it is white make it black.
  - C- If it is grey make it the opposite shade of grey.
- 4- Save the image.

#### Filter 8: Enlarge photo (algorithm)

- 1- Take the requested image name from user
- 2- Load every pixel of it in a 2d array
- 3- Take a single integer input from user to choose which quarter to modify
- 4- Adjust the starting values of X and Y according to user
- 5- Declare row = 0
- 6- Make a for loop that starts at the value of X and ends at the size of the image
- 7- Make col = 0 inside the for loop
- 8- Place each pixel from the 2d array of the image into another 2d array, and place it two more times for each pixel
- 9- copy the row which was placed into a row under it
- 10- increment row by 2 to change the row that is being changed

## All filters:

1. Include all needed libraries.
2. Define each filter function alone.
3. In main function:
  - a. Let user choose if the image gray or colored.
  - b. If gray:
    - i. Do while loop to display a list with all possible gray filters, save the image and end the program.
    - ii. Once the user chooses an option, we call its function.
  - c. If colored:
    - i. Do while loop to display all possible colored filters, save the image and end the program.
    - ii. Once the user chooses an option, we call its function.