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Practical No. 3

Aim: To understand and implement basic image processing operations in Python using the OpenCV library. Specifically, we aim to perform the following operations: conversion to grayscale, obtaining the complement of an image and creating a binary image.

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AIM: To understand and implement basic image processing operations in Python using the OpenCV library. Specifically, we aim to perform the following operations: conversion to grayscale, obtaining the complement of an image and creating a binary image.

OBJECTIVE:
Image enhancement aims to improve the interpretability or perception of information in images for human viewers, or to provide better input for other automated image processing techniques. We understand different image processing operations.

THEORY:

- **Grayscale**

Gray scaling is the process of converting an image from other color spaces e.g., RGB, CMYK, HSV, etc. to shades of gray. It varies between complete black and complete white.

Importance of gray scaling:

Dimension reduction: For example, In RGB images there are three color channels and three dimensions while grayscale images are single-dimensional.

Reduces model complexity: Consider training neural articles on RGB images of 10x10x3 pixels. The input layer will have 300 input nodes. On the other hand, the same neural network will need only 100 input nodes for grayscale images.

For other algorithms to work: Many algorithms are customized to work only on grayscale images e.g., the Canny edge detection function pre-implemented in the OpenCV library works on Grayscale images only.

ALGORITHM:
Step 1: Open the CV library installed as CV2 in Python.

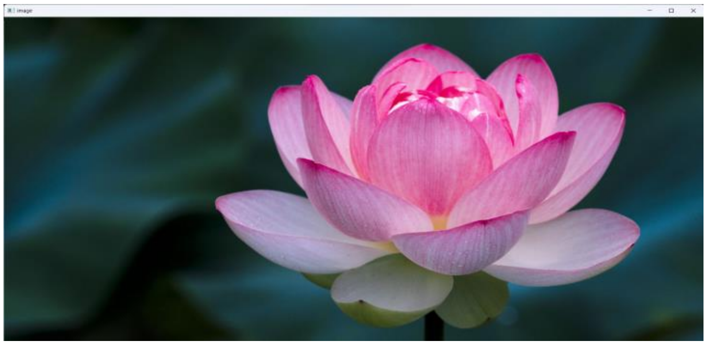
Step 2: Import the cv2 library into this program.

Step 3: Use to read the image in grayscale mode.

Step 4: Displaying the image

CODE:

Input and Output image:



- **Complement of an Image**

A complementary image is a transformed image such that it consists of complementary colours of the ones, which is present in the original image.

For finding the complement of an image, we have to simply subtract each pixel value from the maximum pixel value supported by the class. (In this case, class - uint8, the maximum value of pixel can be 255) and store in the output image array. In the output image, dark areas become lighter and light areas become darker.

ALGORITHM:

Step 1: open-cv library is installed as cv2 in python

Step 2: import the cv2 library into this program.

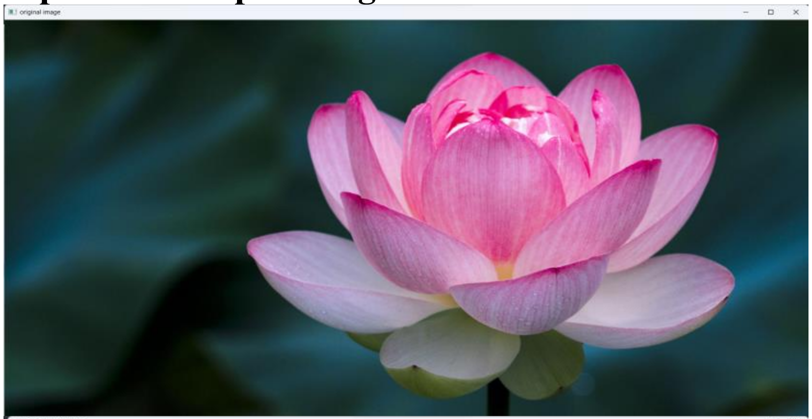
Step 3: read an image using imread( ) function of cv2.

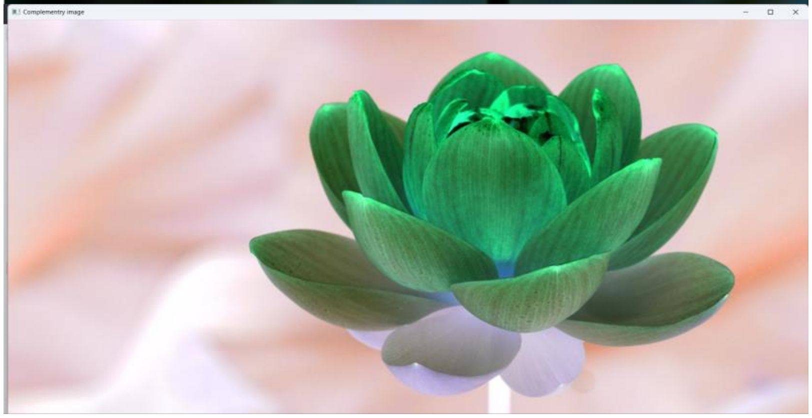
Step 4: Find complements of the image array and store it in the variable.

Step 5: Show the image formed.

CODE:

Input and Output image:





- ### Binary image

Binary Image Operations are a collection of digital filters, image arithmetic, and image processing techniques. Apply simple modifications such as open and fill holes to count the number of cells. Develop complex Work files that utilize multiple binary layers to differentiate nuclei inside cells.
The difference between the Grayscale image and Binary image. Binary image has only two colors: white and black. The pixel values of the Binary image are either 0 (black) or 255 (white).

ALGORITHM:
Step 1: import required libraries

Step 2: load the input image using imread function.

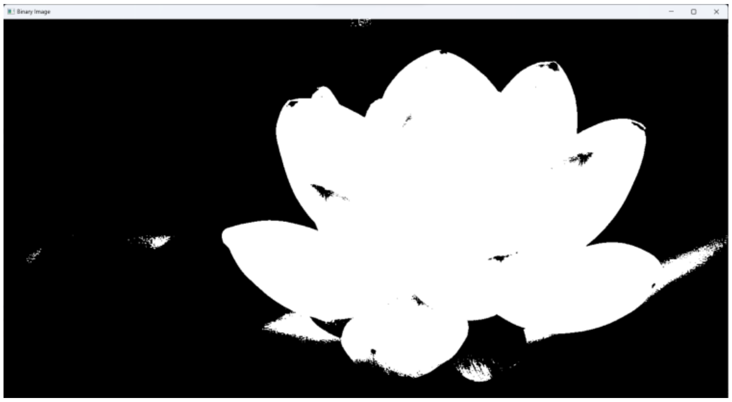
Step 3: convert the input image to grayscale.

Step 4: apply thresholding to convert grayscale to binary image

Step 5: Display the Binary Image

CODE:

Input and Output image:



CONCLUSION: Successfully apply the basic operation on image convert given image into grayscale image, complement of image and binary image.

DISCUSSION AND VIVA VOCE:

1. What will be the number of dimensions of a grayscale image if opened as colored?
2. Is the image a list, tuple or an array?
3. A black and white image can only have what gray levels?
4. Can we flip the image using just one line of Python code?
5. What is the difference between cv.write and printing an image?

REFERENCE:

- The basics of image processing and OpenCV - IBM Developer
- Python Image Processing Tutorial (Using OpenCV) (likegeeks.com)
- Image Processing In Python - Python Geeks
- Python | Grayscaling of Images using OpenCV - GeeksforGeeks
- Color, Grayscale and Binary Image Conversion in OpenCV - Python Geeks