

DIGITAL IMAGE PROCESSING LABORATORY EXERCISE #1

Simulation and Display of an Image, Negative of an Image (Binary & Gray Scale)

Simulation and display of an image, as well as the generation of negative versions of an image in binary and grayscale, involve manipulating pixel values in digital images.

1. Simulation and Display of an Image:

- **Simulation:** In the context of digital images, simulation often refers to the creation or representation of an image, either through mathematical models or algorithms. For example, simulating the appearance of a 3D scene, generating synthetic images, or applying filters to alter the appearance of an existing image.
- **Display:** Once an image is simulated or obtained from a source, displaying it involves presenting it on a visual output device, such as a computer monitor or screen. Displaying an image usually involves converting the digital representation of pixel values into visual colors or grayscale intensities.

2. Negative of an Image:

- The negative of an image is created by inverting the pixel values. In a typical color image, each pixel has three color channels (Red, Green, Blue), and the negative of each channel is obtained by subtracting its value from the maximum possible value. For example, if a pixel has an RGB value of (100, 150, 200), the negative would be (255-100, 255-150, 255-200), resulting in (155, 105, 55).

3. Binary Negative of an Image:

- To create a binary negative, the process involves converting the image to a binary format first (typically by thresholding). In a binary image, each pixel is either black (0) or white (1). The negative of a binary image is obtained by swapping black and white pixels, where black becomes white and vice versa.

4. Grayscale Negative of an Image:

- Similarly, for grayscale images, the negative is obtained by subtracting the pixel value from the maximum intensity value. In an 8-bit grayscale image (where pixel values range from 0 to 255), the negative of a pixel value x would be given by $(255 - x)$.

In summary, the simulation and display of an image involve generating or obtaining an image and presenting it visually, while creating a negative involves inverting pixel values, either directly for grayscale images or after converting to binary for binary images.

In these exercises, feel free to leverage the provided code snippets based on your application. Utilize these codes to transform your original image according to the examples given below. **Save your file** as your **Fullname-Exer1.pdf**

% Red Blue and Green and Gray Components

```
i=imread('cancercell.jpg'); subplot(3,2,1); imshow(i);  
title('Original Image');
```

%Red Component

```
r=i(:, :, 1);  
subplot(3,2,2); imshow(r); title('Red Component');
```

%Green Component

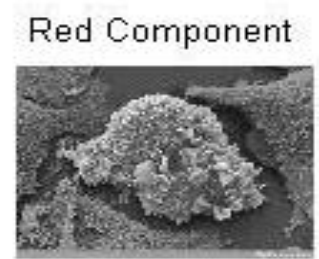
```
g=i(:, :, 2);  
subplot(3,2,3); imshow(g); title('Green Component');
```

%Blue Component

```
b=i(:, :, 3);  
subplot(3,2,4); imshow(b); title('Blue Component');
```

%Color to Gray Image rg=rgb2gray(i);

```
subplot(3,2,5); imshow(rg); title('Gray Image');
```



Complement, Converting and Simulation of an Image

```
% Display color Image, find its complement and convert to gray scale I=imread('cancer.jpg');
subplot(2,2,1); imshow(I); subimage(I); title('Color Image');
```

```
c=imcomplement(I);
subplot(2,2,2); imshow(c); subimage(c); title('Complement of color Image');
```

```
r=rgb2gray(I);
subplot(2,2,3); imshow(r); subimage(r); title('Gray scale of color Image');
```

```
%Complement of Gray Image b=imcomplement(r);
subplot(2,2,4); imshow(b); subimage(b); title('Complement of Gray Image');
```

%Simulation of an Image(Arithmetic & Logic Operation)

```
a=ones(40); b=zeros(40); c=[a b;b a]; d=[b b;a a];
```

```
A=10*(c+d);
```

```
M=c.*d;
```

```
S=c-d; D=c/4; figure;
```

```
subplot(3,2,1); imshow(c);
```

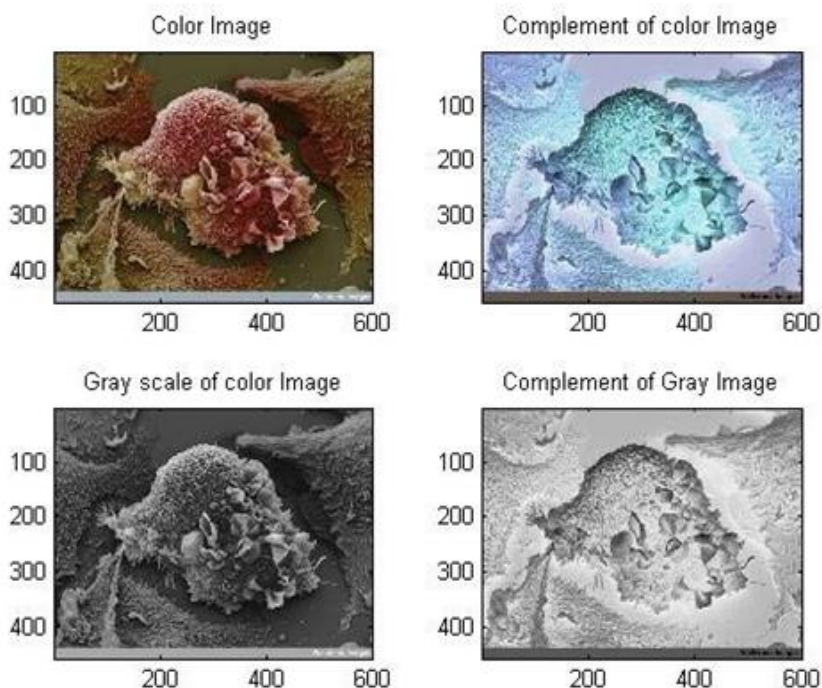
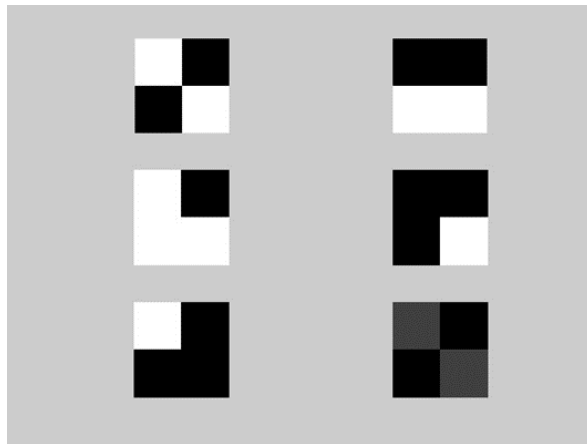
```
subplot(3,2,2); imshow(d);
```

```
subplot(3,2,3); imshow(A);
```

```
subplot(3,2,4); imshow(M);
```

```
subplot(3,2,5); imshow(S);
```

```
subplot(3,2,6); imshow(D);
```



Exercise #1

Simulation and Display of an Image, Negative of an Image (Binary & Gray Scale)

Name:

Year/Block:

Application/Software:

1. Codes
2. Image Transformation
3. Answer the following questions:
 - a. Discuss any visual differences observed between the original image and its negative versions.
 - b. What potential applications or scenarios might require the use of negative images in binary or grayscale?