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Report on Challenging Task 1

ECE3043 Digital Image Processing for Medical Applications

[Slot: L11+L12]

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To

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Expt No. 1 16/02/2021	LOGICAL OPERATIONS ON AN IMAGE

Aim

To apply logical operations on given image and extract certain features such as region of interest.

Theory

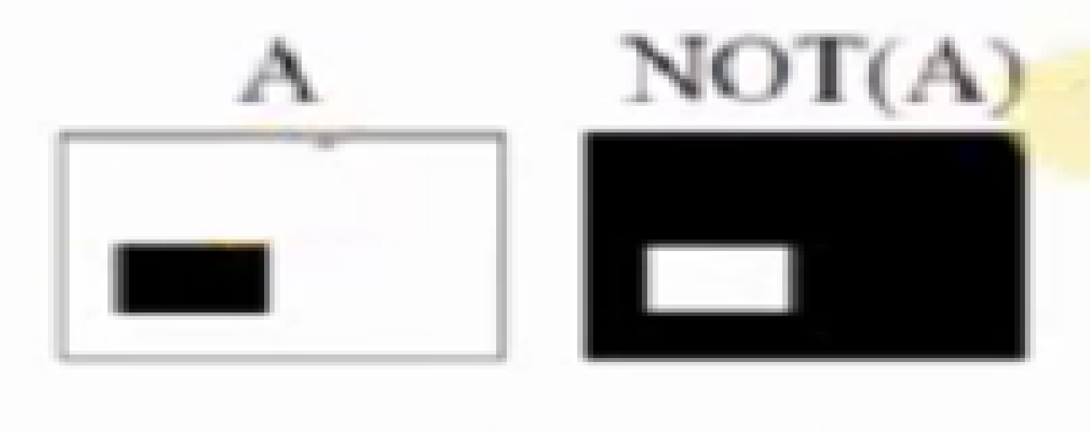
Logical operations are done on pixel-by-pixel basis. There are several basic logic gates used in performing operations in digital systems. The common ones are;

- NOT Gate
- OR Gate
- AND Gate
- XOR Gate

In digital image processing logical operations are applied on bit value of an image. Bit value 1 represents brighter image and bit value 0 represents darker image in binary images.

1. **NOT:** operation is used for: To obtain negative image and Making some features clear. It is applied on a single image and gives compliment of the given image (i.e, 0 to 1 and 1 to 0);
   Syntax : bitcmp(imagef ilename);

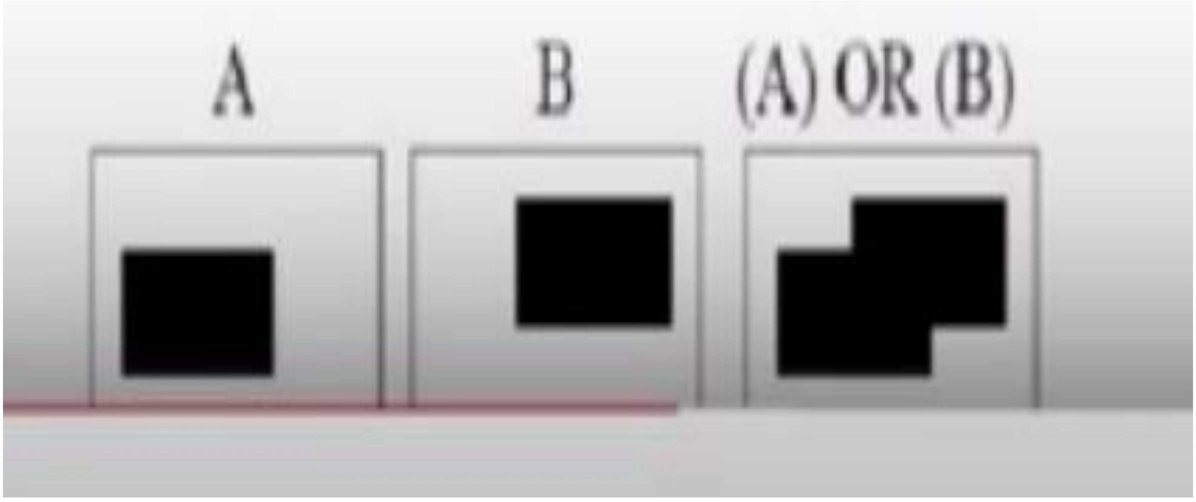
Logical NOT output: in not operation, white becomes black ,black becomes white while applying negation(logical not operation).
For example :



2. **OR:** It is pixel by pixel operation of any two same size image its bit value of 1 will be 1, other wise 0. *Syntax: ORimg = bitor(img1 , img2);*

Example on logical or operation.

Logical OR OUTPUT:

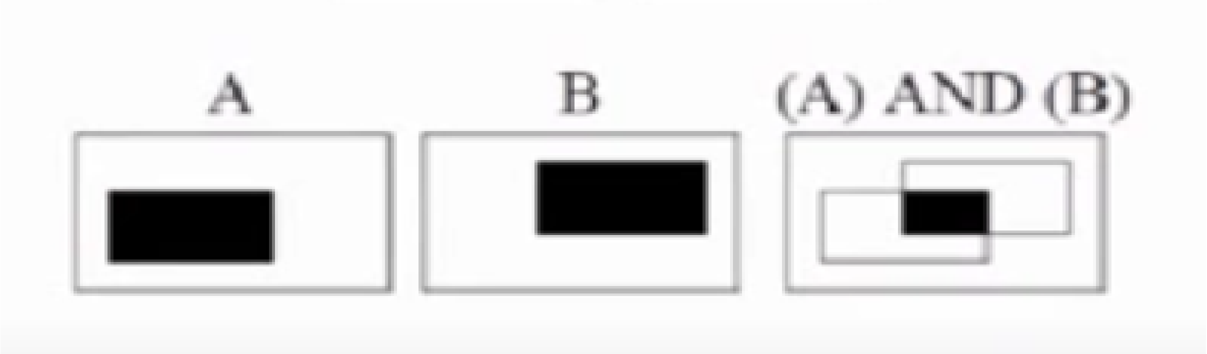


3. **AND**: The corresponding pixel by pixel value of both equal size image if the bit values are 1 then output will be 1 other wise 0.

Syntax: ANDimg =bitand(imgA ,imgB); Where img1 and img2 are two given images in same size.

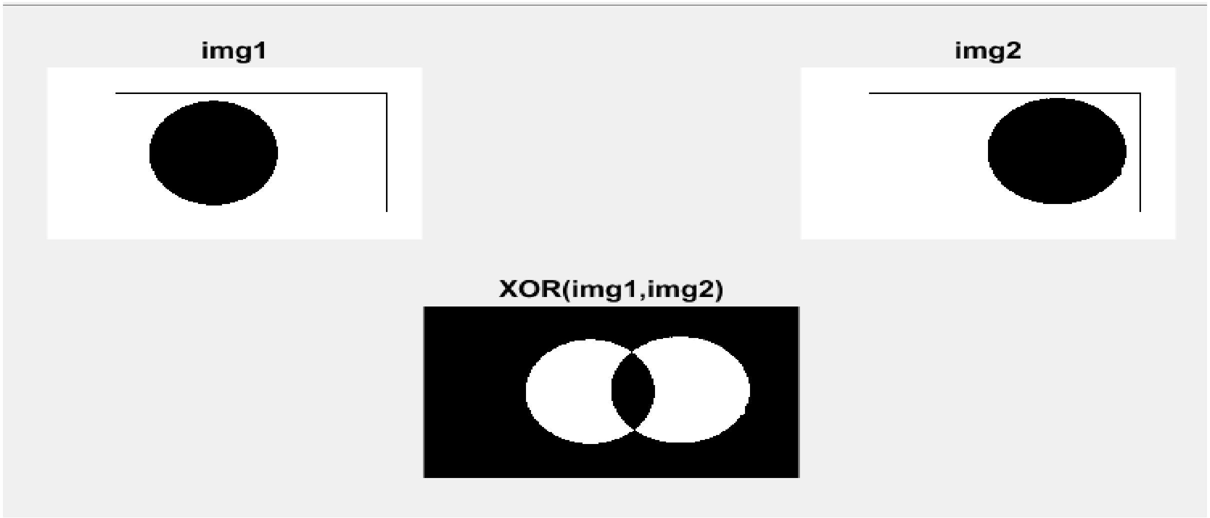
Example on logical and operation.

Logical AND OUTPUT:



4. **XOR:** The corresponding pixel value of any two given images, if they have same bits (0,0 or 1,1) the XOR output is low or 0. Other wise high (I,e, bit value 1).
   Syntax: XORimg = bitxor(img1,img2);
   Example on logical XOR:operation.

Logical XOR output:



Problem statement:

Apply logical operations on any of two given images of your choice to explain that certain features can be extracted using logical operations.

Programming Logic

Algorithm:

1. Read input image
2. Make sure the if the two input image have same size

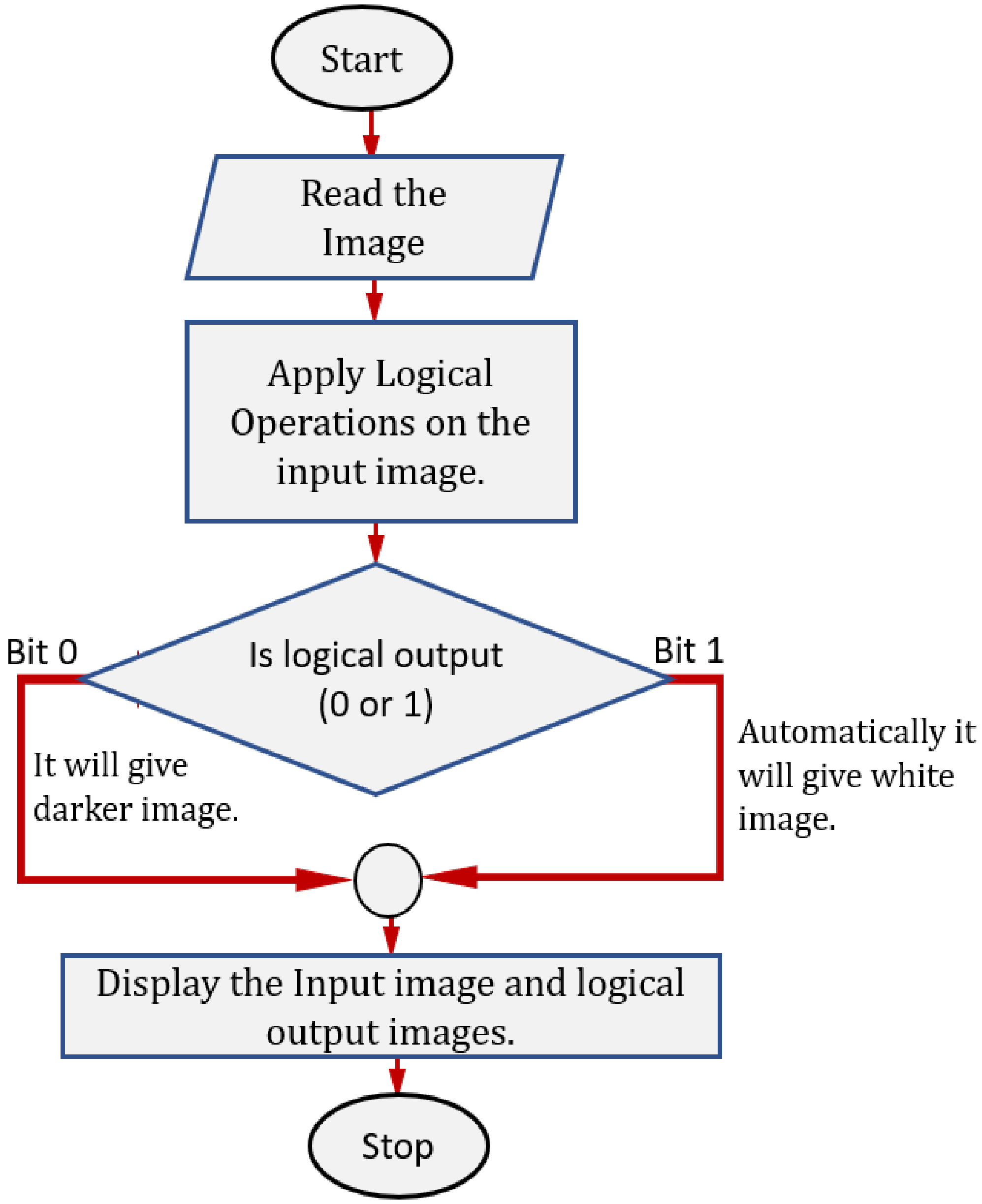
3. Apply logical operation an input image/images. (use combination of logical operator)

4 Display input image

5 Display output image.

For this experiment logical operator xor and NOT are used.

Flow Chart:

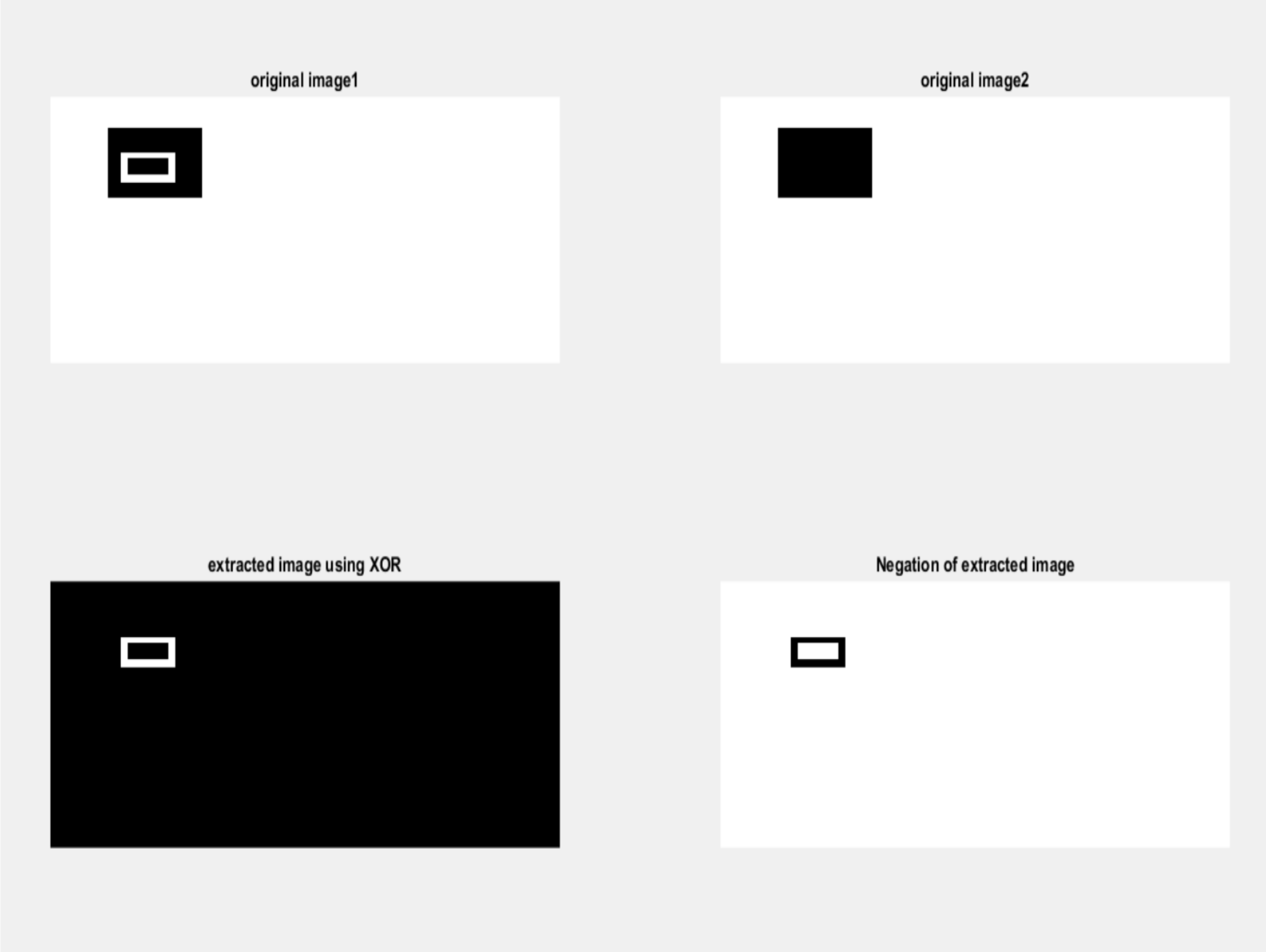

Start
Read the Image
Apply Logical Operations on the input image.
Is logical output (0 or 1)
Bit 0
Bit 1
It will give darker image.
Automatically it will give white image.
Display the Input image and logical output images.
Stop

3. Logical Operation on simple geometric image.

Code

```
% read and display image in matlab
clear all
close all
clc
img1=imread('C:\Users\hp\Desktop\pwd\black_white.png');
img2=imread('C:\Users\hp\Desktop\pwd\black1.png');
img3=bitxor(img1,img2);
img4=bitcmp(img3);
subplot(2,2,1);imshow(img1);title('original image1');
subplot(2,2,2);imshow(img2);title('original image2');
subplot(2,2,3);imshow(img3);title('extracted image using XOR');
subplot(2,2,4);imshow(img4);title('Negation of extracted image');
```

Output:



Interpretation:

From this experiment we can see that when we apply logical NOT operation on black image , then it becomes white and white becomes black. Using a combination of logical operation we can extract the region of interest, this help us to identify the desired parts of image for further image processing.

The AND and OR operations are used for selecting sub images in an image. This masking operation is referred as Region Of Interest (ROI) processing.
Bitwise logical operations can be performed between pixels of one or more than one image. AND/NAND Logical operations can be used for following applications like Compute intersection of the images, Design of filter masks, Slicing of grey scale images.
OR/NOR logical operations can be used for Merging of two images. XOR/XNOR operations can be used for following applications:

- To detect change in gray level in the image
- Check similarity of two images NOT operation is used for:
- To obtain negative image
- Making some features clear.