

Experiment 14

UNDERSTANDING IMAGE PROCESSING ON MATLAB

This tutorial gives a beginner level introduction to image processing using MATLAB® 2013.

INTRODUCTION

Digital Image Processing refers to the manipulation of image data which is motivated by conversion between Spatial and Frequency domains.

A *filter* is a matrix, typically 3x3, 4x4, 5x5 which is applied to the input pixels one at a time, resulting in an output pixel in the filtered image.

Reading and displaying the image

`imread()` and `imshow()` functions are used to load and display an image respectively.

```
image = imread('image.jpg');  
imshow(image);
```



Converting an image to Gray Scale

A colored image is converted into a grayscale image by simply calling the `rgb2gray()` function.

```
gray_image = rgb2gray(image);  
imshow(gray_image);
```



Using kernel matrices with images -- EDGE DETECTION

In image processing, many filter operations are applied to an image by performing a special operation called convolution with a matrix. This matrix is called a KERNEL. Kernels are typically 3x3 square matrices, although kernels of size 4x4, 5x5 are also used. The values stored in a kernel directly relate to the result after applying the filter, and filters are characterised solely by kernel matrix. For example, the following kernels are used for detecting the horizontal and vertical edges in an image.

```
% Define the Sobel kernels
kernel_horizontal = [1 2 1; 0 0 0; -1 -2 -1];
kernel_vertical = [1 0 -1; -2 0 2; -1 0 1];

% Convolve the gray image with Sobel kernels
M1 = conv2(double(gray_image), double(kernel_horizontal));
M2 = conv2(double(gray_image), double(kernel_vertical));
```

double is used because the loaded image was by default in Unit8 format, which needs to be converted to numbers before processing.

Displaying the horizontal and vertical edges separately

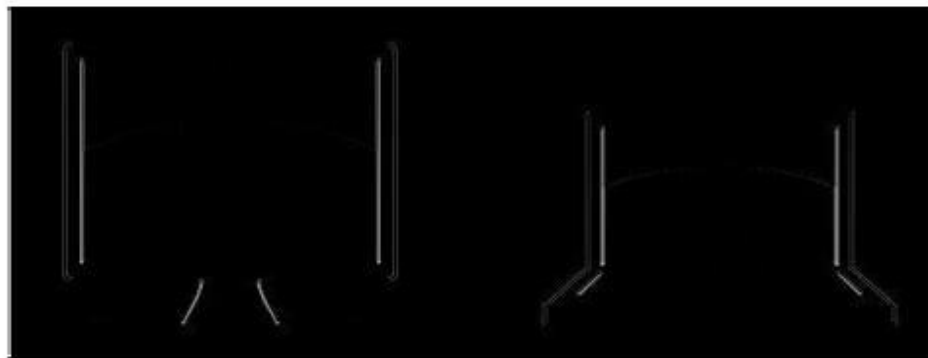
```
figure(4)
imshow(abs(M1), []);
title('horizontal parts');

figure(5)
imshow(abs(M2), []);
title('vertical parts');
```

horizontal parts



vertical parts



Conclusion

Image processing basics exercise (reading, printing, grayscale conversion etc.) done successfully on MATLAB.

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