

An Introduction of Image Processing with MATLAB Tool

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Abstract— There are several tools available for analyzing the images and processing it. But MATLAB is a good interactive tool that provides the good operational tool and enhancing tool for these images. MATLAB is a good interactive tool in image processing and it has a wide area of application and specification. MATLAB provide a platform in which we can easily implement the algorithm that will perform the desired operation. MATLAB has several tools that are used to enhance the image according to our desired. MATLAB is used in two types of application. First one is to enhance the visual information like sharpness, contrast, brightness enhancement to make the image better perspective vision. In Second one we improve the image in such a way that it suitable for the machine application. In this paper, we describe the important feature of MATLAB TOOL and its application image processing.

Keywords— *MATLAB TOOL, image processing, Pre-processing, segmentation, Image restoration, Recognition and interpretation*

I. INTRODUCTION

We know the human loves the beautiful natural creature of the god. Human very much rely on the visual sense for his living. We use the visual sense for the feeling of the things which is around us. The things which are around us we can see them. We can differentiate them on the basis of the colour, shape, size etc. We can also measure the difference of these size, colour, shape etc. On the basis of the colour and the shape and size, we can identify and classify the things which are around us. We can sense the differences to get the over feeling of the things. On the basis of these feelings we live our life. So the visual sense is very important for the human. So in the image processing, we try to enhance the image for their visual sense. We can modify the image for the machine application.

In this chapter I am going to describe the image processing in single image or snapshots. Image processing can also deal with the changes in scenes. We can measure the changes in the particular scene for comparing and determining the different parameters. These parameters are the result of the image processing. Single picture can be defined as the image of the animals, person, a natural scene, an image of organ (medical images), and a micro photograph which is taken by the high resolution camera. High resolution camera provides the better image in comparison in to the ordinary camera. It

gives the detailed information about image. If the camera is not focus properly then the image will not clear and the visual of the Image will not good. So in such cases the image may be have poor contrast, blurred or it may contain the noise. In such case, The image cannot be easily identified in seconds. But these types of the defects can be easily removed with the help of the image processing tool. Image processing tool provide the different image processing technique for the enhancing the image. With the help of the image processing tool we can remove and improve the image for their visual appearance. For this purpose we need to image processing, in the next section I have describe the meaning of the image processing and the purpose of the image processing and the different technique of image processing which is used for the image enhancing the image. Image processing has the so many applications, but we can broadly divide it for two ways one way is make the image better for the human perception and for the machine application etc.

II. WHAT IS IMAGE PROCESSING?

Image processing can be defined as the making change in the image so the image can be enhanced in such a way that the image can be used in two way which is given below.

1. We try to improve its pictorial information for enhancing visual for better human interpretation. It will increase the pictorial information for better presentation of the image.
2. Enhancing the image in such way that it is most suitable for the machine application. We focus to improve the image in that information that is more suitable for autonomous machine application.

Here I am going to describe the digital image processing that uses the computer for the analysis for the digital change in the image in the process of enhancing the image. Image processing differ in the two way that how we can enhance the image in the first way or enhance the image in second way. Both the process differs in the way of processing. In first way we try to increase the visual aspect of the image. But in the second way we do not try to enhance the image for the visual perception but we improve the image for which factor that is used for the autonomous machine application. In the first procedure the image may be most suitable for the visual perception but it may not suitable for the machine application. We know that human like the image which is sharp; have

good contrast and the brightest. But the machine does not prefer the image which is not sharp and brightest. In machine application image should be simpler and uncluttered. We enhance only that information which is used by the machine and all other information is diminished or erased by the image processing. The image processing leads the enhancing the image through the sharpness of the edges of the images which make the image better for visual perception. Sharp edges of the image make the picture clear and the things precise and the more visually clear.

III. DIFFERENT ASPECTS OF IMAGE PROCESSING

In this section, I have described the different aspects of the image processing technique. Here I have divided the different techniques into broad subclasses. Different types of algorithm are used for the different type of image processing. These are given below.

Image enhancement: First one is image enhancement which is used for the modification of the image of their specific use. Some time we use to enhance the visual quality or some time we make the image suitable for their machine application.

- Sharpening or de-blurring for enhancing the image.
- Highlighting edges for the measuring area or measuring the length.
- Improving image contrast and brightening an image for improving the visual quality.
- Removing noise for enhancing the image.

Image restoration: image restoration can be defined as reversing the damage done to an image with the help of the image processing technique. This damage is done by a known cause, for example:

- Removing of blur due to linear motion
- Reducing of optical distortions,
- Reducing the impact of periodic interference.

Image segmentation: Segmentation is defined as the re-grouping of an image into their individual entities. By this process an object is differentiated from its surrounding in an image. Image segmentation is used when we want the process the only part of the image not the whole image. Image segmentation is very useful when we our region of interest is only in some region. Image segmentation has wide application in medical. An analyzer can perform the quantitative measurement of the geometrical changes of arteries like length, width etc and provides the localization of region of interest. These regions contain the important information about the disease. This region works as the disease indicator. Therefore an automated segmentation reduces both the expenditure of resources and the examination time for project developer. Segmentation is used for the following purpose.

- For the identification of different shapes like lines, circles, etc in an image,
- In object detection from the aerial photograph, these objects may be road, car, human building etc.

So these are the main aspects of the image processing technique. They are used to make the image more suitable for its application.

IV. AN IMAGE PROCESSING TASK

In this section I have described the image processing task in detail. Layout for the task is given below. This task can be completed in four stages. These stages are given below.

Acquiring the image: We know that a computer able to process the digital images only. So In the First stage, we produce a digital image which can be processed through the computer. So we use a camera or scanner which changes the paper image to digital image.

Pre-processing: In this stage the processing part is done. Image processing can be defined as the making change in the image so the image can be enhanced in such a way that the image can be used in two way which is given below.

We try to improve its pictorial information for enhancing visual for better human interpretation. It will increase the pictorial information for better presentation of the image.

Enhancing the image in such way that it is most suitable for the machine application. We focus to improve the image in that information that is more suitable for autonomous machine application.

Segmentation: Segmentation is defined as the re-grouping of an image into their individual entities. By this process an object is differentiated from its surrounding in an image. Image segmentation is used when we want the process the only part of the image not the whole image. Image segmentation is very useful when we our region of interest is only in some region.

Representation and description: in this stage we extract the feature form the processed image. For these features we analyze the image for the conclusion. With the help of feature extraction, we can differentiate one object from the other objects. Here we try to extract some feature which related to the shape, size or the colour of the object.

Recognition and interpretation: in this stage we try to inter-relate the results and the features which I have been extracted from the mages. And we try to find the result of the processing. Stage may involve some arithmetic operations. This stage will solve the purpose of the processing.

V. MATLAB TOOL

MATLAB tool is use for the data analysis and enhancing the visualization of the image. This tool has been designed with powerful support for matrices and its operations. This tool has the excellent solution for graphics application, and it also has a powerful programming languages support. All these capabilities make the MATLAB tool very important and the efficient for the image processing purpose. MATLAB tool has much utility software inbuilt. These software's are called the tool boxes. I have use the image processing tool box in MATLAB. These tools are designed in such a way that it can perform the particular task. So basically it is a group of the software which is designed to perform multi-task which is related to the image processing, mathematics, simulink etc. particular task.

Here I am not going to describe the all the tools boxes but I will describe the main application of the image processing tool box. I will describe the introduce functions, MATLAB commands and image processing techniques which I have used. MATLAB function accepts the various parameters which have given as the input and after processing it produces some sort of output. We can give a matrix, a string, a graph or figure as the input. Then we provide the processing functions or command such as sin, imread, imclose etc. according to

these function MATLAB give us the output of the given input. Some examples of the commands are given below.

```
>> c=imread('cameraman.tif');
>> a=imclose(b);
```

```
>> figure, imshow(w), pixval on
```

We write the commands in the commands window. In the commands window we can get history of the commands and we can change the directory etc. The figure of the command window has shown below.

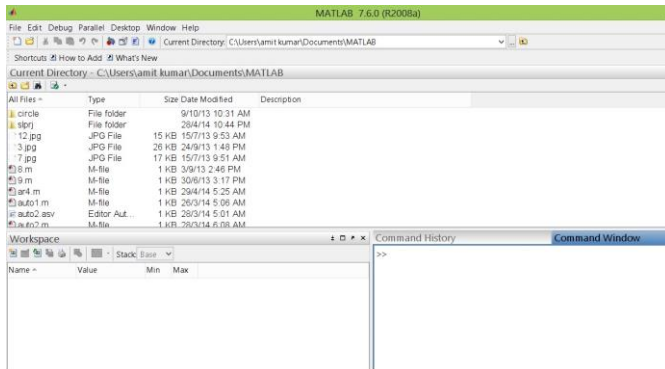


Fig.1. Command window

In MATLAB command window, we can write the combination of function and the commands, multiple commands in a single line of the algorithm. In MATLAB's all the data is written in matrix form. In case of the Images, grey values of the pixels are written in the matrices form. In MATLAB, single values are considered as 1x1 matrices and string is taken as 1xn matrix of characters where n is the length of the string. In the figure 1, I have shown the command window where we write the commands.

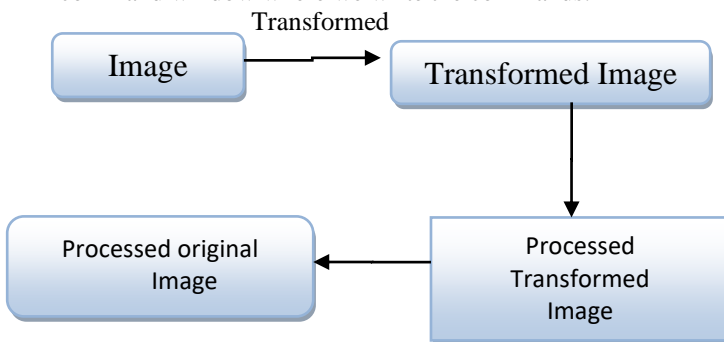


Fig.2. Procedure of applying commands in MATLAB

In MATLAB, the entire image is processed as the single block. This is shown by the figure2.

VI. APPLICATION OF THE IMAGE PROCESSING

There are the so many applications where we need the image processing. Image processing has the wide area application in the field of science and technology. Here we use different image processing technique for the different application. Some application are describe given below.

1. in medical field

- The images which taken from the X-rays, MRI or CAT scans have no good visual. So for the interpretation, we use the image processing technique to enhance the area of interest.

- Image processing help in the analysis of cell images like brain tumor, cancer cell, other internal cell of the different organ.

2. in the field of the Agriculture

- By taking the picture from Satellite/aerial views of land and process it we get that how much land is being used for what purpose.
- These pictures are used to investigate the suitability of different regions for different types of crops.
- For comparing the quality of fruit and vegetables in between good and fresh production from old production.

3. for automation of Industry

- Automatic inspection of the defective pieces of items on a production line. We can separate the half filled or less filled bottles from the production line.
- For checking the paper samples in paper mills.

VII. CONCLUSION

This paper presents the importance of MATLAB TOOL for image processing and the various images processing technique. Image processing tool provide the different image processing technique for the enhancing the image. With the help of the image processing tool we can remove and improve the image for their visual appearance. I have describe the meaning of the image processing and the purpose of the image processing and the different technique of image processing which is used for the image enhancing the image. Image processing has the so many applications, but we can broadly divide it for two ways one way is make the image better for the human perception and for the machine application etc.

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