Digital Image Processing

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Abstract- *Digital Image Processing is a process of digitizing images using digital computer. Using the computer algorithms, the images are enhanced to get the desired information. The following steps are used in Digital Image Processing first we have to Import the image through image acquisition tools. Second step is to analyse and manipulate the image.Finally the Output will be altered image or a report based on analysing that image. Here we are going to discuss about what is an image, sampling and quantization, resizing image and aliasing and image enhancement.*

Keywords- Sampling,Quantization,Aliasing,Enhancement, Intensity, Interpolation.

I. INTRODUCTION

An image can be coined as a two-dimensional function,**F(x,y)**, where x and y are spatial coordinates, and the amplitude of **F** at any pair of coordinates (x,y) is called the **intensity** of that image at that point. When x,y, and amplitude values of **F** are finite, we call it a **digital image**. There are two types of image processing they are analogue and digital image processing. Analogue image processing can be used for the hard copies like printouts and the photographs. Digital image are processed using computers. The image has to undergo three phases while using digital technique they are pre-processing, enhancement, displaying images and extracting information.

Sampling and Quantization :

Before the image is processed, an image function f(x,y) must be digitized both in amplitude and spatially. To sample and quantize the analogue video signal a frame grabber or digitizer is used. Continuous data is converted into digital form in order to create a digital image. The following steps are processed here :

- Sampling
- Quantization

The spatial resolution of the digitized image is determined using sampling rate and the number of gray level is determined by quantization level. A magnitude of the sample image is expressed as a digital value in image processing. The transition between continuous values of the image function and its digital equivalent is called quantization. The quantization levels should be high enough for human perception of fine shading details in the image. The main problem in image is the occurrence of false contours which should be quantized with insufficient brightness levels.

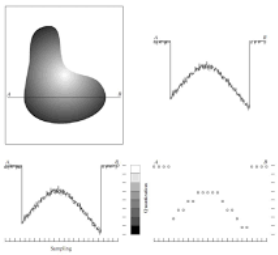

Fig 1: Image Sampling and Quantization Process

Resizing Image:

Image interpolation will occur when the image is resized or distorted. When the number of pixels in the image is increased or decreased, image resizing is needed. When the image is rotated or the lens is distorted, image remapping occurs. When the numberof pixel is increased, the zooming effect occurs and we get more information about image.

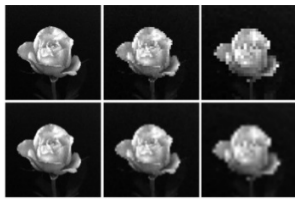

Fig 2:Resizing an Image.

Aliasing and Anti-aliasing:

Aliasing is occurred when a signal is sampled at a less than twice the highest frequency present in the signal. The digital sound recording equipment includes the low –pass filters to remove any signals that are above half the sampling frequency.

Nyquist-Shannon sampling theorem states that if the input contains no frequencies above Nyquist frequency, it is

possible to reconstruct each of the sinusoidal components from the samples.

Anti-aliasing is a process of minimizing the appearance of aliased diagonal edges. Higher resolution and smooth edge appearance of an object is given by anti-aliasing.

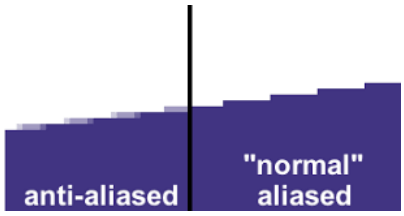

Fig 3: aliasing and anti-alising

Image enhancement:

Image enhancement is a widely used technique in many image processing applications. In any subjective evaluation of image quality, contrast is the important factor. The difference in luminance reflected from two different adjacent surfaces is declared as Contrast.

Also, In visual perception, the contrast is calculated as the difference in the colour and the brightness of the objects with the other objects. Many algorithms have been developed for contrast enhancement and also applied in the Digital Image Processing.

If the image is highly concentrated on specific range then the image is dark, and the information will be lost in the areas which are excessively and uniformly concentrated. So it has to be optimized in order to get all the information in the original image.

Fig 4: Image Enhancement

Arithmetic and logic operations:

The arithmetic operations or the logical operations are applied on two or more images. The value of the pixel in the input image determines the value of the pixel in the output image, thus the images are of same size. There is a wide range of applications, even though the image arithmetic is the most simple form. The primary advantage of arithmetic operators is very simple and also fast.

Binary images are combined using the logical operators.The logical operator is normally applied in a bitwise way, in case of integer images.

Spatial domain filtering:

To modify or enhance an image, filtering technique is used. The value of any given pixel in the output image is determined by applying some algorithm to the values of the pixels in the neighbourhood of the corresponding input pixel. The neighbourhood pixel is nothing but the pixels relative to their location.

II. CONCLUSION

Thus, we can use sampling and quantization techniques to process a digital image. The images are enhanced using above techniques.

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