

# Visual Enhancement Process

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**Abstract:** Visual enhancement is one of the important technique in visual processing field. The main objective of this technique is to improve the quality and information of the visual and to provide better visualization to the visual. In this paper we have used two techniques to enhance the quality of a visual. These two are histogram & Unsharp masking and crispening.

**Key Words:** Visual enhancement, histogram equalization, & Unsharp masking and crispening.

## 1. INTRODUCTION

Digital visual processing is the area where substantial experimental work is done to give a feasible solutions to the problems. Digital visual processing is also used for improving and enhancing the quality of a visual. To enhance the quality of a visual two techniques are used:

Histogram and Unsharp masking and crispening.

### 1.1 History of visual enhancement:

Many of the techniques of digital visual processing, it was developed in the 1960s at the “Jet Propulsion Laboratory, Massachusetts Institute of Technology, Bell Laboratories, University of Maryland” and a few other research facilities, with application to “satellite visual wire photo standards conversion, medical imaging, videophone, character recognition” and photograph enhancement. The cost of processing was high in that era.

In 1990s it was available on cheaper computers and dedicated hardware. Visuals then could be processed in real time, for some dedicated problems such as television standards conversion. As general-purpose computers became faster, they started to take over the role of dedicated hardware for all but the most specialized and computer-intensive operations. With the fast computers and signal processors available in the 2000s, digital visual processing has become the most common form of visual processing and generally, is used because it is not only the most versatile method, but also the cheapest.

Visual enhancement technology for medical applications was inducted into the “Space Foundation” Space Technology Hall of Fame in 1994.

### 1.2 History of visual enhancement technique “Histogram”

The work done by various researchers for visual enhancement are discussed as following:

K.S.Ravichandran et.al (2015)proposed that main aim of visual enhancement is to enhance the quality and visual appearance of an visual. It improves clarity of visuals for human viewing, removing blurring and noise.

Rajesh Garg et.al(2011) reviewed that visual enhancement is among the simplest and most appealing areas of digital visual processing.

Premladha et.al (2015)had given one of the application of visual enhancement i.e one of the most important stages in medical visual detection and analysis is visual enhancement techniques.

Madhu S.Nair et.al (2011) suggested that adaptive histogram equalization produced a better result.

Jinshan Tang Eli Peli et.al (2003) suggested global histogram equalization which adjusts the intensity histogram to approximate uniform distribution.

Oskam Chae et.al (2007) suggested the dynamic histogram equalization (DHE) technique takes control over the effect of traditional histogram equalization so that it performs the enhancement of an visual without making any loss of details in it.

### 1.3 Histogram

Histogram is graphical representation of tonal distribution of data. It plots the number of pixels for each given value. By looking at the histogram for a specific visual a viewer will be able to judge the entire tone of color distribution at a glance.

The histogram equalization technique is used to lengthen the histogram of the given visual. Greater is the histogram lengthened greater is the contrast of the visual. Histogram equation automatically derived a transformation function that attempts to produce an output visual that has uniform histogram. When automatic enhancement is

desired, histogram is a good approach because the results from this technique are predictable and the method is simple & easy to implement.

### 1.4 Unsharp masking and crispening

The techniques of unsharp masking is commonly used in printing industry for crispening the edges. It is applied by reducing an unsharp or smoothed or low-pass filtered version of a visual from the original visual. It is like adding the gradient, or high-pass signal to the visual.

## 2. TECHNIQUES USED

Histogram equalization is one of the visual enhancement technique which is most popular because of its ability to provide better performance on all types of visuals. Histogram equalization is a transform that stretches the contrast by redistributing the gray level values uniformly.

### 2.1 Histogram Equalization Algorithm

Let's suppose that  $Z=\{Z(x,y)\}$  denotes a digital visual where  $z(x,y)$  denotes the gray level of the pixel at  $(x,y)$  place. The total no. of the pixels in visual is  $M$  and the visual intensity is digitized into  $L$  levels that are  $\{Z_0, Z_1, \dots, Z_{L-1}\}$ . So it is obvious that  $Z(x,y) \in \{Z_0, Z_1, \dots, Z_{L-1}\}$  suppose  $m_k$  denotes the total number of pixels with gray level of  $Z_k$  in the visual, then the probability density of  $Z_k$  will be  $P(Z_k)=m_k/M, k=0,1,\dots,L-1$

The relationship between  $p(Z_k)$  and  $Z$  is defined as the probability density function (PDF) and the graphical appearances of PDF is known as the histogram. Based on the visual's PDF, its cumulative distribution function (CDF) is defined as

$$C(Z_k) = \sum_{x=0}^k p(Z_k)$$

Where  $k=0,1,\dots,L-1$  and its obvious that  $c(Z_{L-1})=1$ . Transform function of histogram equation can be termed as  $f(Z_k)=Z_0+(Z_{L-1} - Z_0)c(Z_k), K=0,1,\dots,L-1$

Suppose  $Y=\{Y(i,j)\}$  is defined as the equalized visual

$$Y=f(Z)=\{f(Z(x,y)) \mid Z(x,y) \in Z\}$$

Conventional histogram equalization however results in visuals that have weird look due to excessive contrast enhancement. Researchers have focused on improvement of the histogram equalization based contrast enhancement and new forms of histograms for contrast enhancement have been developed.

Equalization combines the global histogram, multilevel gray level thresh-holding to produce a visual with improved global and local contrast and minimal distortion.

### 2.2 Unsharp masking and crispening

Unsharp masking and crispening is one of the visual enhancement technique which is use to sharp and enhance the detail of the visual. It is similar to adding the gradient, or high-pass signal to the visual. It is mostly used for visual taken form satellite and related to that field.

## 3. APPLICATIONS:

Visual enhancement is mainly used for improving the quality of a visual. The applications of visual enhancement are Vision Graphics, Aerial imaging, Remote Sensing, Satellite imaging, Medical imaging etc.

## 4. CONCLUSION:

This paper presented a method to enhance the visual using histogram and Unsharp masking and crispening. Histogram equalization technique works on enhancing the visual by redistributing the gray levels uniformly.

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