

# Histogram Equalization Software to Enhance Digital Image by Visual Studio 2010

Asmaidi<sup>a,1</sup>, S Fahmi Junanda<sup>a,2</sup>, Teti Novia Dewi<sup>a,3</sup>

<sup>a</sup> Polytechnic of South Aceh, Merdeka Street, Komplek Reklamasi Pantai, Tapaktuan city, 23751, Indonesia  
<sup>1</sup> [asmedmat@gmail.com](mailto:asmedmat@gmail.com); <sup>2</sup> [junanda06@gmail.com](mailto:junanda06@gmail.com), <sup>3</sup> [tetinoviadewi@gmail.com](mailto:tetinoviadewi@gmail.com)

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## ABSTRACT

Digital image (image) is another term for picture, as one of the multimedia components plays a very important role as a form of visual information. Image processing is a process that involves a lot of visual perception. A grayscale image is an image that has only one channel value in each pixel, in other words the values of Red, Green, Blue are used to indicate the intensity level. Pixel (Picture Elements) is the value of each matrix entry in the bitmap. This pixel is affected by the number of colors that can be displayed. Image improvement is one of the simplest and most attractive methods in digital image processing. Basically, the idea behind image improvement techniques is to bring out obscured details or just to highlight certain interesting features. Histogram Equalization/Histogram leveling is a histogram smoothing process, where the distribution of gray level values of an image is made evenly.

## I. Introduction

### A. Background

Equalization method works by describing the distribution of pixels in a histogram. The methods included in this group work by changing the gray level value of certain pixels regardless of their location in the image. From a histogram can be seen the frequency of relative appearance (relative) of the intensity in the image. The histogram can also show many things about the brightness and contrast of an image. Because of this, histogram is valuable tool in image processing work both qualitatively and quantitatively, although this method is not always a good method for improving image quality especially for color images while equalizing the three components R, G, B arises color distortion in processing.

According to [4], the use of the histogram equalization method is considered easy because of its simplicity and relatively better performance in almost all types of images. The histogram equalization method is very effective to be used not only in improving the entire image but also in improving the texture detail. To change the order of gray level from the original image is completely controlled. Thus it can improve images more effectively.

### B. Research Objectives

This research aims to,

- 1) Design an application to do image repairs using the histogram equalization method.
- 2) Apply the histogram equalization method in software design and implement the application in a system.

## II. Literature Review

### A. Image

According to [3], the image is thought about and attitudes towards who have different groups. The image is an image recorded by the camera or by a sensor.



### B. Types of Digital Image

According to [3], the value of a pixel has a certain range value, from the minimum value to the maximum value. The range used varies depending on the type of color. However, the range is 0-255 in general. The types of digital images are binary images and grayscale images.

### C. Image Matching

According to [3], Image matching is an easy thing for humans both in sufficient light conditions and with dim light, but in the view of computers, the work becomes a difficult job, because the image does not have semantic information. So it needs a certain approach so that image matching can be used as the basis for several applications in computer vision such as image recognition. Matching effectiveness can be influenced by several parameters, such as viewpoints, changes in scale or size, changes in rotation and changes in light intensity in the image.

### D. Pixel

According to [3], Pixel (Picture Elements) is the value of each matrix entry on a bitmap. The range of pixel values is influenced by the number of colors that can be displayed. If a bitmap can display 256 colors, the pixel values are limited to 0 to 255. A bitmap is considered to have high accuracy if it can display more colors.

### E. Histogram

According to [3], Image histogram is closely related to various image processing techniques, especially the methods classified in point operations. Therefore, at the beginning of the point operation will be explained first about the concept of the histogram. The image histogram refers to the histogram of the pixel intensity value. The histogram displays the number of pixels in an image grouped by different levels of pixel intensity values. The process of forming a histogram can be done by checking each pixel value in the image, then calculating the number of pixel values and stored in memory.

### F. Histogram Equalization

According to [2], Histogram Equalization is a method where image histogram alignment occurs, where the distribution of color degree values in an image is made evenly. Various algorithms to improve image quality have been developed such as Histogram Equalization, Logarithmic Image Procurement and so on. Inputs to this process are images and outputs that are also images with better quality than previous input images. Many techniques or methods are used in image enhancement. Among other things, using the median filtering method and alignment of the image histogram (Histogram Equalization).

Histogram calculating tabulation is shown in Table 1, it is easy to see that the more true the value is, the greater the value of  $h_i$ .

Table 1. Histogram Count

$I$	$n_i$	$H_i = \frac{n_i}{n} (n = 64)$	$I$	$n_i$	$H_i = \frac{n_i}{n} (n = 64)$
0	8	0.125000	9	3	0.046875
1	4	0.062500	10	7	0.109373
2	5	0.078125	11	4	0.062500
3	2	0.031250	12	5	0.078750
4	2	0.031250	13	5	0.046875
5	3	0.046875	14	4	0.062500
6	1	0.015625	15	3	0.046875
7	3	0.046875	9	3	0.046875
8	6	0.093750			

### G. Visual Studio 2010

According to [2], Visual studio is a classic, legendary programming language, and practically incomparable that most used by programmers in the world. This programming language is used by millions of programmers, and is listed as the most preferable program by the majority of people. Visual Studio 2010 is basically a computer programming language.

## III. Research Methods

### A. Data Collecting

Some methods are applied in data collecting as follow:

- 1) Literature Review  
Study theories about histogram equalization and collect data and all theories relating to research, both from books, papers, journals, and previous research.
- 2) Observation  
Conducting an overview and direct observation, on the equalization histogram and image refinement.
- 3) Sampling  
Sampling is a data collection technique that is carried out by retrieving data records / records relating to the object of research.

### B. System Analysis

System analysis carried out on digital images is conducted by using histogram equalization to produce a better image.

### C. Analysis of Histogram Algorithms

To get a good image, the distribution of intensity values must be changed. Alignment histogram (histogram equalization) is a technique that can be used. The aim is to obtain a uniform histogram spread, so that each degree of gray has a relatively equal number of pixels.

### D. Analysis of Software Facilities

To achieve the initial objective of the research, which is an application that can do graying to digital images, some of the facilities available in this software, namely:

- 1) Digital Image Selection Facility
- 2) Facilities to know the grayness of digital images
- 3) Facilities for grading

### E. Research Design

The design form of the software is to perform gray leveling on digital images using the histogram equalization algorithm. The system design in this study includes the following steps:

#### 1) Interface Design

The purpose of the design is to make it easier for users to use applications in computers efficiently and simply. Interface at a more detailed level, serves as the selection of display screens that are conveyed to users, the interactive concept of an application, the transition from one part to another and data entry from the user.

#### 2) Flowchart

Flowchart describes the flow of processes that occur in the system. Through a flowchart, the user can trace how the process flow occurs in a system. The system flowchart described below is:

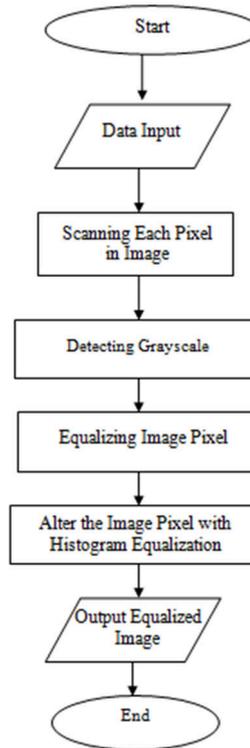


Fig. 2 Program Flowchart

#### IV. Results and Discussion

The results of the leveling application design with the histogram equalization algorithm are tested to see whether the results are in accordance with the initial objectives of the study, while the testing steps carried out are as follows:

##### A. Home-screen Interface

Testing the main menu is done to test whether all the displayed options are well accessed. For this reason, the application is executed so that the main menu display appears as shown in Figure 3.

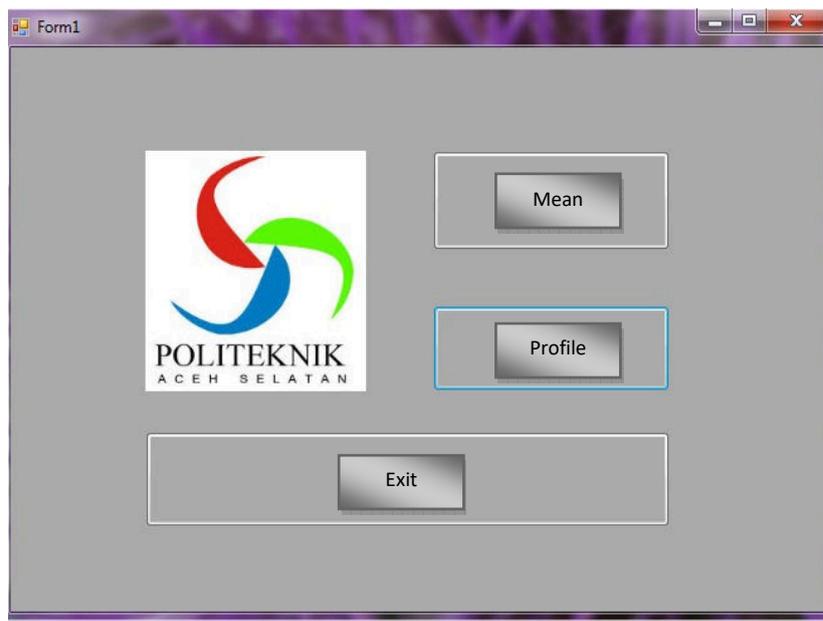


Fig. 3 Home-screen Interface

Next, a menu selection is made for each of the options such as alignment, profile, and exit. The results obtained are the appearance of the alignment window as shown in Figure 4.

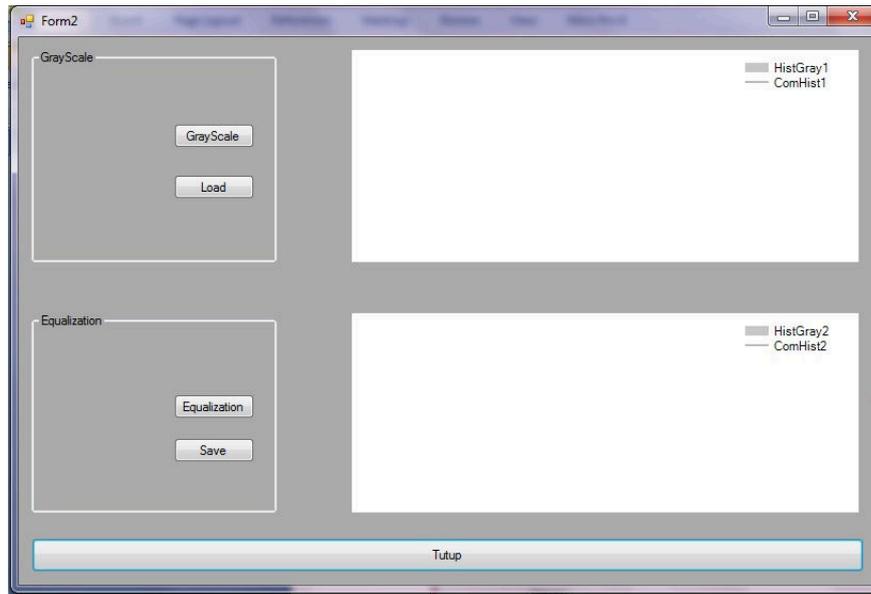


Fig. 4 Equalization Form

*B. Gray Implementation of Digital Image*

This test displays gray on an image for the grayscale menu when grayscale button is pressed. The results obtained are the appearance of the alignment window as shown in Figure 5.

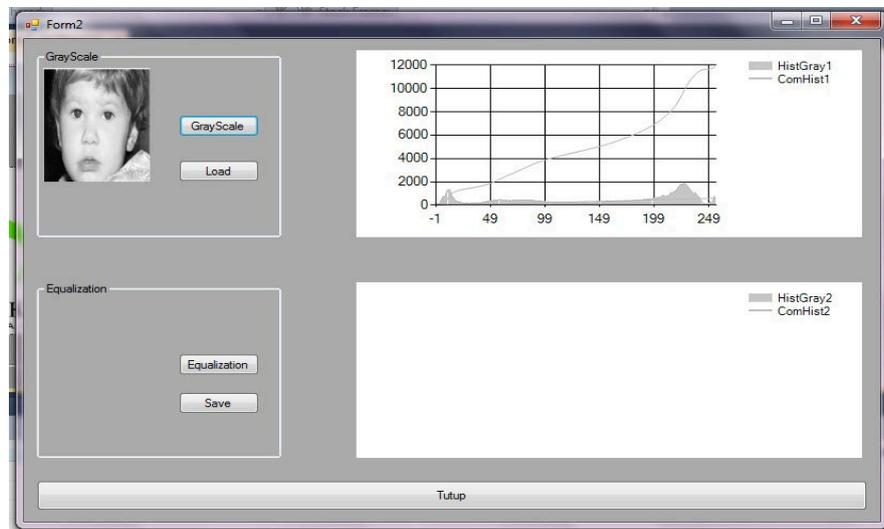


Fig. 5 Grayscale

*C. Implementation of Histogram Equalization in Digital Images*

This test displays alignment of digital images. For equalization menu when equalization button is pressed, the result obtained is the appearance of the alignment window as shown in Figure 6.

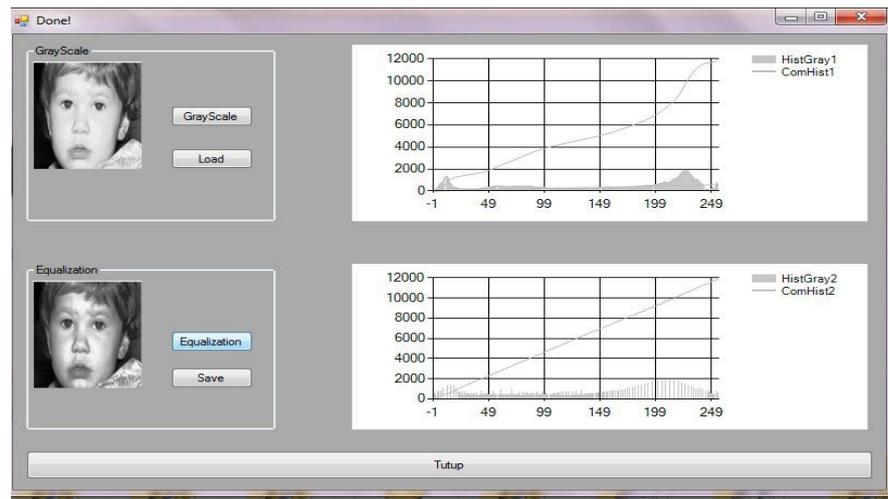


Fig. 6 Equalization Form

## V. Conclusion and Suggestion

### A. Conclusion

Based on the results of the design and implementation of digital image repair software using the histogram equalization method, the authors draw the following conclusions:

- 1) Change the gray degree of a pixel with a new gray degree with a transformation function.
- 2) The design of histogram equalization software is done using Microsoft Visio as the interface design.

### B. Suggestion

Based on the conclusions that have been described before, it can be given a suggestion that:

Based on the conclusions that have been described before, it can be given a suggestion that:

- 1) Image repair method can be developed using the Histogram Equalization method.
- 2) Software to improve digital image applications can be developed along with the development of system usage so that it can improve system performance.

## References

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