Improving Image Quality in Hero Photos Using Grayscale Images Using the Histogram Equalization Method

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A B S T R A C T

Photos of heroes are one of the important images in history. Today's hero photos have poor image quality because the camera technology that existed in the past was still simple. Due to technological limitations at that time, the current hero photos are still of low quality with the dominant color being gray. This condition results in the information contained sometimes not being received properly. To overcome this problem, it is necessary to improve the image quality of hero photos which are still of low quality. Image quality improvement is one of the image processing operations which aims to perfect the image by manipulating image parameters. This operation is often applied to images that have poor quality so that the quality can be improved. In this research, we will apply image enhancement operations or improve the image quality of hero photos so that the quality can increase. There are many methods that can be used to enhance images, one of which is histogram equalization which has been widely used to enhance images, especially greyscale images. This method is usually done on images using the Matlab application because of its simple use. This research produces new images with better quality than previous images.

Keywords:
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INTRODUCTION

In this digital era, the use of photos and images has become an inseparable part of everyday life. A hero is a figure who has an important role in a nation's culture [1] who is often immortalized

in photographs that symbolize courage, dedication and service to society as a form of pride [2]. Hero photos have an important role in immortalizing important moments in a country's history [3] and commemorating the services of heroes who have fought for the nation's independence and progress [4].

However, along with technological developments, many hero photos are damaged [5]. This results in reduced image quality in hero photos [6], including loss of detail, color and inadequate contrast [7]. Therefore, efforts are needed to improve the image quality of damaged or blurry hero photos [8]. This research has the potential to provide significant benefits in improving and preserving historical photos of heroes.

One method that is widely used in image processing is the Histogram Equalization (HE) method [9] [10]. This method is used to increase image contrast by redistributing the image histogram over the entire range of available pixel values [11] [12]. Contrast generally refers to differences in lighting or gray level values in an image [13]. By applying the HE method to grayscale images, we can correct image quality deficiencies in hero photos and produce clearer and sharper images [14] [15].

One aspect that can affect the quality of a photo is the gray scale. A gray scale image is an image consisting of a gray scale from 0 to 255 [16] [17], which reflects the light intensity at each pixel of the image [18]. Greyscale images do not contain color information, as color images generally do. In contrast, grayscale images only display the gray level of each pixel [19]. The use of grayscale imagery can help increase contrast and emphasize details in hero photos [20]. By focusing the light intensity, grayscale images can better highlight the contrast and details in the image [21].

This research aims to improve the image quality of hero photos using greyscale images by applying the Histogram Equalization method [22]. In this research, the effect of the HE method on image contrast and sharpness in hero photos will be analyzed [23][24]. This research will also consider other factors that can affect image quality, such as loss of information and noise in hero photos [25].

It is hoped that the results of this research can contribute to the field of image processing and history, by providing effective solutions in improving and improving the image quality of hero photos. By restoring clarity and detail to photos of heroes, it can strengthen feelings of pride and respect for the services of heroes who have fought for the country and nation.

METHODOLOGY

The method used in this research is the Histogram Equalization method. Hero photos in general are mostly colorless or usually only gray, so the Histogram Equalization method can be applied to improve the image quality of hero photos, as in previous research that used the same method [26]. The application used in this research is the Matlab application which has been widely used for image enhancement because its use is quite simple. The research stages carried out in this study can be seen in the picture below.
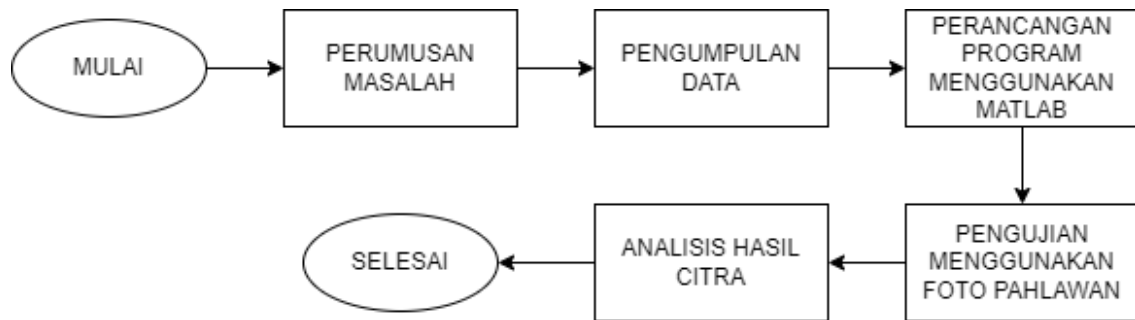
Figure 1 Diagram of Research Stages

1. Formulation of the problem
    Problem formulation is an important stage in research which includes identification, selection and formulation of the problem to be researched. The purpose of the problem formulation is to clarify the problem to be solved and provide a clear direction in the research. At this stage questions arise regarding the process of improving the image quality of hero photos using greyscale images with the histogram equalization method and the Matlab application and what the results of the enhanced images are.

2. Data collection
    The next stage is data collection which includes collecting information, facts, or values from various sources that are relevant to the research objectives. Good and structured data collection is the key to producing valid and reliable research results. Data collection in this research was carried out by collecting photos of heroes sourced from the internet and history books which were then used to beautify the images using the histogram equalization method.

3. Program Design
    Program design refers to the process of planning the structure, function and workflow of a computer program before starting the implementation or coding process. The program design carried out in this research went through two stages. The first stage is creating a program design using GUI tools in Matlab.
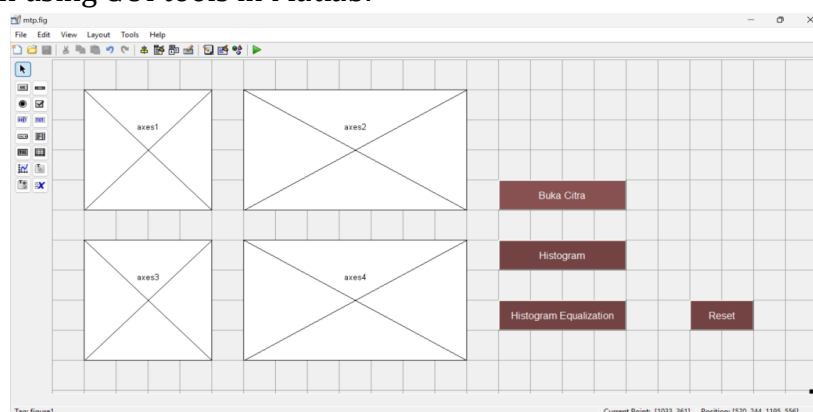

Figure 2 Design Program with GUI Tools in Matlab

Figure 2 is the result of a design program that has been designed using GUI tools in Matlab. The components used to build this program are 4 axes and 4 push buttons, each of which has its own function.
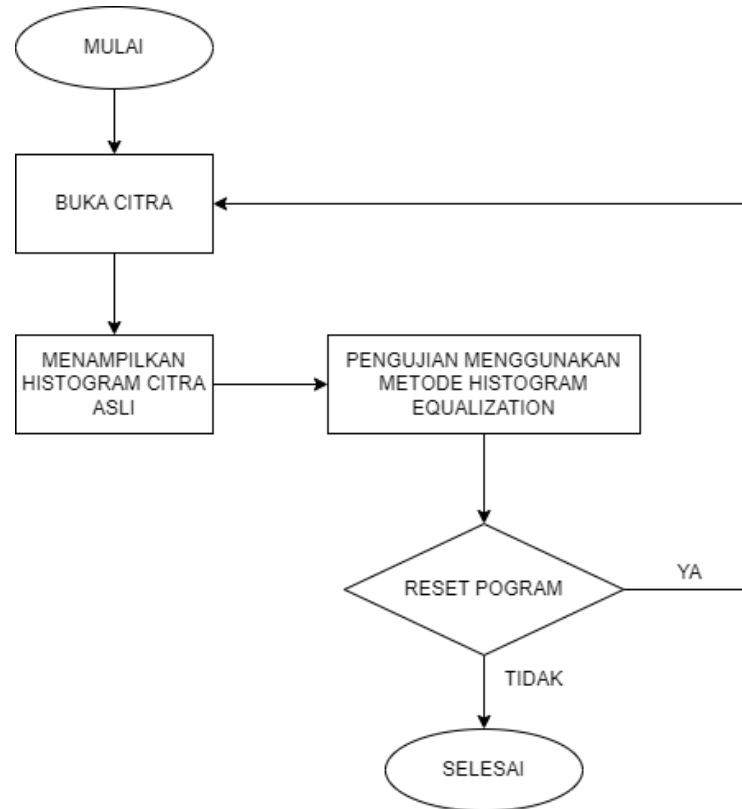
4. Testing Using Hero Photos

Figure 3 Test Diagram Using Hero Photos

Testing is carried out by entering a sample photo of the hero whose quality you want to improve and then processing it using the Histogram Equalization method in the Matlab application, then when the test is not optimal you can open another photo image of the hero after resetting the program first, and if the test is felt to be optimal then the test can be done. resolved immediately.

5. Image Results Analysis
   There are two stages of analysis carried out, namely image analysis and histogram analysis. Image analysis results, namely comparing the original hero photo with the hero photo after processing using the naked eye. Histogram analysis is by comparing the histogram shape of the original hero's photo with the hero's photo after processing.

RESULTS AND DISCUSSION

Hero photos are obtained from history books and the internet. The extension on this hero photo is JPG. This photo shows a GUI program in MATLAB that has been well designed. This program aims to carry out simple analysis of the data that has been obtained. This program has an easy-to-use design, allowing researchers to easily enter data, activate program features, and see analysis results clearly.
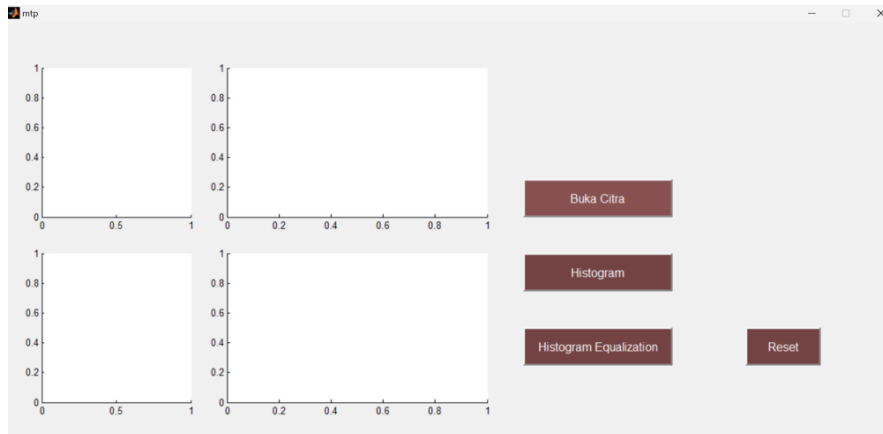

Figure 4 Design Results When Executed

Figure 5 is the result of the design program when executed. It can be seen in Figure 5 that each component has a different function.
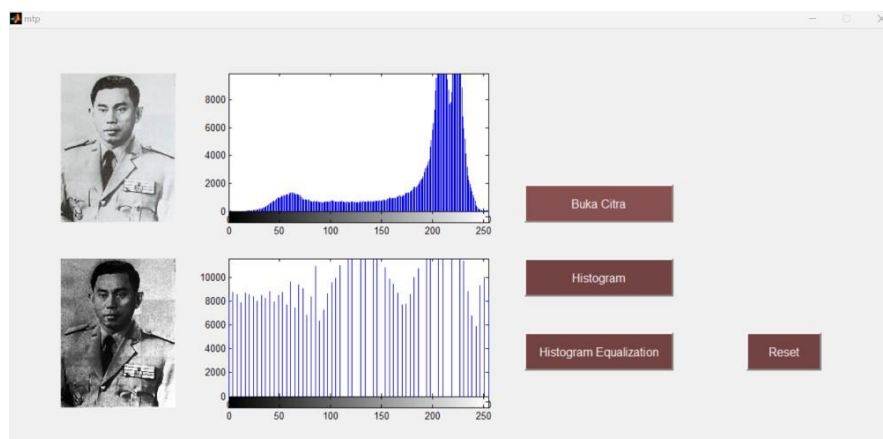

Figure 5 Testing Using Data

Test analysis using Histogram Equalization is an image processing method to increase image contrast and clarity. Histogram Equalization is a technique used to even out the pixel intensity in an image, changing the original histogram into an even histogram.

In this photo you can see the testing process using Histogram Equalization on an image. The image may have lower contrast or uneven intensity. The aim of this analysis is to increase the clarity and contrast of the image so that details can be seen more clearly.

Table 1 Image Comparison Results

Original Image	Image Result of Histogram Equalization

It can be seen that in Table 1 the image comparison results of the original image located on the left may have some objects that are less clear. However, when processed with Histogram Equalization results in an image that has better contrast and even pixel intensity throughout the image. Details that were previously difficult to see, such as the edges of objects or fine textures, are now clearer and well visible.

In the Histogram Equalization process, a pixel histogram of the original image is calculated, where the pixel intensity values and their distribution are represented in graphical form. Then, the histogram is adjusted by changing the pixel intensity values so that the resulting histogram is even. This is done by applying an appropriate transformation function to each pixel in the image.

The advantage of the Histogram Equalization method on processed images is that this method can add contrast and light to the image and can even out gray areas which makes the image can be said to be good, although there are weaknesses such as the contrast and brightness of the image can still be improved, but for this hero photo, this method is not enough to improve the image because the noise that usually exists in hero photo images cannot be reduced by this method.

In previous research, this method was used to improve image quality with different objects. The results of previous research are considered less than optimal so further research is needed. This research develops an existing program and tests it with different objects from previous research. Once developed, the new program can improve the image to the maximum and produce new images with better quality [14].

CONCLUSION

Based on the research that has been carried out, it can be concluded that the Histogram Equalization method can and is good for use in improving the image quality of hero photos. The results of this research can be seen by comparing the images before and after processing and also by comparing the histograms. This research produces better quality hero photos.

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