International Journal of Engineering & Technology, 7 (3.36) (2018) 229-233

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Study the Effect of Using Digital Processing on the Original Image Statistically

Fathala A.Chachan

Administration and Economics, Al-Mustansiriya University
**Corresponding author E-mail: aiiiii_f@yahoo.com*

Abstract

In this paper, we suggested using simple linear regression to determine the extent to which the original image of the changes induced by the use of image processing is affected, and to examine the extent of image similarity by knowing the statistical characteristics of the image before and after treatment, As well as testing hypotheses related to research and included two main axes: The first axis deals with the hypothesis of correlation through the use of simple correlation coefficient (Pearson)
The second axis highlights the effect relationships by using simple regression analysis for the purpose of testing. The results show that the image after the improvement is closer to the original image through the use of the program Mat lab.

Keywords: *simple linear regression, simple correlation coefficient, digital processing, program Matlab.*

1. Introduction

The design of digital imaging systems and the development of programs began in the 1960s , where digital images are characterized by a greater range of grayscale as well as contain information in the form of numbers, which led to easy analysis by mathematical models and techniques.
As well as the ease of dealing with digital data through e-mail, which enables researchers who want to work on the same data access to the ease and ease of access to easy storage of digital data and improve and analyze, display and classification and distinguish hand and hand and obtain the largest amount of information,
The digital image consists of a number of small squares stacked next to each other a matrix problem consisting of columns and rows and each of these squares represents what is known as the element or intensity of the image (pixels).
The research consists of several sections: an introduction that includes a presentation of the research followed by what is related to the initial processing that takes place on the image, which includes (rotate, reduce the image, remove background image, improve contrast)
Then, the method of calculating linear regression to show the effect of treatments on the original image, and finally review the most important results applied to the database

2. Research Goal

The aim of the research is to compare the original image with the traditional image, which is the original image that has been digitally processed by (rotate, resize, improve contrast, remove background) of which

3. Digital Image

The digital image is a matrix of points arranged in columns, lines and each point of the digital image called Pixel, which is the smallest part of the digital image
This point can be identified within the digital image by the coordinate system X, Y, and each point of the image has a numerical value representing the color of this point and the color range between zero which represents the black color and a super value representing the white represents the grayscale that ranges from zero For black color and 255 for white color.

4. Image Analysis Statistical

It is the extraction of data and information from the image, where one of the most important tasks of image analysis is to identify the necessary information extracted for the purpose of statistical analysis of data, and includes image analysis classification of the image into two types, namely the wave classification and based on statistical characteristics and non-wave classification is based largely on the degree of similarity between patterns.

5. Image Processing

It is a process whose input is a picture and its output is another image by applying a set of operations on the original image to get the most accurate information that can be included in the studied image. These processes are:

5.1. Improved Image Contrast:

Image contrast can be improved by using hissteg signals
As follows:

```
x=imread('pout.tif')
 z=imhist(x)
```

Copyright © Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

imshow(z)

5.2.Truncate the Background Image:

The background of the image can be truncated using the imopen directive as follows:
x=imread('pout.tif')
background=imopen(x,strel('disk',15))
z=imsubtract(x,background)
imshow(z)

5.3. Resize the Image (Zoom-Minimize):

The two-dimensional image size, whether grayscale, RGB, Binary, can be resized using the **imresize** instruction as follows
x=imread ('pout.tif')
z=imresize(x,0.6')
orginal_size=size(x)
After size=size(z)
Imshow (z)

5.4. Rotate the Image:

The image can be rotated at a certain angle set in degrees using the imrotate directive as follows:
x=imread('pout.tif')
z=imrotate(x,25,'nearest')
orginal_size=size(x)
After size=size(z)
Imshow (z)

6. The Correlation Coefficient

The Correlation Coefficient is used to determine the type and strength of the relationship between two variables and is denoted by r. If the relationship type is r> 0, the relation is positive, where r <0 is inverse, and r = 0 is no relationship, If the nominal variables) and Pearson correlation coefficient (for quantitative variables) In this study, Pearson correlation coefficient was used according to the following equation

$$r = \frac{\frac{\sum x * y}{n} - \bar{x} * \bar{y}}{S_x * S_y}$$

$\overline{x}$ The mean of the independent variable
$\bar{y}$ The mean variable variable
S_x Standard deviation of the independent Variable
S_y Standard deviation of the dependent Variable

7. Simple Liners Regression

A technique used to study and analyze the effect of a quantitative variable called an independent variable on another quantitative variable called the dependent variable. The regression model can be represented by the following equation: **y = a + bx**
Where it represents
a: the constant gradient or the fraction of the y axis
b: Straight line inclination
The two values are calculated from the following two ratios:

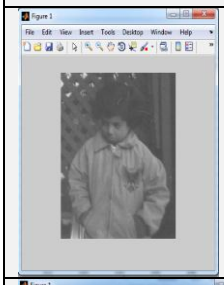
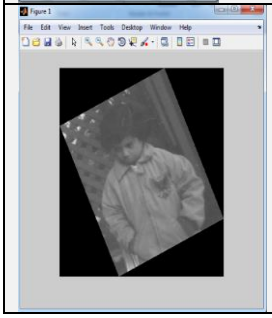
$$b = \frac{\sum \frac{xy}{n} - \bar{x}\bar{y}}{s_x^2} \quad , \quad a = \bar{y} - b\bar{x}$$

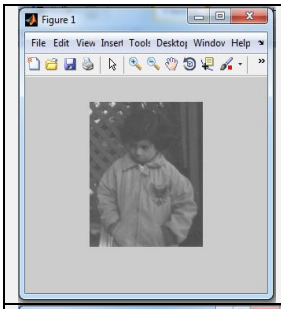
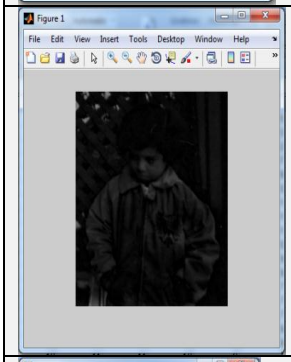
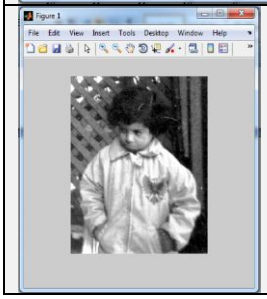
8. Practical

In this research, a specific image was chosen and four images were processed. The digital images were treated on the basis that they were black and white, and the number of dots of the image from white to black was 256. Of points based on the previous description of digital images. And then study the degree of similarity between the original image and the traditional image through the following steps:

1. Inserting and reading the image using Matlab
2. Initial processing of the image (rotation, minimization, removal of background image, improvement of contrast), and consider the resulting images after the processing process with traditional images
3. Extracting the statistical characteristics of the original image and traditional images
4. Measuring the degree of compatibility and degree of similarity between images before and after treatment using simple linear regression, Pearson Correlation correlation coefficient

Table 1: Statistical characteristics of the original image and traditional images

Pictures before and after treatment		**mean**	**S.D**	**Coefficient of variation**
	The original picture	87.94	46.039	52.35
	Rotated image	61.89	30.39	49.10

	Minimize the image	52.90	55.99	100.84
	Remove background image	10.02	5.97	59.58
	Improved image contrast	101.46	65.02	64.08

The results of the above table show that the mean of the original image was 87.94 and a standard deviation of 46.039 and Coefficient of variation of 52.35. The image was obtained after improving its variance at the highest mean (101.46) and standard deviation (65.02) Coefficient of variation (64.08). The image was obtained after removing its background at the lowest mean (10.02) and with a standard deviation (5.97) and Coefficient of variation of (59.58).

9. Testing Hypotheses

The research relied on a simple correlation coefficient (Pearson Correlation) for the purpose of testing the main hypothesis and its sub-hypotheses of the correlation between the independent variable (the image on which the modifications were made) and the dependent variable (the original image), as follows: **The null hypothesis:** There is no significant correlation between the original image and the image after the treatment process (rotation, minimization, background removal, improved contrast) **Alternative hypothesis:** There is a significant correlation between the original image and the image after the process (rotation, minimization, background removal, improved contrast)

The table (2) shows the existence of a significant positive correlation between the original image and the image after improvement of its variance. The mean correlation coefficient (0.922 **) at the level of significance (0.01), as well as the relationship of positive correlation between the original image and the image after the removal of its background The simple correlation coefficient (0.875 **) was at the mean level (0.01). There is also a slight relationship between the original image and the image after recycling. Therefore, these results fully support the validity of the alternative hypothesis. This indicates that the image after processing (image background removal, contrast enhancement and rotation) is very close to the original image (before processing). As for the process of reducing the image, it affects a lot on the original image as the value of the simple correlation coefficient (0.352 **) at the level of significance (0.01).

Table 2: Simple correlation coefficient (Pearson Correlation)

Pearson Correlation	Image after rotation	Image after resizing	The image after the background image removal process	Image after improving contrast
The original picture	0.62	.352**	.875**	.922**

10. Testing of Impact Hypotheses

The purpose of this paragraph is to test the hypotheses of the effect between the variables of the research, based on simple regression analysis and F test to determine the significance of the regression equation. The R2 is used to explain the effect of the independent variable on the dependent variable. The objectives of this paragraph will be achieved through the following assumptions:

A. The hypothesis of: (There is a significant effect of the image processing process (rotation in the original image):
The following table shows that the rotation of the image has achieved a significant effect in the image as the coefficient of selection (R2) of the image after the rotation of the amount (0.393), which means that the image after treatment explains the amount (39.3%) of the variation

in the original image, (A), the value of (a) was 29.16, meaning that the value of the original image is estimated at constant value (a) even if the slope parameter is zero, (b) was 0.95. This means that changing one unit in the amount of rotation will change the original image by 0.95. Hypothesis (there is a significant effect of the rotation process on the original image), and is accepted according to these results as in the table below.

Table 3: Results of the effect of the process of rotation (rotation) on the original image using simple regression analysis

Level of significance 0.000[a]	The coefficient of determination R^2	Value (F)	Value coefficient β	Regression coefficients		Traditional image / Image The original
There is an effect	0.393	57.64	0.627	29.16	a	
				0.95	b	

B - The hypothesis that there is a significant effect of the image(reduction process in the original image): The table below shows that the (R2) parameter of the thumbnail was 0.124, meaning that the command interprets 12.4% of the variation in the original image. The coefficient of F is calculated by the mean of the regression model,), And the fixed value (a) was 72.64). Thus, the value of the original image is estimated at constant value (a) even if the slope parameter is zero, while the value of the slope parameter (b) was 0.289. One in the amount of the miniaturization process will change the amount of the original image by 0.289, and this is not sufficient to reject the hypothesis (there is a significant effect of the process of minimization in the original image) Y) and are accepted according to these results as in the table below.

Table 4: Results of the effect of reducing the image in the original image using sim ple regression analysis

Level of significance 0.000[a]	The coefficient of determination R^2	Value)F (	Value coefficient β	Regression coefficients		Traditional image / Image The original
There is an effect	0. 85	13.89	0.922	21.697	a	
				0.65	b	

C - The hypothesis of the existence of a significant effect of moral removal of the background image in the original image:

The following table shows that the process of removing the background of the image has achieved a significant effect in the original image as the coefficient of determination (R2) of the leadership amount (0.766), which means that the processing process for the image explain the amount (76.6%) of the variance in the image, The value of the constant (a) was 20.27, ie the value of the original image is the constant value of (a) even if the slope parameter is zero, and the value of the slope parameter (b) (6.75) This means that changing one unit in the amount of background image removal process will change the original image size by (6.75). This is not sufficient to reject the hypothesis (there is a significant effect of the background scaling process in the original image), and is accepted according to these results and as in the table below.

Table 5: Results of the effect of removing the background image in the original image using simple regression analysis

Level of significance 0.000[a]	The coefficient of determination R^2	Value)F (	Value coefficient β	Regression coefficients		Traditional image / Image The original
There is an effect	0.124	51.266	0.35	72.64	a	
				0.289	b	

D - the hypothesis that there is a significant effect of the process of improving the contrast of the image in the original image: The table below shows that the process of improving the contrast of the image has achieved a significant effect in the original image as the coefficient of determination (R2) of the leadership amount (0.85) This means that the process of image improvement interprets 85.0% of the variation in the original image. The coefficient of (F), which is calculated on the significance of the regression model, is 13.89, Which is larger than the value of the (F) table, and the fixed value (a) was 21.697 (ie the value of the original image is estimated at the value of constant a even if the slope parameter is zero, (0.65). This means that changing one unit in the amount of image contrast improvement will change the vision amount by 0.65, thus not to reject the hypothesis (there is a significant effect of the process of improving the image contrast in the original image), and accepted according to these results as in the table below.

Table 6: Results of the effect of improving image contrast in the original image using simple regression analysis

Level of significance 0.000[a]	The coefficient of determination R^2	Value)F(	Value coefficient β	Regression coefficients		Traditional image / Image The original
There is an effect	0.766	36.25	0.87	20.27	a	
				6.75	b	

11. Conclusions

1- The results of the research show that the use of simple regression analysis method is more accurate in distinguishing between images

2- Using the coefficient of selection to compare regression models shows that y = 21.697 + 0.56x The best regression models where the coefficient of selection is 0.85, that is, it means that the image improvement process explains 85.0% of the variation in the original image.

3- To compare the images and study the extent of similarity of the

images before and after the treatment, it became clear that the image after improvement of the contrast is close to the original image and then the image after the process of removing the background image

12. Recommendations

1. We recommend further studies that compare the method of regression analysis to determine the extent to which the original image of the changes that affect it is affected by the use of image manipulation
2. In the case of studies that include a large number of explanatory variables, it is preferable to use the main components because it reduces the explanatory variables and a few linear combinations of equations derived from the original variables to replace them so that they are qualified to explain most of the total variance of the original values
3. AIC and SIC can be used to select the best regression model

4. The regression analysis method can be used in studies of clinical practice .

References

[1] J.Schurmann(1996), Pattern Classification :a Unified View of Statistical and Neural Approaches,Jon Wiley and Sone ,New York.
[2] R.schalkoff(1992),Pattern Recognition :Statistical ,Structural ,and Neural Approach ,JohnWiley and New York.
[3] K.Fukunage (1990) ,Introduction to Statistical Pattern Recognition,2nded.Academic Press ,New York
[4] R.Hogg and A.Craig (1970). Introduction to Mathematical Statistics .the Macmillan Company.
[5] W.Feller (1957) , An Introduction to Probability Theory and Is Applications :VplsIandII,John Wiley @Sons.