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Body Height Detection System Using Russel & Rao Method

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Abstract. Height body detection is an interesting thing to study, because of height is often using in various fields. Measurement height with a manual tool, it is very easy to use. Retrieval of objects using a webcam camera then measured with the Russel & Rao method. This system was built using Borland Delphi 07 programming language. His research method was obtained from literature studies of various books and articles which consisted of several stages, like the grayscale stage, and russel & rao. And at the time of height detection, this system will doing well if around the object that will be taken into account there are no other objects, such as the meter will move to another thing. So to simplify the measurement, you must choose the right place. Russell & Rao's performance has a true detection percentage of 65%. Based on 8 sample tests that have been carried out, only 3 have been detected correctly.



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1. Introduction

The era of information technology is growing rapidly and complex, a system that is valuable for processing completely data will produce good information. This modern data processing is closer to image, sound, text and video data.

Measurements are carried out by systematic procedures to observe someone behavior and unique to assistance of numerical scales or categorization systems. Quality and quantity measurement of results are depends on the type and quality of measuring instruments that has been used. Measurement are to find out a quantitative data information activities. The results of the measurements can be display in the information or data containing letters or descriptions form that are very useful in decision making, therefore quality of information must be accurate. Based on the opinions above, it can be concluded that the height is a systematic procedure to contain quantitative information data both data expressed in a numbers form as well as accurate, relevant, and reliable descriptions of the attributes that correspond to good measuring instruments and clear procedures and correct [1].

Length and height are a measure that often used in various purposes that require a person's height data. Height measuring instruments in the market, is not possible to get accurate data, because most of the tools are still conventional or manual. This means that to get a person's height data is still using manually [2].

Image processing is the process of processing pixels in a digital image for a specific purpose. At first this image processing was done to improve image quality, but with the development of the computing world which was marked by the increasing capacity and speed of computer processes and the emergence of computational sciences is enabled humans to retrieve information from an image [3]. In the height detection system the image processing body is able to carry out object recognition and is able to process height detection so it can bring the correct results.

2. Related Works

Image processing is a digital image manipulation technique that specifically using a computer, becoming another image suitable for use in certain applications. To be easily interpreted by humans or computers, image processing must be done with various methods to achieve the image as want. Digital image processing operations are generally carried out with the aim to improving the quality of an image so it can be easily interpreted by the human eye and to process information contained in an image are need for automatic object identification [4].

3. Research Methodology

Grayscale Scheme

Grayscale scheme is a flowchart arrangement that describes the process of changing the original or source image into a grayish image to obtain object texture [5].

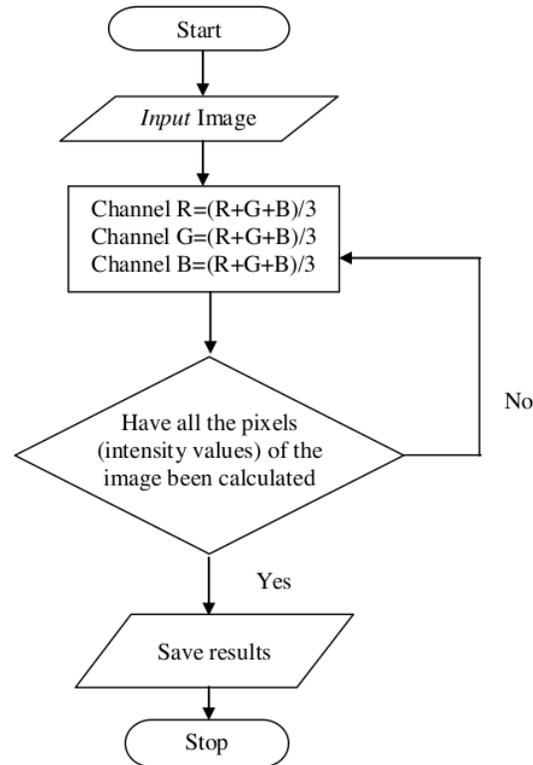


Figure 1. Flowchart of Grayscale Process

The grayscale stage aims to equalize the intensity values of the three channels found on the image. Consecutive intensity values contained in the R channel, G channel, and B channel are summed and divided by the number of channels, so the channel values are now updated with the value of the number of each channel divided by the number of channels. The image grayscale process is very beneficial in further computation, because the process system block only takes the value of one channel as a presentation of the other intensity values that have an image [6].

Russel & Rao Method Scheme

The Russell & Rao method scheme is a flowchart design that describes the application process of the method formula to find out the results of the systematic calculation based on the detection of the inputted image [7].

Based on Figure 2 there are several processes that can be implemented, like:

1. Input values from image search results.
2. Detect files are in .bmp format and acquire the value of N.
3. The N value that has been obtained will be calculated using the formula of the Peirce method based on the provisions.
4. Then from the calculation process was done to check whether the value of $S = N-1$, or the conditions of the condition is if the value of S (Similarity) is greater than 0 or is less than 1.
5. If the result is Yes it shows the image energy / value has been obtained, otherwise if it is No then repeat the previous process for recalculation.
6. If all has been obtained and in accordance with the provisions, the results / output will be released.
7. After all processes are complete, the calculation will stop.

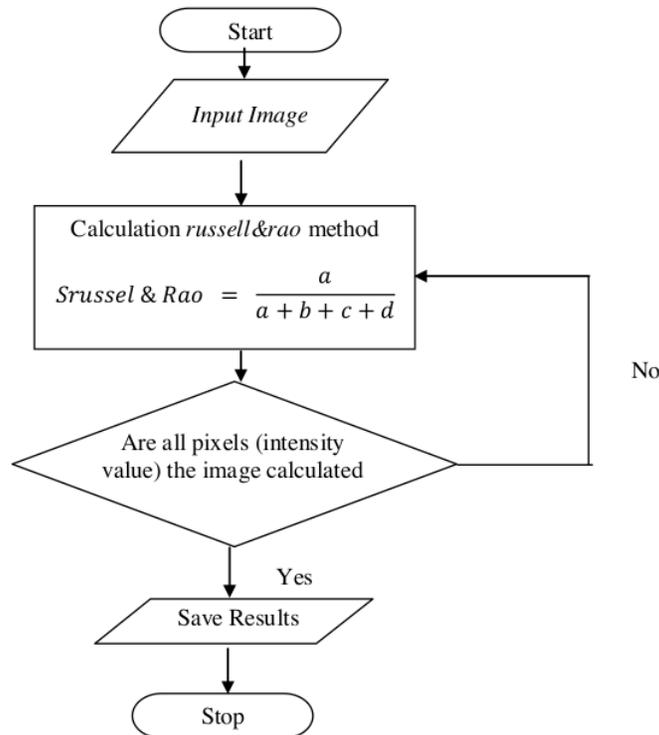


Figure 2. Flowchart of Russel & Rao Process

4. Result and Discussion

Based on the results of this research that has been done, the result of the height measurement system has been successfully identified with the total number of test samples is strongly influenced by the test location, the distance when testing, observation of the reference vector pattern for testing. The role of the ruler in the system is very important to determine various measurements of height. Commonly the ruler can experience failure in measuring height when facing with videos contains abnormal light, too bright or dark. And other constraints that become a problem in testing this system, due to many other objects around the test area can interfere when the running system process. Regarding the processes can support the performance of the height detection system using the Russell & Rao method, more detail from the sample data sources that have been collected, then processed to become a capable system.

4.1 Testing Sample

The testing sample in this research amounted to 4 images that represent the characteristics of height measurement vectors. Figure 3 shows some body height measurement samples as a test.



Figure 3. Several Body Height that Have Been Collected

4.2 Change the Value of RGB Image to Grayscale Image

Changing the RGB image value to grayscale image is a conversion process from a color image that has three layers (R-layer, G-layer, B-layer). So that to do the following processes are still observed by these three layers. If each calculation process are using three layers, it means the same three calculations are carried out. So that the concept is changed by changing the three layers into one layer of grayscale matrix and the result is a grayscale image. One grayscale image represents 8 bits, 24-bit image means having 3 registers or 3 channels. Following of the process to completing the calculation of values. To simplify the calculation of a grayscale image, the color image will be represented by the same value in the RGB component. The color of each pixel depends on the composition of the three components in the coordinates.

Table 1. Manual Conversion RGB into Grayscale

x,y	0	1	2	3	4
0	(160,163,157)	(163,157,160)	(157,160,163)	160,163,160)	(163,160,161)
1	(177,184,182)	(184,182,177)	(182,177,184)	(177,184,182)	(184,182,177)
2	(193,194,188)	(194,188,193)	(188,193,194)	(193,194,188)	(194,188,193)
3	(186,185,187)	(185,187,186)	(187,186,185)	(186,185,187)	(185,187,192)
4	(184,180,180)	(180,180,184)	(180,184,180)	(184,180,180)	(180,180,179)

The process to acquire the results of manual conversion of RGB to Grayscale can be seen in the table above requires a calculation using the following formula:

$$S = \frac{r+g+b}{3} \dots\dots\dots (4.1)$$

Information :
 S = Grayscale Color
 R = Red Color
 G = Green Color

B = Blue Color

Each coordinate requires calculation with the formula, so the results of the calculation process obtained at each coordinate of the image matrix that has been converted from RGB to Grayscale will form like the following table:

Table 2. Grayscale Manual Conversion Calculation Results

x,y	0	1	2	3	4
0	160	160	160	161	161
1	181	181	181	181	181
2	192	192	192	192	192
3	186	186	186	186	188
4	181	181	181	181	180

4.3 Manual Calculation of Russel & Rao Method

The following is an example of the explanation of the formula from the Russell & Rao method to find out the distance between two vectors in this application as follows:

$$i = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix} \quad j = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

In the matrix above, vector i is a pattern vector of training values while vector j is a vector pattern of test values, both of these will be processed by the calculation of the Russell & Rao method. Before the vector distance is calculated, first determine the values of a, b, c and d for the Russell & Rao formula. The calculation step can be seen below:

Russel & Rao Method:

$$\begin{aligned} a(i,j) &= (1,1) = 3 \\ b(i,j) &= (0,1) = 0 \\ c(i,j) &= (1,0) = 6 \\ d(i,j) &= (0,0) = 0 \end{aligned}$$

$$\begin{aligned} Russel \ \& \ Rao &= \frac{a}{a + b + c + d} \\ &= \frac{3}{3 + 0 + 6 + 0} \\ &= \frac{3}{9} \\ &= 0.3 \end{aligned}$$

The description of the formula that has been used above is a manual calculation process to discover a distance values. Based on the values that have been obtained through these stages, it will guide the

image similarity with the patterns that have been trained in the system. The value of $S_{ij} = 0.3$ and this states the pattern is detected because the distance value of the image pattern is between 0 to 1.

5. Conclusion

The results of the study provide some conclusions that will be described as follows:

1. This height detection system uses Borland Delphi 07 programming language and object retrieval using a webcam camera was measured using the Russel & Rao method. There are several stages of the process, that is resize, grayscale and russel & rao.
2. Russel & Rao's performance has a accurate detection percentage of around 65%. Based on 8 sample tests that have been carried out, only 3 have been detected correctly.
3. At the time of measurement, to get the right results. Environmental conditions must also be considered, including light, distance, and position of objects must also be considered.
4. The background that used when the detection process must be white and without obstruction of any object, because it will block the detection process.
5. This height detection system will not work properly if there are another objects around the object to be measured, because the measuring line will move to the other object. So to make the measurement easier, you can choose the right place.

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