

ANALYSIS OF WEIGHT EGG USING IMAGE PROCESSING

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Abstract- In This article show the analysis of weight egg using Image processing to measure the egg weight from digital photos by measuring the and the length of the egg then estimating weight which consists of these steps..... First, Image acquisition. Second, Image sharpening. Third, Image Representation Forth, Regional Descriptors. Finally, computer weight. After that illustrate the classification of egg size following the agricultural commodity and Food standards (ACFS). The experiment using so eggs from SAHA Farm company, mahasarakham. To do an experiment and analyze information to create equations of estimating egg weight. The equation is $M = 1.1056 V^{0.9923}$ then brings 100 Images of egg the equation is accuracy. After the examination, the accuracy is 97.67 % and the average processing time is approximately 0.55 seconds per image. Result from this study show the correlation coefficient in the experiment of estimate egg weight by using digital photos has 2.33 % of the error. So we can develop this research processing or buildup the automatic sorting egg in the future.

Keywords- image processing, egg, egg weight

I. INTRODUCTION

The egg farmers in countries most of them are medium to small sizes farms. Egg farmers sell the egg in assorted sizes from separation by human eyesight comparison to sell in a tray or separately sell the big size eggs especially. Sorting eggs this way would have high falsity and discrepancy but almost of the egg farmers in medium and small sizes cannot purchase the machine to sorting egg because of the high cost of machine and maintenance. With current image processing technology we can use digital image to estimate egg size such in an image sorting egg [1] The method using is to count the pixels of egg image but this method has restrictions on light and shadow happening during the processing, its caused of the mistake in counting the number of pixels of egg image. Some egg maybe huge area of the pixel size but it maybe weight less when weighed it really. Thus the counting pixels of eggs photo cannot compare with the actual weight of the egg.

This article focuses on the analysis of weight egg using digital image processing which select the specific area of the object by focusing on the edges of object. To distinguish basic attributes by the object are the width, the length and the perimeter to calculate the estimate of volume and the egg weight. However, this article emphasizes the principle of mathematical calculation that can be applied to create the sorting egg machine in order to use in all sizes industries.

II. RELATED THEORIES

An image can contain a lot of meanings. This is a basic feature of an object in the picture. So, is there a way to put out each basic feature to apply for working. This research using the teeniques of image

processing which focused on the process and method to distinguish the basic features of egg photo to analyze for an egg weight. There are consists of these following steps.

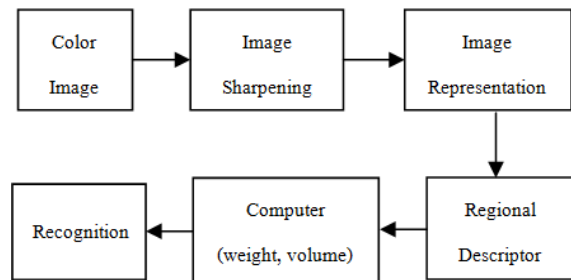


Fig.1. egg weight analysis steps

2.1. Color Image

Color image is photo in RGB color system. Use to analyze egg weight with a $3,000 \times 4,000$ size of pixels which caused by using digital camera to photograph the egg in vertical. The distance from the camera to the egg stand is 52 cm. The egg will be placed in different style to do experiment the accuracy of estimating and analyze an egg weight in the photo that showed in fig.2.

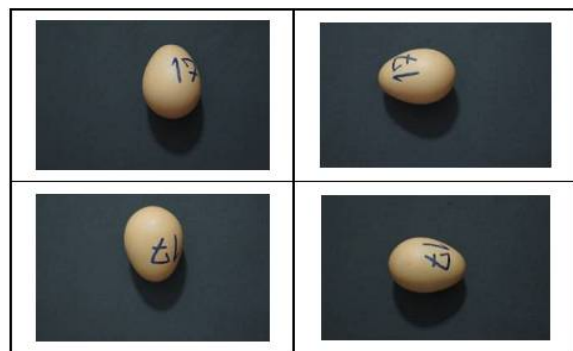


Fig.2. Egg image in each style.

2.2. Image Sharpening

Image sharpening is adjusting the contrast of image. In this research will adjust the contrast of the object by finding the position changes of the intensity of light at the position of pixel instantly so this position is the edges of the object which using the principles Gradient (2) to determine the edges of the object's clearly. From the bake ground of picture and the object's shadow.



Fig.3. Egg picture which specify the extent of the object.

2.3. Image Representation.

Image representation is to separate the interrelated part of picture to be a representative of object in the picture. In this research using region representation, is using an internal area in the picture to be an object representative. So the egg picture which specified the extent exactly will be separated by using number 1 as the area that is representative of objects and number 0 as another areas which isn't area of object.

2.4. Regional Descriptors.

Regional descriptors is an area that are representative of each object will comprises of basic features of object including the width, the length, the height, shape and the surface of itself. So they are in egg image can explain an egg's attribute too. This research using formula for determining the distance between two points with equation [1] to find the distance from two pixels (Ending points) which lines longest in the area of the object in x-axis plane and y-axis plane to obtain the width and length of egg after that to calculate the volume and egg weight.

$$d(p_1, p_2) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad (1)$$

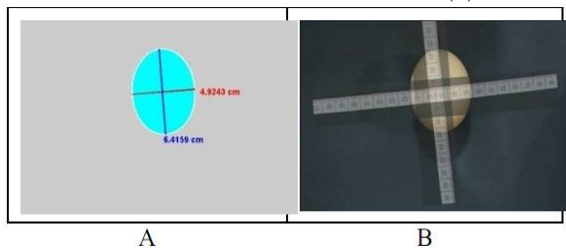


Fig.4. The result of measuring the width and the length of the egg.

A: The result of measuring the width and the length of the egg from programmer.

B: The result of measuring the width and the length of the egg in rectangular coordinate system.

2.5. Computer weight and volume.

The outside of egg, things can be measured and shape, size, color, characteristic of the shell. Many researchers have proposed the concept of estimating the volume of egg by measuring the width and the length of egg. Such as F.W. Preston [3] from equation No.2 V.G. Narushin [4] from equation No.3, Ago pw [5] from equation No.4 and Romanoffs [5] from equation No.5

$$V = \frac{11}{21} LB^2 \quad (2)$$

$$V = (0.6057 - 0.0018B)LB^2 \quad (3)$$

$$V = 0.526LB^2 \quad (4)$$

$$V = 2.854LB \quad (5)$$

When L = Length of the egg (mm.)
 B = Width of the egg (mm.)
 V = Volume of the egg (mg.)

This research using volume estimating from the 4th equation. If we analyze with extrapolation method, will get the estimate egg weight such the 6th equation which shows in figure 5

$$M = 1.1056 V^{0.9923} \quad (6)$$

When M = egg weight (g.)
 V = egg volume (mg.)

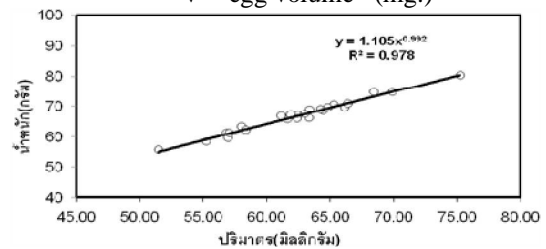


Fig.5. The graph shows the relationship of weight and volume

2.6. Recognitions

Recognitions is a step to sort egg size by weigh from the analysis of egg weight compare with the agricultural commodity and food standard (ACFS 6702 – 2548) which shows in table 1

Table 1: Size of Egg by Weight.

Number	Size	weight (g)
0	jumbo	Upper 70
1	extra large	upper 65 - 70
2	large	upper 60 - 65
3	medium	Upper 55 - 60
4	small	upper 50 - 55
5	pewee	upper 45 50

III. THE EXPERIMENT AND RESULT

The experiment using all sizes of 100 eggs. Measure the width and length of egg with Venire then measure the volume by a 100 ml. Beaker and balance the weight of egg to compare with the estimate width & length and egg weight from the programmed in research methodology. Mat lab programed compare with the estimate weighing real egg from digital balance.

Digital photo has size 3000 × 4000 pixels and the distance from camera to the object is 120 cm. Is using to estimate the egg weight. The result is show in table 2.



Fig.6. Balancing Eggs.

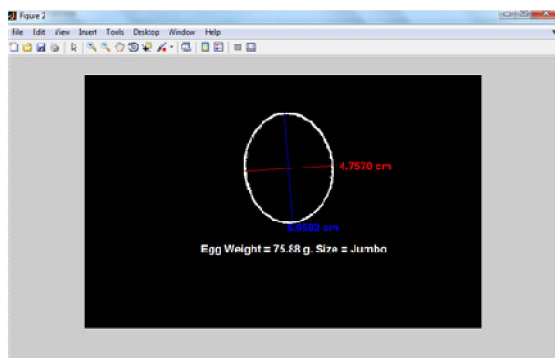


Fig.7. Calculate the weight and sorting size of egg

Table 2: comparison of egg weight from programed and real balance measure

Number Egg	weight (g)		% error
	From programed	different from digital balancing	
5	75.88	72.09	5.26
10	72.59	70.43	3.07
15	73.45	69.31	5.97
20	68.53	69.51	1.41
Min.	49.74	52.32	4.93
Max.	81.41	83.27	2.23
Average	66.14	64.63	2.33

Note: The mean is the average number of egg from 100 eggs

From figure 7 displays the egg weight from digital image processing. According to the research

methodology discussed initially and shows the size of each egg following the Agricultural commodity and food standard. Table 2 displays the test to find egg weight from 100 eggs. The result of weight analysis has a few different from digital balancing. For example the 5th egg has a result from analysis programed is 75.88 grams but measure by real balance is 72.09 grams so the weight difference is 3.79 grams and the percentage of error is 5.26 %. Next is the 20th egg has a result from analysis programed is 68.53 grams but in real balancing is 69.51 grams so the weight difference is 0.98 grams and the percentage of error is 1.41%. they are rage of all eggs in analysis weight programed is 66.14 grams and by real balancing is 64.63 grams the weight difference is 1.51grams the percentage of error is 2.33%.

CONCLUSIONS

According to research, found the analysis of weight egg by image processing which selected the specific area of the object by focusing on the edges of the object then considering basis attribute of the object such as the width, the length to calculate to find the mathematical equations can be estimating really the real weight with the percentage error is only 2.33%. This research methodology can be applied to create the automatic sorting egg machine to use in big, medium, small sizes industries.

ACKNOWLEDGMENTS

Thanks for the research and development institute of Rajabhat Mahasarakham University with funding to support this research. Thank you for science center, Faculty of science and technology for the generous in equipment trials and very much thankful to from physics branch for your kind ness to determine the validity of equation. Including those associated with this research that have not mentioned. Researchers have to thank you all very much.

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