MEASURING BABY'S BODY LENGTH UTILIZING IMAGE PROCESSING

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ABSTRACT

The Baby Body Length Measurement System with Machine Learning methods and Open CV library is a system designed to make it easier for Posyandu officers to take measurements of the baby's body length, where this system will measure the baby's body length using a camera, and assisted with library image processing, namely, Open CV, and to measure the length of the baby's body using Machine Learning, namely the Linear Regression method, and the measurement data will be sent to a Web application so that the baby's mother can monitor the growth and development of her baby, The system that was built has an average error of -1,42 in the condition of the lamp with a power of 40Watt and in the light of a lamp with a power of 11Watt the average error is found with a value of -15,37 and at a distance of 64 cm the system can detect objects and measure the length of the object with an average measurement error of -10,6.

Keywords: Open CV, Image Processing, Machine Learning, length measurement, Posyandu.

I. INTRODUCTION

P OSYANDU (POS PELAYANAN TERPADU) is a form of Community-Based Health Efforts (UKBM) carried out by and with the community, to empower and provide convenience to the community to obtain health services for mothers and babies. Infant growth and development, Measurement of the length of the baby's body is usually still done manually by officers who are considered less effective and time-consuming in handling the number of babies whose band length will be measured by posyandu officers.

With the development of current technology, the measurement of the baby's body length can be done automatically and the measurement results can be displayed in a web application so that the process of measuring the length of the baby's body can be done quickly and the baby's mother can know and monitor the growth and development of her baby. In this study, the measurement of the baby's body length was carried out using the Open CV-Library, Shiki learns, Numpy, a camera, and using a raspberry pi as a data processor and as a data sender to a web application.

II. THEORY

In previous studies using color segmentation for character recognition on vehicle number plates and using the K-NN (k-nearest neighbors) method to recognize vehicle number plates, the weakness of the K-NN method is, the K-NN method needs to determine the value of the parameter K (the number of nearest neighbors), the K-NN algorithm requires high computational time because it requires high enough hardware to perform computations [1].
In previous studies, the linear regression method was used to predict the selling price of used cars and obtained an accuracy of 80% [2]. In this study, the linear regression method was used to predict body length in infants.
The HSV method in this study functions as an object detector by selecting color segmentation, the desired color segmentation in this study is all colors except green, whereas in previous studies the HSV method was used to detect objects in 2-dimensional images [4].
The raspberry pi in this study functions as data processing and also as a tool to send data to Web applications, the raspberry pi used in this study is the raspberry pi 4 b with 4 GB of ram, in previous research the raspberry pi was used for data processing on surveillance cameras based on mobile devices [4].
In this study, the camera is used to capture images of objects, the camera used in this study is an HD 720 WEB-0 webcam camera, In previous studies, a webcam camera was used to detect objects based on color, shape, and size, and good results were obtained [6].

2,1 HSV

In this study, the HSV Open CV (Hue, Saturation, and Value) method is used, which is used to classify colors where Hue represents actual colors such as red, violet, and yellow. Hue distinguishes colors and determines the redness (redness), greenness (greenness), and so on from light. Hue is associated with the wavelength of light. Saturation represents the level of purity of a color, which indicates how much white is given to the color. Value is an attribute that states the amount of light received by the eye regardless of color. In addition, the color range of HSV is pure and the concept is almost uniform, so the quantitation process on HSV can be produced by collecting dense and complete colors [3].

III. ANALYSIS AND DESIGN

3,1 Current System Overview

Figure. 1. *Infantometer (Sumber: http://vickottblack,com/product/infantometer).*

As shown in Figure 1, the measurement of the baby's body length at the posyandu is still done manually, with the help of a tool called an Infantometer, where the baby is measured by placing it on the device in a lying position, and holding the baby's feet together while pressing on the baby's knees. then the panel on the infantometer is shifted until it touches the baby's feet, then reads with the largest number scale on the ifantometer to get the size of the baby's body length, after getting the length of the baby's body, the Posyandu officer will write it down on the KMS (Card Towards Health) and record it manually by posyandu and KMS officers.

3,2 System Requirements Identification

After knowing the description of the current system, it is known that this system will later assist posyandu officers in measuring the length of the baby, where the measurement results will be sent to a web application and can be monitored by the baby's mother. from babies, raspberry pi for data processing and also needed a box made of plywood and wood that serves as a place to put the baby when it will be measured, a protocol that functions to send data to Web applications, and also a support pole made of wood to place the camera at the top of the measuring box on the length of the object, for non-functional needs, namely a lamp with white light so that the camera can capture the image well so that the system can detect objects and television as a monitor screen for the raspberry pi.
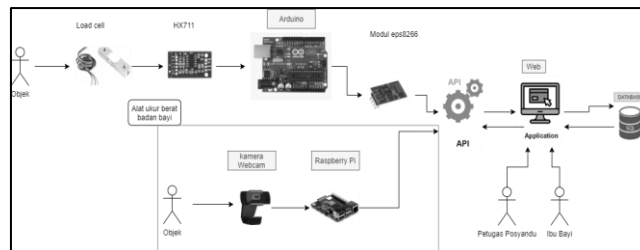
3,3 Design System

Figure. 2. Block Diagram System.

In Figure 2, the system design to be built is that the camera can capture objects and data processing is carried out on the raspberry pi then the data will be sent to the web application from the raspberry pi using the rest API before the data is sent to the application the Posyandu officer will input the NIB (Nomor Induk Bayi) first.
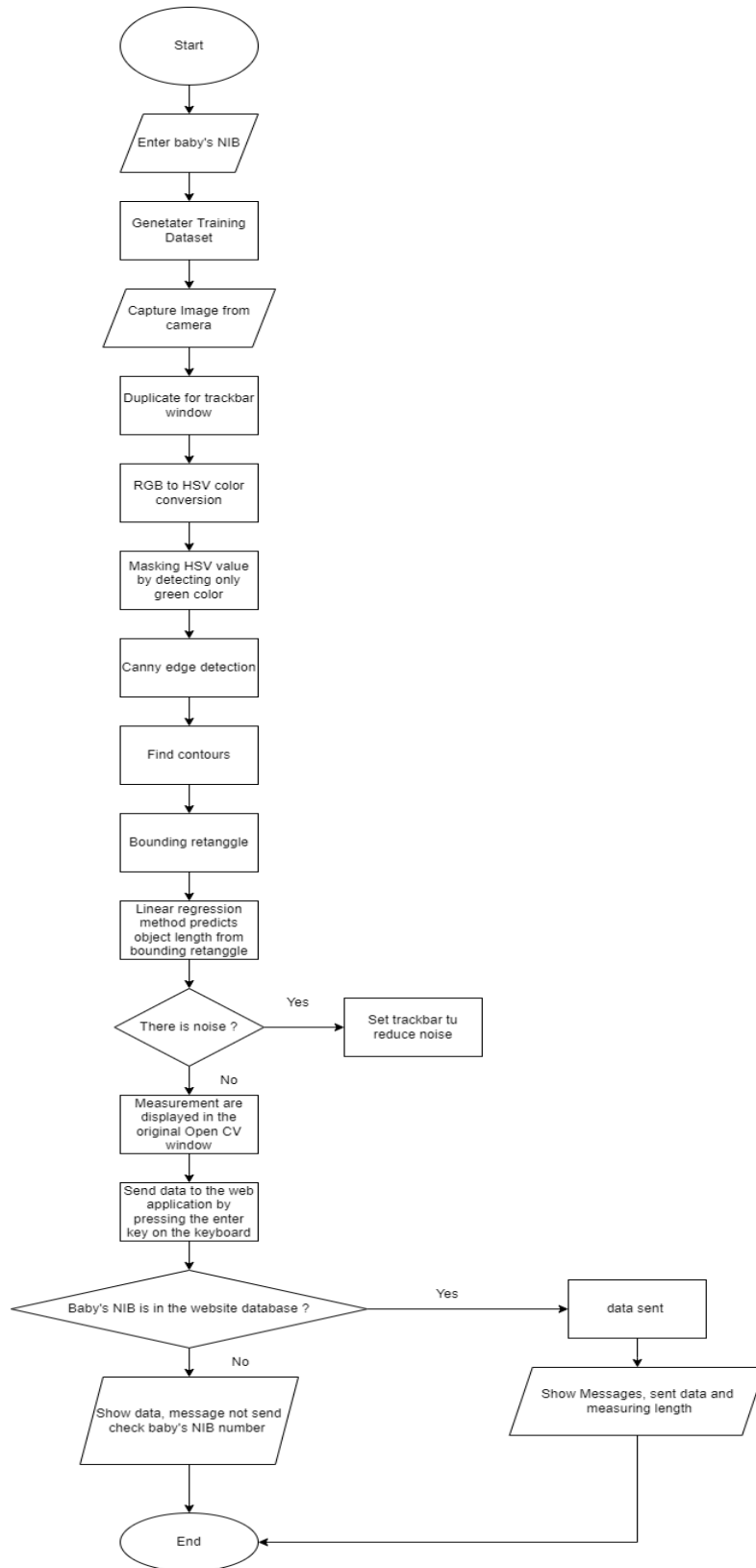

Figure. 3. Flowchart system.

In Figure 3 it can be seen that the Posyandu officer will input the baby's NIB and then the baby is placed lying on the baby's body length measurement box then the system will start detecting the baby's body if there is noise in the measurement window, the posyandu officer will adjust the track bar to reduce noise in the measurement window if there is noise in the measurement window. the noise has been reduced and the measurement results can be seen, the Posyandu officer will press the Enter key on the keyboard to send the baby's length measurement data, when sending data the system will check whether the baby's NIB is in the Web application database, if there is, the system will send data to the Web application use the rest API and library re-quests, otherwise an error message will appear data not sent and check the baby's NIB.

3,4 Running System and input NIB's baby
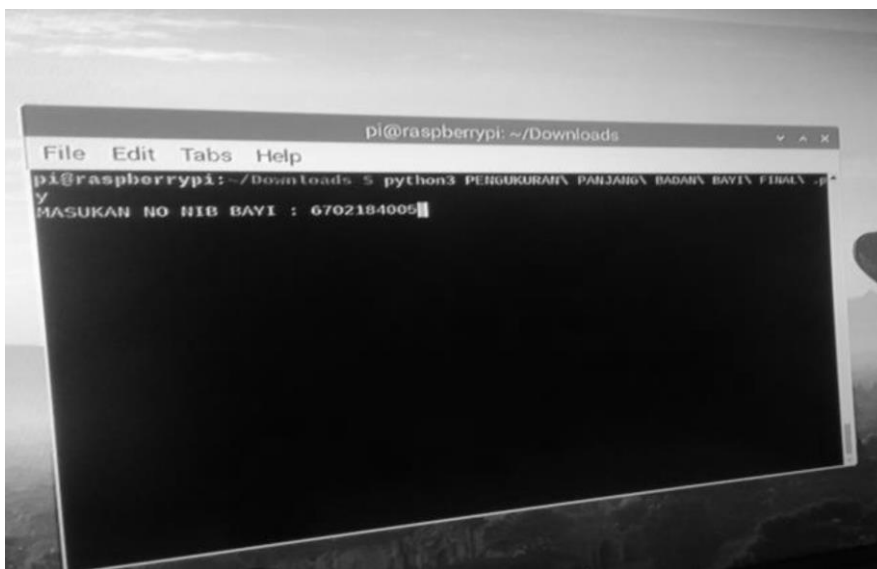
Figurer. 4. The program is run for the first time and asks for the Baby's NIB Number.

In Figure 4, when the program is first activated, it will ask posyandu officers to input the baby's NIB number.

3,5 The system when measuring objects that still have a lot of noise

Figure. 5. Measurement of objects that still have a lot of noise

In Figure 5 object measurements can be done but there is a lot of noise so that the measurements become less stable.
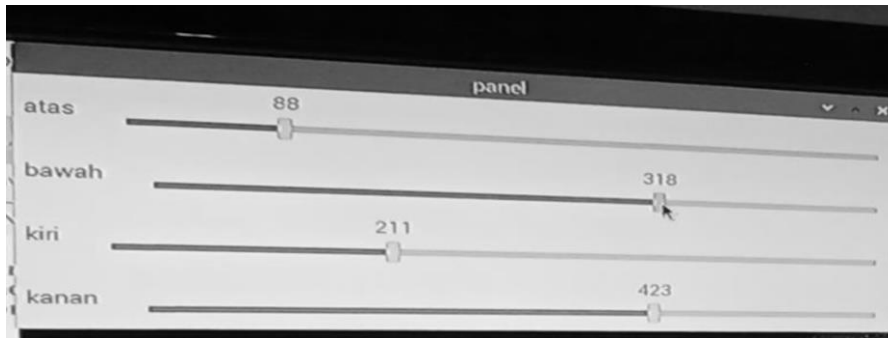
3,6 Trackbar

Figure. 6. *Trackbar.*

In Figure 6 the system is added to a trackbar that functions to reduce noise during measurements, on the trackbar there are 4 trackbars, namely trackbars for the top, bottom, left, and right.

IV. TESTING

In table 3 it can be seen that the measurement of the length of the object using a 40Watt lamp can be detected by the system and the system can take measurements, while measuring the length of an object using an 11Watt lamp, none of the objects can be measured in length by the system, due to the lack of lighting and a lot of noise in the system. at the time of measurement. The results of the testing are as follows:

TABLE I

TESTING WITH 40 WATT LIGHT AND 11 WATT LIGHT

Testing	Object	Object length		Error (cm)	Object lenght	Error (cm)
		real (cm)	A system with 40 Watt lamp light		A system with 11 Watt lamp light	
1	Pink Teddy Bear	23	23,4	+0,4	2,3	-20,7
2	Brown Teddy Bear	21	20,6	-0,4	0,7	-20,3
3	Black Parabolic Nex Box	22,8	28,7	+5,9	0,7	-20,3
4	Box Hannochs Motion Sensor 13 W	11,7	11,6	-0,1	11	-0.7
5	Hannochs box light sensor 11 W	13	12,8	-,0,2	1,2	-11,8

6	White stuffed dog	28	28,7	+0,7	25,6	-2,4
7	Bolster pillow	56,5	49,3	-7,2	43,2	-13,3
8	White Paralon Pipe	48,2	43,9	-4,3	2,6	-45,6
9	Rolled Newspaper	58,6	52	-6,6	41,9	-16,7
10	Rolled Calendar Paper	32,3	29,9	-2,4	32,1	-0,1
Average				-1,42		-15,37

In Table 4-2 it can be seen that the measurement of the length of the object using a 40Watt lamp with 10 measurements found an average error of -1.42 while the measurement using an 11Watt lamp was found to have an average error of -15.37.

In the next test scenario, the system will be tested with a distance of 64 cm. The test uses a lamp with a power of 40 Watt because seen from previous tests, a lamp with a 40 Watt light got a smaller error than using an 11 Watt lamp. , The purpose of this test is whether the system built can still detect objects and take measurements, on measurements with a camera distance of 64 cm the object can still be detected but the accuracy decreases because the reference length data does not match the existing data, and some objects cannot be detected even though they have adjusted the trackbar, these objects include bolster pillows, white stuffed dogs, and folded newsprints.

TABLE II

TESTING WITH A DISTANCE OF 64 CM

Testing	Object	Object length		Error (cm)
		real(cm)	Camera with distance	
1	Pink Teddy Bear	23	30,6	+7,6
2	Brown Teddy Bear	21	26,9	+5,9
3	Black Parabolic Nex Box	22,8	28,4	+5,6
4	Hannochs Motion Sensor Box 13W	11,7	15,1	+3,4
5	Hannochs box light sensor 11 W	13	16,5	+3,5
6	White stuffed dog	28	1,0	-2,7
7	Bolster pillow	56,5	65,2	+8,7
8	White Paralon Pipe	48,2	56,8	+8,2
9	Rolled Newspaper	58,6	0,6	-58
10	Rolled Calendar Paper	32,3	40,1	+7,2

Average	-10,6

From Table 4-4 with 10 experiments with a camera distance of 64 cm from the background and in the test using a lamp with a power of 40 Watt, the average error is -10.6.

V. CONCLUSION

From the results of tests carried out, the system can measure the length of objects using a camera and process by Open CV. Each object is measured first using a ruler and compared with the measurement results by the system, the measurement results have a maximum difference of up to 10 cm which is also influenced by the lighting conditions that exist. In the room when measurements are made, it is hoped that further research will take measurements closer to precise results and use better camera functionality in capturing images of objects.

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