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Jaundice Detection System

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ABSTRACT

Jaundice or neonatal jaundice is a medical term that describes an increasing amount of bilirubin in the body which makes the eyes, skin and whole body turning into yellow. Bilirubin is a yellow pigment in the body that release in the body after the birth of the baby. “Four out of five babies get jaundice”. With approximately 8,000 babies born every day in Malaysia, 6,400 babies get jaundice. The proposed research includes a process for detection of jaundice based on the yellow skin colour. The detection will use the image processing technique of colour feature to extract and enhance the image to compare with the normal skin. It also classifies the level of the yellow colour using Color Detection Method which it classifies whether jaundice in a mild, severe or normal condition.

Key words : Jaundice, bilirubin, yellow, color detection method.

1. INTRODUCTION

Disease is a particular abnormal condition that affects part or all of an organism not caused by external force but consist of a disorder of a structure or function. Study of disease known as pathology. Current medical system needs the intelligent system for the recognition of the diseases [1]. According to research, nearly 50% of the people of the world are unaware about the body change which reflects in terms of the symptoms, or even it leads to the fatal end [1]. Baby disease is an abnormal condition or disorder that happens on infant. The research focuses on jaundice. According to Hedayati, Rahman, and Ullah (2016) [2], jaundice is a life-threatening disorder in new born. Jaundice also known as Hyperbilirubinemia which is a multifactorial disorder with many symptoms. In a simple word, Jaundice is a medical term that describes an increase in the amount of bilirubin in the body which gives the result of eyes, skin and body fluid turning yellow. Jaundice is not painful, but serious complications can occur if elevated bilirubin levels are not treated in a timely manner. Furthermore, Jaundice among newborn babies is one of the leading diseases happen in new born babies. This research focuses on physiological **j**aundice that common happen to newborn babies in Malaysia. Most infants develop visible jaundice due to elevation of unconjugated bilirubin concentration during their first week which called physiological jaundice.

1.1 Problem Statement

Parent will have to follow up and made appointment for checking condition of the mother and baby. The main symptoms happen are a fever. Baby will have fever first before slightly seen a yellow tinge at the skin and spreading down the body. Some parents will misinterpret the baby only had a normal fever. Symptoms of jaundice can be recognized through baby itself, from pale stool, dark urine and itchiness. Parents will not able to detect the jaundice when the level of bilirubin in body is less. Mostly, parent still use the traditional method for mother to recognize jaundice is by pressing the skin of baby to check whether the skin will be yellowish or not without knowing the level and the dangerous of the jaundice. Besides, there also some baby will have other symptoms such as weight loss, abnormal pain, and vomiting

In babies who are the bilirubin reach hazard levels, bilirubin may across to the brain and become reversible damage called early acute bilirubin encephalopathy or permanent damage called kernicterus. Jaundice is one of the infection or disease happen among newborn that gives a bad effect such as deaf, inflammation of the liver and athetoid cerebral palsy. Jaundice is known by the parents but the seriousness and the danger of the disease always be ignored and be thinks like a trivial matter.

The current conventional method for the jaundice detection by undergoes several numbers of laboratory blood testing. However, this lead to consume more time to detect jaundice on the baby and more time needed to go in frequent basis to clinics or medical centers for checking baby’s condition. Furthermore, the procedure gives more painful toward the baby which it takes blood several times at the same place such as foot. During diagnosis, nurse or pediatricians usually have their own structured assumption based on laboratory blood test either the baby has jaundice or not with the level of the bilirubin in the body. But, problem occurred when the laboratory blood test is conducted by inexperienced nurse and need to repeat the test several times.

1.2 Current Process

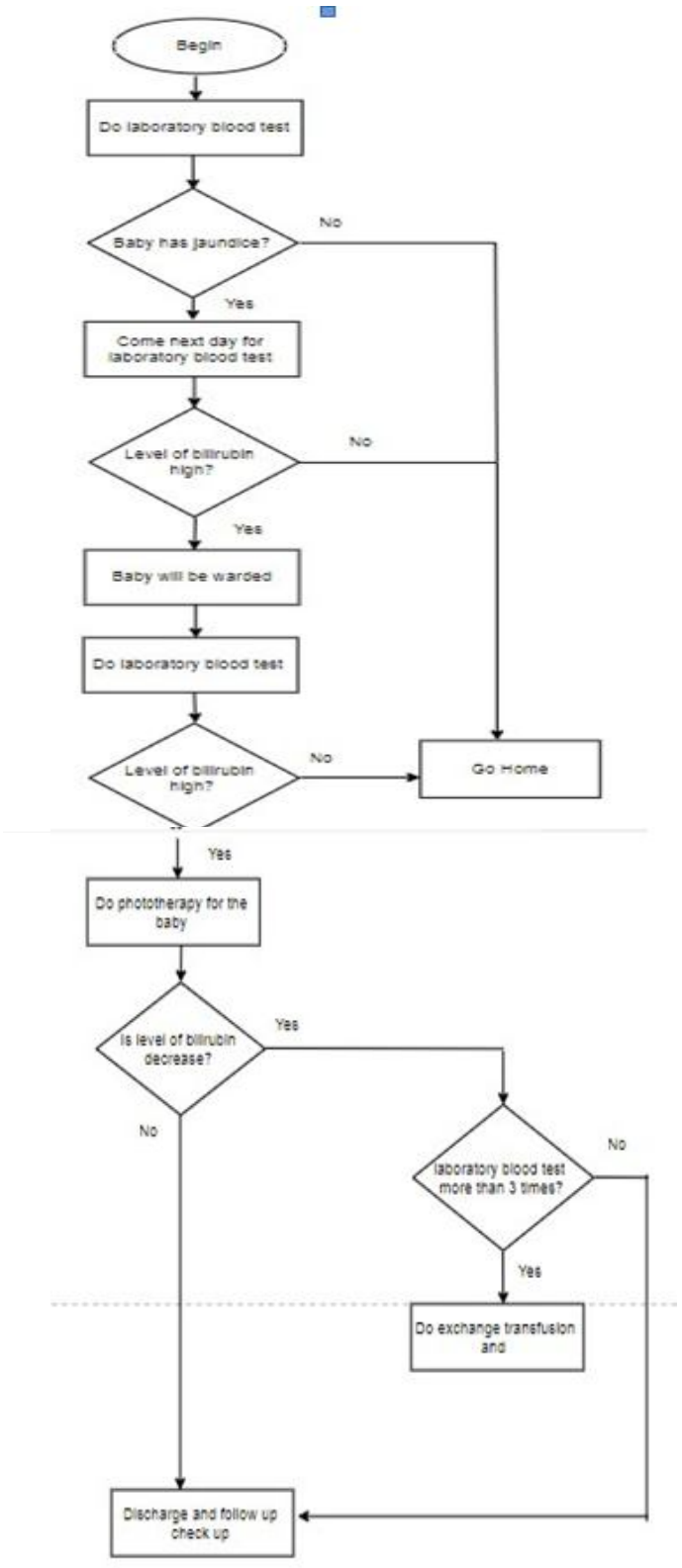

Figure 1: Flowchart of the current method to detect and treatment for babies

Based on the flowchart in Figure 1, is the current conventional method that has been applied to detect on jaundice and further check-up and treatment to be done on babies. Interview has been conducted with Medical Practitioner from SALAM Specialist Hospital, Kuala Terengganu to get the flow of the current method implemented.

1.2 Objectives

This research aims to develop a prototype that is being able to recognize and classify jaundice among baby based on its symptom. This research also aims to help for early detection of jaundice among mothers at home.

1.3 Practically

The system had been tested practically at the Hospital on real babies. 30 babies have been tested by the system and it shows the accurate result.

1.4 Project Scope

This research was develops for parent who has or will have baby around 0-2 years. Jaundice among babies is mostly happens during 0-2 years old. The prototype develops to detect and classify jaundice on baby with the level of the bilirubin in the baby's body. Furthermore, it will consume less time to detect the jaundice. Other than that, this prototype will only detect based on the skin and the eyes of the baby.

2. RELATED WORKS

Image processing is a method to perform some operations on an image in order to get an enhanced image or to extract some useful information from the image [3]. Image classification refers to the task of extracting information classes from a multiband raster image. The resulting from image classification can be used to create graph and maps. Two types of image classification are supervised and unsupervised. Supervised classification requires training set to find the best before continue and compare with others data. Unsupervised classification is a method which examines a large number of unknown pixels and divides into a number of classes based on natural grouping in image value [4].

2.1 Neonatal Jaundice

Neonatal comes from two words of neo which are from Greek and means "new" and natal comes from the Latin word natus which means "to born". Neonatal means newborn. The neonatal period is that first month after a baby is born [5]. Neonatal disorder means disturbance of normal state of body, organs and abnormal function of a newborn. Neonatal jaundice is jaundice that begins within the first few days after birth. It is normal for bilirubin levels in the blood to become elevated in almost all infants during the first few days following birth and jaundice occurs in more than half of newborn. There is much neonatal disorder such as neonatal

infection, hemolytic disorder and congenital malformations (NCBI – neonatal disorder). The most common neonatal disorders are neonatal jaundice and sudden infant death syndrome (SIDS) [6] [7] [8].

This research Neonatal Jaundice (NJ) or neonatal hyper-bilirubinaemia is one of the most common medical conditions of the neonatal disorder [8]. All babies have a transient rise in serum bilirubin but the percentage of newborn get infect of jaundice is 80%. Every year, the number of jaundice's cases happen in Malaysia is increasing (CPG management of neonatal jaundice). In fact, jaundice frequently and common disease infected to a newborn in the world. Jaundice is yellow discoloration of the skin, sclera and mucous membrane due to raised plasma bilirubin. In a simple word, Jaundice is a medical term that describes an increase in the amount of bilirubin in the body which gives the result of eyes, skin, and body fluid turning yellow [9].

Bilirubin is a yellow pigment form by the breakdown of red blood cells in the body which the liver helps to excrete it. [10].

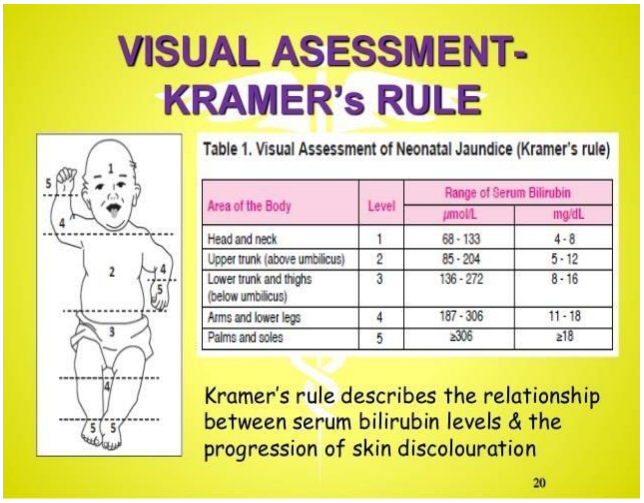

Figure 2: Kramer's Rule [11]

Figure 2 shows table of Kramer's rule which has been used in hospital and doctor in analyzing the level of bilirubin in the body. Kramer's rule describes the relationship between serum bilirubin levels & the progression of skin discoloration. Kramer's rule divided every part of the body with the label itself where the divided part is different from one to another part. Based on the figure, palms and soles is the highest yellow pigment has in the body.

3. METHODOLOGY

Figure 3 shows the framework of the research. In detail, the research will detect jaundice based on the skin and classification of the level of bilirubin based on the result of detection itself.

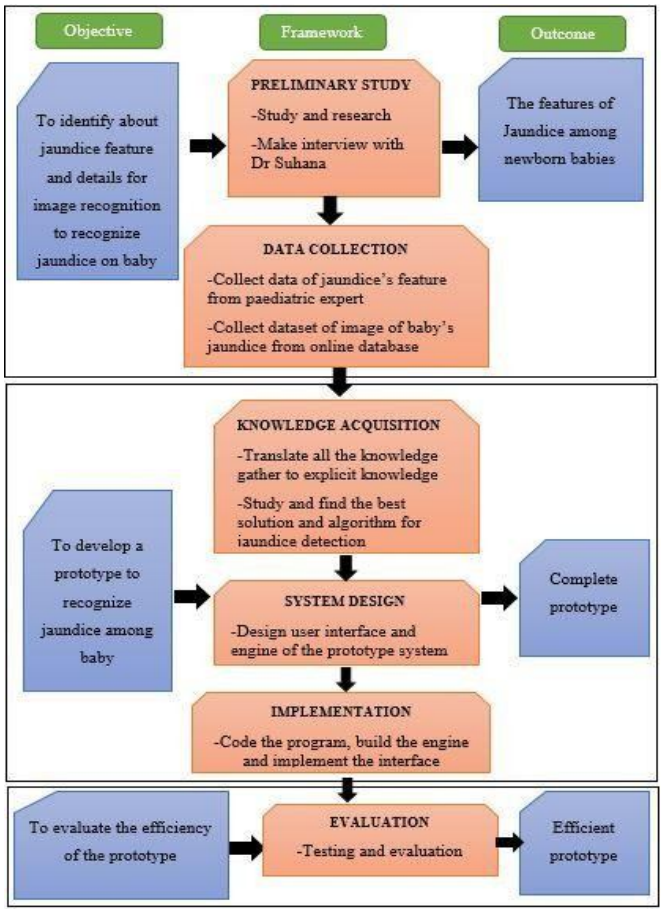

Figure 3: Framework of the Project

3.1 The Process Flow of the Research

The process will begin with image acquisition which the process of input the image to be processed. The source of the image can be an online database, video, camera and another source. The pre-processing technique will be used for image detection. In this project, image detection used to detect whether the newborn has jaundice or not by detecting on the skin and eyes. Image processing technique will be used first is pre-processing. The pre-processing step removes the noise present in the input images. Generally, the process will be image filtering by using median filtering to filter the noise and remove unwanted part. Pre-processing focus on enhancing the image before continuing with the other process such as image segmentation and image classification.

Feature extraction is the process of transforming the contents of the image into multiple content features. The jaundice detection extract color features to detect the yellowish of the skin on the image. Colour feature is the widely used feature for image detection. The key components of color feature extraction are color space, similarity measurement, and color quantization. Inclusive of mean, variance, standard deviation, skewness, hue, and saturation calculation and comparison. All of the features give an important role to get the better result of

yellowish color. The techniques will able to detect jaundice with the high or low of the yellowish skin of the newborn [12].

Next step will be the classification of the level of bilirubin based on the result from the yellowish of skin and eyes detection. Classification will be added with K-Nearest Neighbour (KNN) algorithm which will combine and calculate the exact value of the points and use the algorithm to classify it [13].

Figure 4 shows on how the classification algorithm works. It starts with the training dataset to be trained. Focusing on a training module, in this step, machine will be training to learn from the dataset to understand the criteria and the rules. Then it will include classification algorithm to calculate and set up the point to classify the similarities from the dataset. The next step will separate the result based on the category using KNN algorithm.

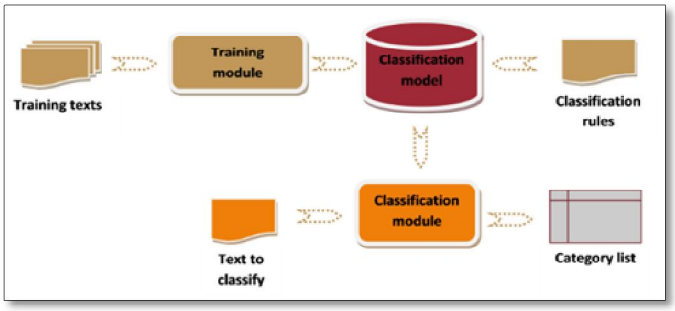

Figure 4: Classification Algorithms Work Flow

4. RESULTS AND DISCUSSION

Figure 5: Jaundice Classification using Color Detection Method

Figure 5 shows the prototype of the jaundice classification using color detection method. This prototype can be used for all categories of people who want to detect jaundice on babies. But, it more concern on parents who has baby around age 0-2 years. This will give more significant towards the parents and baby itself.

4.1 Safety Mechanism

Baby friendly because it does not have any danger rays to hurt babies.

4.2 Novelty and Significance

The research idea comes from doctor at SALAM Hospital itself. Currently, there is no available product in market to become first aid of early detection of jaundice. This research outcome development will assist and easier for mothers to do early detection of jaundice at home.

4.3 Contribution to society

Every one especially mothers can use this for their baby for early detection of jaundice. This system contributes to medical area related to jaundice simple detection home method. This method will give more awareness for parents towards the jaundice related to babies. This prototype will help parent to detect jaundice on baby in a fast way. It will assist parent to be more concern and act quickly in detecting jaundice on baby. Furthermore, it will help in reducing time consume to go and back several times for detection of jaundice at medical center or clinics. Other than that, for future work this research can be develop in more advance stage to be use in medical centers and clinics to enhance the way of detecting jaundice among babies without hurting the babies. Furthermore, Computer Aided Diagnosis (CAD) systems is the area of medical imaging that serves as the second opinion for medical practitioner [14] during image interpretation .

5. CONCLUSION

Physiological jaundice is the most common types of jaundice happen among newborn in the world. Physiological jaundice happens in the first 24 hours after the baby has been delivered. Term infants and the preterm infant is the type of newborns categories under physiological jaundice, in where 50% - 60% of all newborn are jaundiced in the first week of life. A total amount of bilirubin will get an increase from day by day with a mean peak of 6mg/dL while preterm infant's incidence of visible jaundice is higher than term infant and it mostly happens on day 5-7 of baby's life. A Malaysian study found that less than 50% of the mother has good knowledge about the risk of neonatal jaundice. This show the number of the mother not aware of jaundice is more than mother who filled with the knowledge. Many of mothers will misinterpret jaundice with another disease. The outcome of the research can be handy for mothers to use it at home as first hand tool in detection of jaundice among new born.

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REFERENCES

[1] B. Buvaneswari , T. Kalpalatha Reddy (2019), ELSA- A Novel Technique to Predict Parkinson's Disease in Bio-Facial Recognition System, International Journal of Advanced Trends in Computer Science and Engineering, Volume 8, No.1, January – February https://doi.org/10.30534/ijatcse/2019/03812019

[2] Ullah, S., Rahman, K., & Hedayati, M. (2016). Hyperbilirubinemia in neonates: types, causes, clinical examinations, preventive measures and treatments: a narrative review article. Iranian journal of public health, 45(5), 558.

[3] Rufai, A. M., Anbarjafari, G., & Demirel, H. (2014). Lossy image compression using singular value decomposition and wavelet difference reduction. Digital signal processing, 24, 117-123.

[4] Castro-Ramos, J., Toxqui-Quitl, C., Villa Manriquez, F., Orozco-Guillen, E., Padilla-Vivanco, A., & Sánchez-Escobar, J. (2014). Detecting jaundice by using digital image processing, (February), 89491U. https://doi.org/10.1117/12.2041354

[5] Abbas, M., Shamshad, T., Ashraf, M., & Javaid, R. (2016). Jaundice: a basic review. International Journal of Research in Medical Sciences, 4(5), 1313–1319. https://doi.org/10.18203/2320-6012.ijrms20161196

[6]Akobeng, A. (2016). Neonatal jaundice. Clinical Evidence, (12).

[7] Singla, R., & Singh, S. (2016). A framework for detection of jaundice in new born babies using homomorphic filtering based image processing. Proceedings of the International Conference on Inventive Computation Technologies, ICICT 2016, 20 https://doi.org/10.1109/INVENTIVE.2016.7830209

[8] Neonatal Jaundice. (2018, April 17). Retrieved from https://emedicine.medscape.com/article/974786-overview

[9] Ali, S. K., Beiji, Z. B. Z., & Long-Xiang, P. L.-X. P. (2009). A Wavelet -Fuzzy Approach for Diagnosis the Constitutional Jaundice. 2009 3rd International Conference on Bioinformatics and Biomedical Engineering, 1–4. https://doi.org/10.1109/ICBBE.2009.5162258

[10] Mediline Plus (2018), US National Library of Medicine, retrevied from https://medlineplus.gov

[11] Wan, Asl et al. “Management of neonatal jaundice in primary care.” Malaysian family physician : the official journal of the Academy of Family Physicians of Malaysia vol. 11,2-3 16-19. 31 Aug. 2016

[12] N., Ahmad Jamil, S. H. F. S., Mohd Khidir, M. L., Saad, S. A. (2012). Jaundice in newborn monitoring using color detection method. Procedia Engineering, 29, 1631–1635. https://doi.org/10.1016/j.proeng.2012.01.185

[13] Mansor, M. N., Yaacob, S., Muthusamy, H., Nisha, S., Syam, S. H., Lutfi, M., … Junoh, A. K. (2011). PCA- Based Feature Extraction and k-NN algorithm for Early Jaundice Detection. International Journal of Soft Computing And Software Engineering, 1(1), 25–29. https://doi.org/10.7321/jscse.v1.n1.4

[14] Andrews Jose , Dr.D. Sujitha Juliet (2019), Recent advances and investigation of efficient Computer Aided Diagnosis systems for CT images in Liver cancer detection , International Journal of Advanced Trends in Computer Science and Engineering, Volume 8, No.3, May - June 2019