

STUDY ON POSSIBILITY TO DETERMINE  
JAUNDICE SYMPTOM USING VISION  
SYSTEM

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STUDY ON POSSIBILITY TO DETECT JAUNDICE SYMPTOM  
USING VISION SYSTEM

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This thesis is submitted as partial fulfilment of the requirements for the award of the  
Bachelor of Electrical Engineering (Hons.) (Electronics)

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### **SUPERVISOR'S DECLARATION**

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of the Bachelor Degree of Electrical Engineering (Hons.) (Electronics).

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12<sup>th</sup> DECEMBER 2016

### STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

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*Dedicated to all my beloved family, supportive friends for the endless support.  
Not to mention my kind and very patient supervisor for all the advices and help I needed.  
May Allah shower you with endless blessings.*

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## ABSTRACT

Jaundice is one of the most common disease affecting neonates worldwide caused by hyperbilirubinaemia in blood, which results in the appearance of yellow discolouration forming on the skin & white eyes (sclera). In the rise in today's technology, apparently one of the most popular methods used in our country used for detection and confirming the symptoms is by blood sampling and other clinical testing with special equipment. But the main issue here is the blood sampling as it seems to be a bit painful especially for infants who are mostly less than 30 days old. One of the non-invasive methods is by measuring the level of bilirubin in blood using a bilirubinometer. It is a small accurate device which uses spectrophotometry but this small device has a really steep price tag, around \$500 - \$2000 a unit. So, the aim of this study is creating an affordable non-invasive system to determine whether a person is jaundice patient by detecting the yellow component on the skin using vision system. Throughout the progress, around 19 pictures of various samples (13 jaundiced & 6 healthy) were taken and colour analysis (RGB) was done on each samples in a software (MatLab). From the colour spaces mentioned, the mean values of each component were calculated and used to plot a distribution graph. Then, the graphs were observed to differentiate any obvious trends happening between the healthy and jaundiced samples. From RGB graph, yellow component is extracted from Green - Blue component and all 13 jaundiced samples shows higher yellow component than the healthy samples. A graphical user interface (GUI) is used to give a clearer view and better understanding for the audience.

## **ABSTRAK**

Jaundis adalah salah satu penyakit biasa yang menjejaskan bayi seluruh dunia disebabkan oleh hiperbilirubinemia dalam darah, ia menyebabkan kemunculan tompok-tompok kuning terbentuk pada kulit & putih mata. Dalam era perubahan teknologi yang mendadak hari ini, salah satu kaedah yang paling popular digunakan di negara kita digunakan untuk mengesan dan mengesahkan gejala jaundis adalah dengan membuat ujian darah dan ujian klinikal yang lain menggunakan peralatan khas. Tetapi isu utama di sini adalah ujian darah kerana ia seolah-olah menyakitkan terutama untuk bayi yang berumur kurang daripada 30 hari. Salah satu kaedah yang bukan invasif adalah dengan mengukur tahap bilirubin dalam darah menggunakan bilirubinometer. Ia adalah mesin kecil yang tepat yang menggunakan spektrofotometri tetapi harga untuk satu unit alat ini sangat mahal, ianya sekitar USD500 sehingga USD2000. Oleh itu, tujuan kajian ini adalah mencipta satu sistem yang tidak invasif dengan harga berpatutan untuk menentukan sama ada bayi itu ialah pesakit jaundis atau tidak dengan mengesan komponen kuning pada kulit dengan menggunakan sistem penglihatan komputer. Sepanjang projek berlangsung, sekitar 19 gambar-gambar pelbagai sampel kulit (13 bayi demam kuning & 6 bayi sihat) telah diambil dan analisis warna (RGB) telah dijalankan ke atas setiap sampel dalam perisian (MatLab). Dari ruang warna yang disebut, nilai minimum bagi setiap komponen telah dikira dan digunakan untuk memplot graf. Kemudian, graf diperhatikan untuk membezakan corak treng jelas yang berlaku antara sampel sihat dan jaundis. Dari RGB graf, komponen kuning (Yellow) diekstrak daripada hijau (G) - komponen biru (B) dan 13 sampel jaundis menunjukkan kadar kuning yang lebih tinggi daripada sampel yang sihat. Satu antara muka pengguna grafik (GUI) digunakan untuk memberi gambaran yang lebih jelas dan pemahaman yang lebih baik kepada pengguna.



## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 PROJECT BACKGROUND**

Jaundice is one of the most common disease affecting neonates worldwide caused by hyperbilirubinaemia in blood, which causes the appearance of yellow discolouration on babies skin when the level of bilirubin in the serum rises above 85 mmol/L (5mg/dl). While in utero, unconjugated bilirubin is cleared by the placenta resulting in a cord serum bilirubin level usually at the level of 35 mmol/L (2mg/dl) or less. According to the UK's National Institute for Health and Clinical Excellence (NICE), about 60% of term babies, and 80% of preterm babies, develop jaundice in their first week after delivery. If it is failed to be controlled, it may lead to Kernicterus and worst of all, death.

In this modern era, technology has ascended which now can provide cure for this disease but apparently, prevention is always better than cure. Generally in health department, the first procedure to confirm the symptoms on babies is visual examination. The white of eyes (sclera), gums and also the condition of urine and stool are being examined to detect changes in their appearances and colour. After that, bilirubinometer is used to determine the level of bilirubin within the babies' body system. Bilirubinometer is a small medical device which operates by beaming light into the skin. Then, the level of bilirubin is calculated by analyzing how the light reflects off or absorbed by the skin.

The final step is the main reason why this project has been brought up front. This final procedure is blood sampling which is practically done by pricking the heel of baby using needle to withdraw blood. But it is only necessary if the yellow tint developed within 24 hours or when the reading on bilirubinometer is higher. So, this project is carried out to detect that yellow discoloration (jaundice symptoms) on babies skin without the need to prick any parts of the babies' body.

## **1.2 PROBLEM STATEMENTS**

These are the problems which have been identified and need to be solved by the end of this project

- To determine the characteristics of jaundice symptoms
- To determine the most suitable image resolution for the symptoms detection
- To decide which method of image processing should be used for this project

## **1.3 OBJECTIVES**

There are several objectives that have been recognized for this project and had been listed as below:

- To detect jaundice symptoms on babies without hurting them by developing a vision based system using MATLAB
- To provide a cheaper solution for jaundice symptom detection compared to the readily available device in the market

## **1.4 SCOPE OF PROJECT**

This project focuses on extracting yellow component (jaundice discolouration) on different samples babies' skin.

- All programming were done in MATLAB
- Photos of confirmed jaundiced & healthy samples were obtained via a government doctor.
- Using offline image processing was used to perform data analysis

## **1.5 THESIS OUTLINE**

This thesis consists four chapters overall including this chapter and excluding abstract. Supposedly, there should be 3 chapters but an extra chapter is added for the data samples have been taken for analysis. The contents of each chapter can be described as below.

Chapter 2 describes the overview of this project and discussion for literature review. In this chapter, explanations are provided from the basic, general concepts until the very core of the project.

Chapter 3 discusses on the methodology explained step by step, also the processes on which image processing step used specifically for this study and project. There are 3 colour spaces used for the colour analysis which RGB, YCbCr and L\*a\*b.

Chapter 4 shows the results got from the analysis from the 3 colour spaces mentioned above. And for the result part shows which colour space has the most accurate result obtained according to the main objective of this project.

Chapter 5 is the final conclusion from the analysis result and also the student's recommendations to make improvement for future studies on this case.

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