



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF WIRELESS SIDS DETECTION  
SYSTEM FOR INFANT**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology with Honours.



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2020

**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

Tajuk: DEVELOPMENT OF WIRELESS SIDS DETECTION SYSTEM FOR  
INFANT

Sesi Pengajian: 2020

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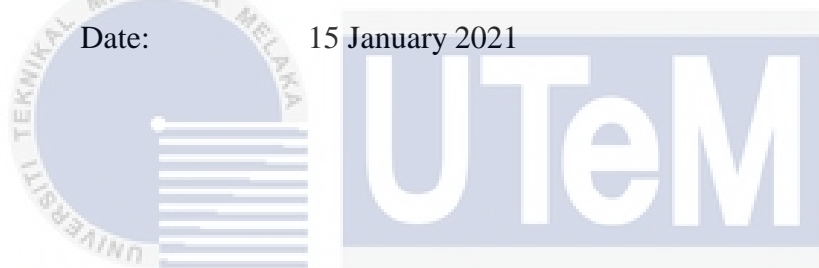
## DECLARATION

I hereby, declared this report entitled DEVELOPMENT OF WIRELESS SIDS DETECTION SYSTEM FOR INFANT is the results of my own research except as cited in references.

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## APPROVAL

This report is submitted to the Faculty of Electrical and Electronics Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronics Engineering Technology with Honours. The member of the supervisory is as follow:



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## ABSTRAK

*Pada masa kini, salah satu masalah utama yang dihadapi oleh kebanyakan ibu bapa adalah penjagaan bayi. Ibu bapa tidak dapat mengesan atau memantau bayi secara berterusan. Ibu bapa memerlukan alat pemantauan bayi yang dapat mengawasi keadaan bayi dengan lebih tepat. Berdasarkan pemerhatian, alat pemantauan bayi yang paling popular adalah kamera video, mikrofon atau gabungan kedua-duanya. Batasan terbesar ialah ibu bapa mungkin tidak mengetahui sama ada bayi tersebut mengalami kejadian SIDS. Sistem ini dirancang untuk mengembangkan sistem pemantauan bayi yang dapat memberi peringatan kepada ibu bapa. Sistem dengan kemampuan tanpa wayar dengan mengesan jika bayi mengalami degupan jantung yang tidak normal, penggera akan mencetuskan ibu bapa. Lebih-lebih lagi, sistem ini adalah untuk mensimulasikan sistem melalui simulasi dengan menggunakan data degupan jantung dari pangkalan data. Ini kerana Arduino bertindak sebagai mikrokontroler sistem dan akan mengesan corak degupan jantung yang tidak normal dari pangkalan data. Sistem ini akan membantu ibu bapa atau penjaga untuk memantau pergerakan bayi malah dengan mengurangkan kadar kematian bayi.*

## ABSTRACT

Nowadays, one of the most major problems facing many parents today is child care. Parents cannot detect or monitor the infants constantly. Parent needs a baby monitor that can keep track of an infant's condition more accurately. Based on the observations, most popular baby monitors are either a video camera, a microphone or a combination of both. The biggest limitation is that parents may not know whether the baby is experiencing a SIDS incident. This system is designed to develop detection system for infant which able to give alarm to the parents. System with wireless capabilities by detecting if the infant is experiencing an abnormal heart rate, a buzzer will trigger the parents. Moreover, this system is to simulate the system directly through sensor by using a pulse rate sensor in beats per minute. It is because Arduino acted as the microcontroller of the system and will detect abnormal heart rate pattern from sensor. This system will help parents or guardian to detect abnormal heart beat level whereby decreasing the rate of infant mortality.

## DEDICATION

*Specially dedicated to my beloved dad, Khalil bin Abd Aziz, my friends and my fiancé, Muhammad Bajrai bin Ahmad who has been with me through all the years and those people who helped and encouraged me during my educational journey.*





## ACKNOWLEDGEMENTS

With His permission, I would like to express my gratitude to Allah that I am done with my project and that it has been successful and smooth. Alhamdulillah, His Willingness has allowed me to complete the Bachelor Degree Project in decent time.

I would like to take this opportunity to express gratitude to my dedicated supervisor, Dr Haslinah Binti Mohd Nasir for her guide that help this project at every stage and getting things done by sharing his valuable ideas, time and knowledge. I would also like to thank my co supervisor, Mr Noor Mohd Ariff Bin Brahin and other lecturers whom had helped directly or indirectly thus making this project a reality.

Not forgotten are my best colleagues for their openhandedly and compassionately guided, assisted, and supported to make this project successful. My deepest thanks to my dearest family and fiancé which always support and pray on me throughout this project. Their blessing gave me the high-spirit and strength to lift me up and face any problems that had occurred and overcome it appropriately.

The great cooperation, kind heartedness and readiness to share worth experiences that have been shown by all of them will be always appreciated and treasured by me, thank you.

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## LIST OF SYMBOLS

|     |                  |
|-----|------------------|
| °C  | Degree Celsius   |
| bpm | Beats per minute |



## LIST OF ABBREVIATIONS

|       |   |
|-------|---|
| RPi   | Raspberry Pi                            |
| IoT   | Internet of Things                      |
| GSM   | Global System for Mobile Communication  |
| LCD   | Liquid Crystal Display                  |
| LED   | Light Emitting Diode                    |
| SIDS  | Sudden Infant Death Syndrome            |
| SIUDs | Sudden Infant Unexpected Death Syndrome |
| SMS   | Short message service                   |
| PIR   | Passive Infrared                        |
| ECG   | Electrocardiograph                      |
| IDE   | Integrated Development Environment      |
| CPU   | Central Processing Unit                 |

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Background

Infant mortality is the death of an infant below the age of 12 months. In each 1,000 live births the infant mortality number is the rate of infant deaths. Infant mortality has several different causes, from infection to genetic disorders or accidents. In 2018, Malaysia's infant death rate was 6.7 dying for every 1,000 live deliveries. Thus, 5 most significant reason of mortality for infants were; birth defects, premature birth, birth defects, SIDS and pregnancy complications and injuries.

In 2019, Malaysia's infant death rate was 5.750 deaths per 1 000 live deliveries, with decreased of 2.53% from 2018. The exact reason of SIDS is unknown and cannot be explained after a thorough case investigation including post-mortem, scene investigation, and infant's clinical history. Deficiencies in the cortex, that is the area of brain that regulates sleeping and breathing anticipation are considered to be related to SIDS.

A term used to define any sudden death unexpected death is Sudden Infant Death Syndrome (SIDS). SIDS is also an expression used to represent any sudden and abrupt death happens during infancy. This is also one of the main causes of infant mortality

between the ages of one until 12 months. Thanks to expertise of various organizations, the number of death from SIDS has dropped to the lower rate. [1]

SIDS is a subcategory from Sudden Infant Unexpected Death Syndrome (SIUDs). After several analysis SIUDs can be assigned to cause of death in infant such as suffocation, asphyxia, trapping, positioning, ingestion, metabolic and traumatic diseases. The difference between SIDS and SIUDs, especially those that happens during an unnoticed sleep time. Along the whole process of the research, all cases will be labelled to as SIDS. Since this research is more focused on developing system detection for infant wirelessly.

[2]



## 1.2 Problem Statement

Parents need a baby detection system that capable of monitoring and detecting an infant's heart rate more accurately. Most popular baby monitors are often a camera, a video recorder or even a variation between both. The biggest limitation is that parents may not know whether the infant is experiencing a SIDS incident.

Usually SIDS happens when parents and infant are sleeping together on any surface such as; bed, couch or nursing chair. During this time, parents are not aware of their infant's condition. Even though cameras and microphones are equipped, it cannot warn parents when SIDS is happening. It is inevitable this causes a longer reaction time from the parents that may in turn lead to losing life.

With wireless Infant Detection System, it can help parents to look after infant's heart rate when they are out of sight. Also being able to keep track of infant's condition will give parents a feeling of comfort that results in better night's sleep, which every parents or guardian can use.

This research will detect SIDS by detecting infant's heart rate using sensor and send the data to parents via wireless and trigger the parents if abnormal heart rate happens. The sensors will sense, connected to microcontroller and warn parents immediately. This will advantage and benefits infants in terms of safety issue. Therefore, the chance of SIDS happens is reduced by providing a wireless infant detection system. [3]

### 1.3 Objectives

The objectives of this research works are:

- To develop a wireless detection system for infant.

System with wireless capabilities by detecting whether the infant is experiencing an irregular heart rate, a buzzer will trigger parents or guardian wirelessly. In situation of SIDS, the parents will response immediately by producing an alert, resulting in a life saved.

- To validate the system using the pulse rate sensor.

Arduino UNO acted as the microcontroller of the system and needs to be programmed in order to control the system. It will detect abnormal heart rate level and show parents their infant's current status and heart rate in bpm. The Bluetooth is use to communicate through application notifications as soon as abnormality heart rate is detected.

## 1.4 Scope of Research

This part explains about the scope of work for this project. To obtain the objective of this project, HC-05 Bluetooth can be used to send notifications to the parents. A wireless connection based on application is programmed in order to host and notify infant's heart rate through the parent's smartphone. It will initiate connection with the device by communicating through Android. The sensor is placed to detect infant's heart rate and warn the parents if there is presence of unusual heart rate. Therefore, buzzer will be generated to trigger parents and results to turn on LED.



Figure 1.1: Block diagram for baby detection system