



Faculty of Electrical and Electronic Engineering Technology



**DEVELOPMENT OF IOT-BASED KIDS' SMART ACTIVITY
TRACKER WITH SEIZURE DETECTION CAPABILITY**

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LEE YI KENT

**Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics)
with Honours**

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**DEVELOPMENT OF IOT-BASED KIDS' SMART ACTIVITY TRACKER WITH
SEIZURE DETECTION CAPABILITY**

LEE YI KENT

**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics)
with Honours**



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I declare that this project report entitled “Development of IoT-Based Kids’ Smart Activity Tracker with Seizure Detection Capability” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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I approve that this Bachelor Degree Project 2 (PSM2) report entitled “Development of IoT-Based Kids’ Smart Activity Tracker with Seizure Detection Capability” is sufficient for submission.

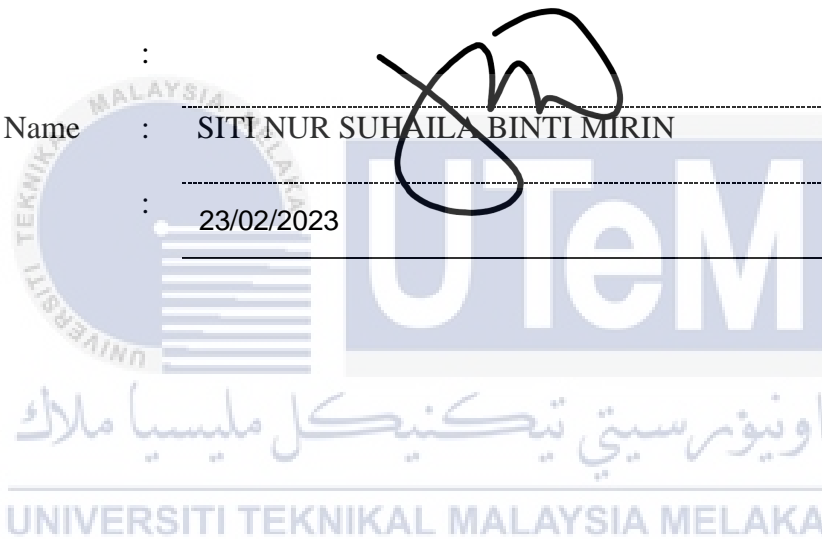
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DEDICATION

To my beloved mother, Mrs. Lee Yoke Ting, and father, Mr. Lee Yim Nyen, for giving the greatest support in mentally and physically throughout my final year project.

To my brothers, mentor, friends and course mate who share their knowledge and advices to finish this project.



ABSTRACT

Seizure is a sickness that have be a part among human being for more than thousand years. A single event of seizure does not mean epilepsy as epilepsy is usually diagnosed when a person has at least two seizures that the cause is unknowns and happen at least 24 hours apart. Febrile seizure is a special name for kids' seizure which their age is in between 6 months to 5 years old. Sudden Unexpected Death in Childhood (SUDC) states that 31.7% cases had a history of Febrile seizure. The main symptom of Febrile seizure is the children will have fever above 38°C. In this era, parents have to work in order to provide daily expenses to the family and this means that children of them who have Febrile seizure will not have extra care and attention. To provide maximum protection for children with Febrile seizure in order to protect them from risk, danger and death from seizure, activity tracker with seizure capability will be designed and developed for the community. This device will be able to detect the temperature of the kids from their wrist and show in parents' smartphone through phone application. Once the device detected abnormal high temperature in children for several minutes, it will send notifications to through application to the parents' smartphone as they can take some precautions steps to reduce the risk and danger that might be happen to their children. ESP8266 will be used as a microcontroller as to send data to Blynk App, which is a smartphone application that can receive the information sent by microcontroller. DS18B20 digital temperature sensor will be used to sense the temperature near the wrist and transfer it to the microcontroller.

ABSTRAK

Sawan adalah penyakit yang telah menjadi sebahagian daripada manusia selama ribuan tahun dan lebih. Satu kejadian sawan tidak bermakna epilepsi sebab epilepsi biasanya diagnosis apabila seseorang mengalami sekurang-kurangnya dua sawan yang puncanya tidak diketahui dan berlaku sekurang-kurangnya 24 jam. Sawan Febrile (Demam) ialah nama khas untuk sawan kanak-kanak yang umurnya antara 6 bulan hingga 5 tahun Sudden Unexplained Death in Childhood (SUDC) menyatakan bahawa 31.7% kes mempunyai sejarah sawan Febrile. Gejala utama sawan Febrile ialah kanak-kanak akan mengalami demam melebihi 38°C. Pada era ini, ibu bapa perlu bekerja untuk menyediakan perbelanjaan harian kepada keluarga dan ini bermakna anak-anak mereka yang mempunyai sawan Febrile tidak akan mendapat penjagaan dan perhatian yang lebih banyak. Untuk memberikan perlindungan maksimum kepada kanak-kanak yang mengalami sawan Febrile supaya dapat melindungi mereka daripada risiko, bahaya dan kematian akibat sawan ini, penjejak aktiviti dengan keupayaan sawan akan direka dan dimajukan untuk komuniti. Peranti ini akan mengesan suhu kanak-kanak dari pergelangan tangan mereka dan ditunjukkan dalam telefon pintar ibu bapa melalui aplikasi telefon. Sebaik sahaja peranti mengesan suhu tinggi yang tidak biasa pada kanak-kanak selama beberapa minit, ia akan menghantar pemberitahuan melalui aplikasi ke telefon pintar ibu bapa supaya mereka dapat mengambil langkah berwaspada untuk mengurangkan risiko dan bahaya yang mungkin berlaku kepada anak-anak mereka. NodeMCU akan digunakan sebagai alat mikrokontrol untuk menghantar data ke Blynk App, iaitu aplikasi telefon pintar yang boleh menerima maklumat yang dihantar oleh alat mikrokontrol. Meter suhu yg dinamakan DS18B20, dicategori sebagai meter suhu digital, akan digunakan untuk mengesan suhu bahan berhampiran pergelangan tangan dan menghantar data ke alat mikrokontrol.

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LIST OF SYMBOLS

- ° - Degree
- ± - Plus minus



LIST OF ABBREVIATIONS

C - Celcius



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CHAPTER 1

INTRODUCTION

1.1 Background

Seizure is an uncontrollable electrical disruption in the brain that occurs suddenly. It can alter a person's behaviour, motions, or sensations, as well as the person level of consciousness. Epilepsy is defined as having two or more seizures that occur at least 24 hours apart and are not caused by a known cause. Seizures come in a variety of forms, each with its own set of symptoms and intensity. The sort of seizure depends on where it starts in the brain and how far it spreads. The majority of seizures endure between 30 seconds and two minutes. A seizure lasting more than five minutes is considered a medical emergency.

When a child has a fever, he or she may experience febrile seizures (febrile convulsions). They are most common between the ages of six months and three years. Seeing your child have a seizure, especially if it's their first, can be frightening and distressing. These seizures, on the other hand, are usually innocuous, and almost all youngsters recover completely. Although febrile seizures are associated to the onset of a high temperature, the aetiology is uncertain (fever). There may also be a genetic relationship to febrile seizures, as having a seizure is more likely if a close relative has had one before. An infection is the most common cause of a child's elevated temperature. Chickenpox, the flu, a middle ear infection, or tonsillitis are all common examples.

One of the most distressing elements of childhood epilepsy for children and their families is not knowing when a seizure may occur. This unpredictability can pervade every facet of existence. Children are unable to swim in deep water or bathe alone. Teens are

frequently unable to drive for fear of having a seizure behind the wheel. Parents may sleep on their children's bedroom floors to keep an eye on any difficulties that arise throughout the night.

A smartwatch that has received FDA approval is part of an expanding group of gadgets targeted at detecting and even forecasting seizures. For many patients, the Embrace watch detects the movements and electrical pulses in the skin that are associated with seizures. When it detects a seizure, it sends a text message to a caregiver's phone, coupled with GPS coordinates so the user may be quickly located. It also saves and analyses data on sleep and activity patterns, which could help patients and their doctors better understand when and why seizures occur on any given day. The FDA approved the watch for adults early last year, and it has now been approved for youngsters.



1.2 Problem Statement

Seizure is dangerous without considering the age. An adult can suffer in seizure and sometimes will cause risks and danger because of it as seizure come in sudden without advanced notice. We can imagine that if an adult cannot take care of himself from seizure, how about a kid without life experience?

Kids should grow up in a happy and healthy surrounding. But if unluckily a kid was born with seizure, would it mean that he do not deserve a happy childhood?

In order to protect our kids from the sickness of seizure, together with the risk and danger from it, the problem that we got now is to investigate more about the kids seizure so that more studies and maybe more protection device, medication and additional concern can be provided to them to protect and secure them from danger.

An activity tracker, or more specifically a seizure tracker, can give additional monitor and protection to seizure patient. Seizure tracker do not meant to be an advanced technology device but it is used to detect the symptom of seizure attack such as convulsion, tremor and fever. Kids seizure, or called as Febrile seizure, the symptom is high fever, which body temperature is above 38°C, the kid might have high possibility to trigger by seizure with the precondition that the kid have seizure before. Nowadays, seizure tracker is quite expensive which is cannot be afford by some families, but medication should be received by anyone without comparing the salary and family burden.

Besides that, to detect the kid's temperature is easy when their parents are along with them. But in this era, most of the families should have more than one salary, which means both of the parents should go to work in order to pay for household expenses. Who should they rely on to monitor their kids with seizure and what method should they use in order to have a peace of mind during their work?

Therefore, in order to let parents know more about what is kids seizure and the danger, sequela of kids seizure, more studies should be excavate. Other than that, in order to help parents which moderate or below average income to know the body temperature of their kids so that they can be aware of their kids trigger by seizure, a low cost and user friendly seizure tracker should be design for parents in order to detect their kids' temperature. Lastly, to let parents have a peace of mind during working hour or the time they are not with their kids, an application to monitor the kids' body temperature should be develop and the purpose of the phone application is not just monitor, and also give pop-up notifications to the parents so that they can take advanced precaution and be aware of it when anything trigger of seizure happen suddenly.