NABI

DIPLOMA OF ELECTRONIC ENGINEERING

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

KY-039 SENSOR BASED NON-INVASE BLOOD GLUCOSE MEASUREMENT TECHNOLOGY WITH IOT

MOHAMED NABIL FIRDAUS BIN MOHAMAD

ZAMHARI(08DJK19F2003)

DEPARTMENT OF ELECTRICAL ENGINEERING

2022

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

KY-039 SENSOR BASED NON-INVASE BLOOD GLUCOSE MEASUREMENT TECHNOLOGY WITH IOT

MOHAMED NABIL FIRDAUS

BIN MOHAMAD

ZAMHARI(08DJK19F2003)

THESIS SUBMITTED IN PARTIAL FULFILMENT FOR THE

DEPARTMENT OF ELECTRONIC ENGINEERING (MEDICAL)

2021/2022

ENDORSEMENT

"I hereby acknowledge that I have read this report and I find that its content meet the requirements in terms of scope and quality for the award of the DIPLOMA OF EELECTRONIC ENGINEERING (MEDICAL).

Signature : ……

Name of Supervisor : TUAN IDRIS BIN KAMARUDDIN

Date : …….

DECLARATION

I hereby declare that the work in this thesis is my own expect for quotations and summaries which have been duly knowledge.

Signature : 

Name : MOHAMED NABIL FIRDAUS BIN ZAMHARI

Registration No. : 08DJK19F2003

Date : 5.7.2022

ACKNOWLEGMENT

At first, I would like to express my heartily gratitude to my supervisor,Tuan idris bin kamaruddin i for the support, enthusiasm and motivation given throughoutthe whole process of this project. Tuan idris bin kamaruddin guidance also helped me a lot throughout this reseach and thesis writing.

On the other hand, thanks a lot to my parents for supporting me spiritually throughout my life. My appreciation also goes to my family members who has been tolerant and supporting me all these months in accomplishing my final project. Thanks for their encouragement, loves and emotional support that they had gave to me.

Finally, I would like to thanks to all my friends for helping me to accomplishing this project especially during my hard time of problem solving which who involved directly or indirectly in my project.

ABSTRACT

Diabetes is a disease that occurs when your blood glucose, also called blood sugar, is too high. if patient go to invaded glucose monitoring system can be lack of a permanent cure and impractical, expensive, painful measuring techniques are among the reasons for these alarming statistics. This research focuses on finding a solution, which is non-invasive, portable, practical, accurate, and cost-effective with the help of sensors and accessible technology platforms. The proposed system uses node MCU as a microcontroller, one sensor unit. The method that we use for this paper is an. The Arduino Uno. Next, KY-039 sensor. The hardware device was built using NIR accompanied by a user-friendly mobile application, which can be accessible by patients of all ages. The comparative measurement was conducted between a certified commercial finger-pulse-oximeter and the proposed ESP32 embedded system with the MAX30100. Since this solution is non -invasive, it provides a reusable and portable platform, which can constantly monitor blood glucose levels conveniently in a painless manner without any repetitive costs. The developed device adapted the wireless technology and using smart phone which enable the user to view the previous results of blood pressure at any time on the smart phone.

Keywords- Diabetes, internet of things (IOT), non-invasive glucose monitoring, health-care, blood glucose, self-monitoring

ABSTRAK [BM]

Diabetes adalah penyakit yang berlaku apabila glukosa darah anda,yang juga dipanggil kandungan gula di dalam darah, terlalu tinggi. Jika pesakit pergi ke sistem pemantauan glukosa yang biasa. mungkin kekurangan penawar kekal dan teknik pengukuran yang tidak praktikal, mahal dan menyakitkan adalah antara sebab statistik yang membimbangkan. Penyelidikan ini memberi tumpuan kepada pesakit mencari penyelesaian, yang tidak invasif, mudah alih, tepat dan kos efektif dengan bantuan penderia dan platform teknologi yang boleh diakses. Sistem yang dicadangkan menggunakan nod MCU sebagai mikropengawal, satu unit sensor. Kaedah yang kami gunakan untuk kertas kerja ini ialah a. Arduino Uno. Seterusnya, Sensor KY-039. Peranti perkakasan itu dibina menggunakan NIR disertai dengan aplikasi mudah alih yang mesra pengguna, yang boleh diakses oleh pesakit dari semua peringkat umur. Pengukuran perbandingan telah dijalankan antara oksimeter nadi-jari komersial yang diperakui dan sistem terbenam ESP32 yang dicadangkan dengan MAX30100. Oleh kerana penyelesaian ini bukan invasif, ia menyediakan platform yang boleh diguna semula dan mudah alih, yang sentiasa boleh memantau paras glukosa darah pesakit dengan mudah dengan cara yang tidak menyakitkan tanpa sebarang kos berulang. Peranti yang dibangunkan mengadaptasi teknologi tanpa wayar dan menggunakan telefon pintar yang membolehkan pengguna melihat keputusan tekanan darah sebelumnya dan pada bila-bila masa pada telefon pintar.

Kata kunci- Diabetes, internet of things (IOT), pemantauan glukosa bukan invasif, penjagaan kesihatan, glukosa darah, pemantauan diri

TABLE OF CONTENT

CHAPTER TWO LITERATURE REVIEW

CHAPTER THREE METHODOLOGY

CHAPTER FIVE CONCLUSION AND RECOMMENDATION

LIST OF TABLE

LIST OF FIGURE

CHAPTER ONE

INTRODUCTION

1.0 INTRODUCTION

Diabetes is a disease that occurs when the blood glucose, also called blood sugar, is too high. Blood glucose is the main source of energy and comes from the food eaten by human. Insulin, a hormone made by the pancreas, helps glucose from food get into the cells to be used for energy[1]. Some 3.6 million Malaysians are suffering from diabetes, the highest rate of incidence in Asia and one of the highest in the world, said Health Minister Datuk Seri Dr.Dzulkefly Ahmad. Seven million Malaysian adults are likely to have diabetes by 2025, a worrying trend that will see diabetes prevalence of 31.3% for adults aged 18 years and above, he added. This exponential increase is significantly within type two diabetes, which is largely the result of excess body weight and physical inactivity. The government is giving serious attention to this increase as it is becoming a major economic burden on the healthcare system and national economy. Dr. Dzulkefly said although Malaysia has a parallel public and private system, the majority of treatment for chronic diseases is provided by the public health system heavily subsidized by the governmentat a “significant cost”[1].

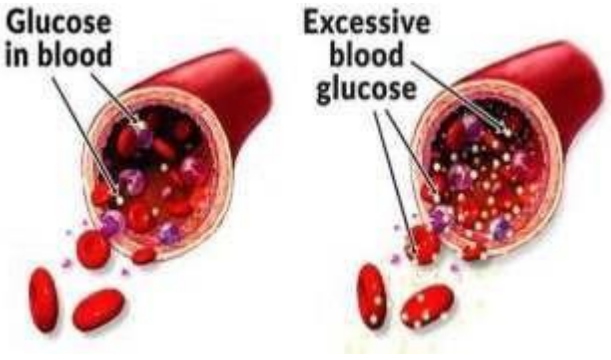

***Figure 1** : The blood in human body*

A macroeconomic study in 2011 showed the cost at about RM2bil, representing 13% of the healthcare budget for the year 2011. The analysis reflects that this cost could

be as high as RM3.52bil if societal costs were included. The one-day event held at Sunway Medical Centre brought specialists to discuss the latest developments in acute and general medicine.The hardware used are KY-039 sensors, skin sensors as an assistant to the sensor data so that the program can match the data of the sensor and the skin sensors. It also using Arduino R3, Liquid crystal display and ESP-01S to help detect the glucose level needed. Based on our observations and research about the relationship between the KY-039 sensor and the glucose level, when the sensor is between range of 70 –80 bpm, the skin sensor are needed to sense the heat of the person's finger as if the range of data of the person heart rate is equal to the heat of a normal person whom does not having diabetes, the data of the glucose level will appear at the phone or apps used by using internet (wifi). This is because the heat of the skin whom having diabetes is more heater than the normal person usual range. As the heart rate will be put on the feet to sense the heat and the heart rate as it physically a little far from the person heart itself. So, using skin sensor to help the heart rate data that combine to easy the program to produce a good result and exact data that we want for the person.By using wifi, the application that used are GLUCOSE for appearing the result or data of whether the person that are being examine is having diabetes or not with the relationship between the sensor data and the heat of the skin[1].

GLUCOSE is an IOT internet of thing platform that are collected data that sense at the same time and show it on the phone or PC used. By connecting to the internet, by just need to log in the account on the link and inserting the personal information and sense the feet, automatically the data will appear with the analysis needed.

. The results obtained were validated by using statistical techniques. The analysis showed a strong linear correlation between the voltage output and the blood glucose level. The overall accuracy of the system accounts for above 90%. Since this solution is non-invasive, it provides a reusable and portable platform, which can constantly monitor blood glucose levels conveniently in a painless manner without any repetitive costs. This solution will help patients to adjust medication based on their current blood glucose levels to reduce the unnecessary organ damage and additional costs incurred.

1.1 TITLE

KY-039 SENSOR BASED NON-INVASED GLUCOSE MEASUREMENT TECHNOLOGY WITH IOT

1.2 PROBLEM STATEMENT

- The patient must prick the finger with a needle to take a blood sample and test using a non-reusable biochemical reaction stripe.
- pricking a finger can also lead to various allergies and infections.
- costly, quite painful, and inconvenient
- If the blood glucose level goes higher than usual, it could cause kidney failure, heart attacks, and strokes.
- If the blood glucose level is lower than usual, the patient could go into a diabetic coma, lose consciousness
- Patient information cannot be stored in more detail and securely

1.3 OBJECTIVES

1 To develop a software for non-invasive glucose monitoring system.
2. To develop hardware prototype for non-invase glucose monitoring system.
3. To develop interface for non-invasive glucose monitoring system

1.4 SCOPE OF PROJECT

The scope of this project is specifically for the elderly who are prone to diabetes. This project can help them check their blood sugar content more quickly and reduce costs and is not painful.

1.5 SIGNIFICANT OF THE STUDY

Therefore, another importance of this research is that it focused on developing the most cost-effective solution. All the citizens need to keep proper control of blood glucose levels to prevent complications and side effects of this disease. in addition, the benefit of this project is that it does not cause pain or allergies to patients. We are well aware that data collected in hospitals may not necessarily be securely maintained. Moreover, this project was created to store the patient's data more securely, even the patients can see for themselves sugar content in their blood by simply opening the application created that is GLUCOSE which is available in their mobile phones.

1.6 EXPECTED OUTCOMES

i. To reduce pain and prevent the occurrence of allergies to all users of all ages
ii. To provide a tool to measure blood sugar levels that can be seen and monitored using only the application available in the mobile phone
iii. Produce a product with reasonable price by planning the budget in order to it affordable for patient to purchase.

1.7 THEORETICAL STUDY

The research focus on non-invasive measuring techniques, which gives no pain, no allergies, and in return motivates constant monitoring. Constantly pricking a finger can also lead to various allergies and infections. Many patients with higher glucose levels take more time to heal a wound and sometimes could lead to various complications and result in the removal of limbs, hands, and scooping out infected areas. I t was calculated that if a person uses one test strip per day it costs more than LKR 18,000.

1.8 CONCLUSION

In short**,** in this chapter explained on the overview of the title of the thesis. We also viewed the problem statement and significance of KY-039 sensor based non-invased measurement using iot. We also declare d on some definition operation that might be found in this thesis. So that the reader could understand more.