



IOT Innovation And Sustainability For Electrocardiogram (ECG) Bluetooth (HC-05) Wireless Via Smartphone And Photoplethysmography (PPG) With ECG Display "PQRSTU Wave And BPM Reading" Based On IR Project Heart Rate Liver Monitoring System Sensor AD8232 Using Arduino UNO R3 For Heart Disease.

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JABATAN KEJURUTERAAN ELEKTRIK

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This report submitted to the Electrical Engineering Department in fulfillment of the requirement for a Diploma in Electrical Engineering

JABATAN KEJURUTERAAN ELEKTRIK

SESI 2 2021/2022

CONFIRMATION OF THE PROJECT

The project report titled " IOT Innovation And Sustainability For Electrocardiogram (ECG) Bluetooth (HC-05) Wireless Via Smartphone And Photoplethysmography (PPG) With ECG Display "PQRSTU Wave And BPM Reading" Based On IR Project Heart Rate Liver Monitoring System Sensor AD8232 Using Arduino UNO R3 For Heart Disease." has been submitted, reviewed and verified as a fulfills the conditions and requirements of the Project Writing as stipulated

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“I acknowledge this work is my own work except the excerpts I have already explained to our source”

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Date : **8/3/2022**

DECLARATION OF ORIGINALITY AND OWNERSHIP

TITLE : IOT Innovation And Sustainability For Electrocardiogram (ECG) Bluetooth (HC-05) Wireless Via Smartphone And Photoplethysmography (PPG) With ECG Display "PQRSTU Wave And BPM Reading" Based On IR Project Heart Rate Liver Monitoring System Sensor AD8232 Using Arduino UNO R3 For Heart Disease.

SESSION: SESI 2 2021/2022

1. I am is **KHAIRUL AMIRIN BIN SAIFUN HAKIMI (08DEU19F2007)**
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2. I acknowledge that 'The Project above' and the intellectual property therein is the result of our original creation /creations without taking or impersonating any intellectual property from the other parties.
3. I agree to release the 'Project' intellectual property to 'The Polytechnics' to meet the requirements for awarding the **Diploma in Electrical Engineering** to me.

Made and in truth that is recognized by;

a) **KHAIRUL AMIRIN BIN SAIFUN HAKIMI**)
(Identification card No: - 010515-14-0387)



.....
**KHAIRUL AMIRIN BIN SAIFUN
HAKIMI**

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BIN ABD RAZAK** .As a project supervisor, on
the date:

.....
**ENCIK KHAIRUL NAPISHAM BIN
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ABSTRACT

The development of medical devices for health care is a research field with great relevance, as there is a continuous need to innovate and improve health care. In the last decades, there has been an alarming increase in cardiovascular disease, one of the main causes of death globally. Due to a lack of knowledge or identification, cardiovascular disease often results in death caused by heart attack or heart conditions. Heart diseases are becoming a big issue since last few decades and many people die because of certain health problems. Therefore, heart disease cannot be taken lightly. Cardiovascular disease generally refers to conditions that involve narrowed or blocked blood vessels that can lead to a heart attack, chest pain (angina) or stroke. By analyzing or monitoring the ECG signal at initial stage these disease can be prevented. So I am present this project by using ECG Monitoring with use the aids AD8232 ECG Sensor, Arduino UNO R3, 3-Leads Electrodes and ECG Bluetooth (HC-05) Wireless Via Smartphone To Apps Swastik Electronics And Serial Bluetooth Terminal. Moreover, the AD8232 is a neat little chip used to measure the electrical activity of the heart and amplifies the signal extracted with the help of ECG electrode. So in this project I am will interface AD8232 ECG Sensor with Arduino UNO R3 and observe the ECG signal on Via Smartphone To Apps Swastik Electronics And Serial Bluetooth Terminal.

In this paper also, I am have connect Photoplethysmography (PPG), Oled Lcd Led and Buzzer in the intelligent devices Arduino UNO R3 for better service for the desired patients suffering from heart malfunctioning. The ECG signals are processed and transmitted to the ECG display at Oled Lcd Led for display "PQRSTU Wave And BPM Reading" .However, the main aim to review the current state of the Monitoring Device where it extensive depth analysis to finding in the area of smart health Monitoring for the ease of patient and the doctors. Moreover, the paper concludes that health Monitoring Device will be prevalently implemented with home environment monitoring and control systems and the Photoplethysmography (PPG) is usually do for a few minutes and it is a painless or help to diagnosis much common heart problem of all age peoples.

As the result, this ECG hardware has worked with a desirable result. Thus, this product was also created in a small size so that it will be easy for people to carry everywhere. Therefore, this device is success and very helpful for people who have heart disease so they can know their electrical activity of heart.

Keywords : Bluetooth (HC-05), AD8232 ECG Sensor, 3-Leads Electrodes, Arduino UNO R3, Buzzer, Photoplethysmography (PPG), Oled Lcd Led, Electrocardiogram (ECG), Apps Swastik Electronics And Serial Bluetooth Terminal.

ABSTRAK

Pembangunan peranti perubatan untuk penjagaan kesihatan adalah bidang penyelidikan yang mempunyai perkaitan yang besar, kerana terdapat keperluan berterusan untuk berinovasi dan menambah baik penjagaan kesihatan. Dalam dekad yang lalu, terdapat peningkatan yang membimbangkan dalam penyakit kardiovaskular, salah satu punca utama kematian di seluruh dunia. Disebabkan kekurangan pengetahuan atau pengenalan, penyakit kardiovaskular sering mengakibatkan kematian akibat serangan jantung atau keadaan jantung Penyakit jantung menjadi isu besar sejak beberapa dekad lalu dan ramai orang meninggal dunia kerana masalah kesihatan tertentu. Oleh itu, penyakit jantung tidak boleh dipandang ringan. Penyakit kardiovaskular secara amnya merujuk kepada keadaan yang melibatkan saluran darah yang sempit atau tersumbat yang boleh menyebabkan serangan jantung, sakit dada (angina) atau strok. Dengan menganalisis atau memantau isyarat ECG pada peringkat awal penyakit ini boleh dicegah. Jadi saya membentangkan projek ini dengan menggunakan Pemantauan ECG dengan menggunakan alat bantu AD8232 ECG Sensor, Arduino UNO R3, Elektrod 3-Leads dan ECG Bluetooth (HC-05) Tanpa Wayar Melalui Telefon Pintar Ke Aplikasi Elektronik Swastik Dan Terminal Bluetooth Bersiri. Selain itu, AD8232 ialah cip kecil yang kemas digunakan untuk mengukur aktiviti elektrik jantung dan menguatkan isyarat yang diekstrak dengan bantuan elektrod ECG. Jadi dalam projek ini saya akan antara muka AD8232 ECG Sensor dengan Arduino UNO R3 dan memerhati isyarat ECG pada Melalui Telefon Pintar Ke Aplikasi Swastik Electronics Dan Terminal Bluetooth Bersiri.

Dalam kertas kerja ini juga, saya telah menyambungkan Photoplethysmography (PPG), Oled Lcd Led dan Buzzer dalam peranti pintar Arduino UNO R3 untuk perkhidmatan yang lebih baik untuk pesakit yang dikehendaki mengalami masalah jantung. Isyarat ECG diproses dan dihantar ke paparan ECG di Oled Lcd Led untuk paparan "PQRSTU Wave And BPM Reading" .Walau bagaimanapun, matlamat utama untuk mengkaji keadaan semasa Peranti Pemantauan di mana ia analisis mendalam yang meluas untuk mencari di kawasan kesihatan pintar Pemantauan untuk kemudahan pesakit dan doktor. Selain itu, kertas kerja itu menyimpulkan bahawa Peranti Pemantauan kesihatan akan dilaksanakan secara lazim dengan sistem pemantauan dan kawalan persekitaran rumah dan Photoplethysmography (PPG) biasanya dilakukan selama beberapa minit dan ia tidak menyakitkan atau membantu untuk mendiagnosis masalah jantung yang biasa dialami oleh semua peringkat umur. .

Hasilnya, perkakasan ECG ini telah berfungsi dengan hasil yang diinginkan. Justeru, produk ini juga dicipta dalam saiz yang kecil supaya mudah dibawa ke mana-mana. Oleh itu, peranti ini berjaya dan sangat membantu orang yang mempunyai penyakit jantung supaya mereka dapat mengetahui aktiviti elektrik jantung mereka.

Kata kunci : Bluetooth (HC-05), Sensor ECG AD8232, Elektrod 3-Leads, Arduino UNO R3, Buzzer, Photoplethysmography (PPG), Led Lcd Oled, Electrocardiogram (ECG), Aplikasi Swastik Electronics Dan Terminal Bluetooth Bersiri.

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LIST OF ABBREVIATIONS

1. Bluetooth (HC-05)
2. Photoplethysmography (PPG)
3. Oled Lcd Led (Oled Lcd)
4. Electrocardiogram (ECG)
5. Heart Rate (BPM)
6. Cardiovascular Disease (CVD)
7. Coronary Artery Diseases (CAD)
8. Left Chest (LA)
9. Right Chest (RA)
10. Below The Right Chest (RL)

CHAPTER 1

1 INTRODUCTION

1.1 Introduction

CHAPTER 1

The development of medical devices for health care is a research field with great relevance, as there is a continuous need to innovate and improve health care. In the last decades, there has been an alarming increase in cardiovascular disease, one of the main causes of death globally. Due to a lack of knowledge or identification, cardiovascular disease often results in death caused by heart attack or heart conditions. ECG, also referred to as EKG, is the abbreviation of the word electrocardiogram – a heart test that tracks the electrical activity of heart and records it on a moving paper or shows it as a moving line on a screen. To get an ECG trace, an ECG monitor is needed to record it. As the electrical signals move through the heart, the ECG monitor records the strength and the timing of these signals in a graph called a P wave. Traditional monitors use patches and wires to attach electrodes to the body like at skin of chest, arms and legs and communicate the ECG trace to a receiver. While, Modern monitors use bluetooth observe the ECG signal on Via Smartphone To Apps Swastik Electronics And Serial Bluetooth Terminal. Nextly, The length of an ECG test varies depending on the type of the test being performed. Sometimes it can take a few seconds or minutes.

For longer, more continuous monitoring there are devices that can record ECG for several days or even a week or two. Not only that, an ECG is often used alongside other tests to help diagnose and monitor conditions affecting the heart. It can be used to investigate symptoms of a possible heart problem, such as chest pain, palpitations (suddenly noticeable heartbeats), dizziness and shortness of breath. An ECG can help detect an arrhythmias where the heart beats too slowly, too quickly, or irregularly. Then, it help detect a coronary heart disease where the heart's blood supply is blocked or interrupted by a build-up of fatty substance. Moreover, heart attacks is where the supply of blood to the heart is suddenly blocked and lastly is for cardiomyopathy where the heart walls become thickened or enlarged.

Moreover, information about ECG for example in the present time, people suffering from heart diseases are increasing so much. In India, many lives are affected because of a lack of knowledge in diagnostic awareness. The electrocardiogram (ECG) is the most commonly used diagnostic test for measuring the electrical activity of the heartbeat in the medical field. It was discovered by William Eintheon in 1895. It is a diagnostic tool that is used to measure and record the electric activity related to cardiac contraction of the heart in fastidious detail. It is a non-invasive, painless test with quick results. With the help of this information, we can easily get to know about the conditions of the heart's status. These conditions can vary from minor to life-threatening. It is an easy and affordable test that is used generally in the assessment of the patient with pain in the chest with zero risks to the patient. The ECG is the cornerstone for making the decision for eligibility for thrombolytic therapy. An ECG is basically a chronicle of the electrical movement on the body surface produced by the heart muscles. An ECG info is collected by Photoplethysmography (PPG) placed at the selected location on the patient's index finger then it shows the result In the form of ECG display at Oled Lcd Led for display "PQRSTU Wave And BPM Reading". Most hospitals and diagnostic centres in India use incorporated devices designed to measure the body pressure circulatory strain and pulse of the patient. Although such devices are valuable, their cost is usually uneconomical. So, in this paper Investigation report : project 2 IOT Innovation And Sustainability For Electrocardiogram (ECG) Bluetooth (HC-05) Wireless Via Smartphone And Photoplethysmography (PPG) With ECG Display "PQRSTU Wave And BPM Reading" Based On IR Project Heart Rate Liver Monitoring System Sensor AD8232 Using Arduino UNO R3 For Heart Disease. Able to save money to produce high quality ECG products and work successfully.

1.2 Background Research

Provides an overview of this project as a whole containing a background about the project, objectives, problem statement, scope of the project, project significance, chapter summary and references include appendices. Moreover, contain brief introduction about the heart disease (called abnormal signal) or does not have heart disease (called normal signal) as well as literature review discussion about work from source people until the result of a own handiwork project that is IOT Innovation And Sustainability For Electrocardiogram (ECG) Bluetooth (HC-05) Wireless Via Smartphone And Photoplethysmography (PPG) With ECG Display "PQRSTU Wave And BPM Reading" Based On IR Project Heart Rate Liver Monitoring System Sensor AD8232 Using Arduino UNO R3 For Heart Disease. Nextly, specify the design a description on the components used. After that, present the results obtained from the system implementation and a brief discussion on these results. The conclusion of the project and goodness and effectiveness as well as high quality of the developed project.

1.3 Problem Statement

ECG (electrocardiogram) signals are signals taken from the human body in order to measure the activity and health of the human heart. An ECG signal shows whether a patient has heart disease (called abnormal signal) or does not have heart disease (called normal signal).

Lately, we always heard on mass media or article about heart disease that often happen which regardless of age and gender. Heart diseases are becoming a big issue since last few decades and many people die because of certain health problems, hypertensive heart disease and rheumatic heart disease. Therefore, the term "heart disease" is often used interchangeably with the term "cardiovascular disease." Cardiovascular disease (CVD) is a class of diseases that involve the heart or blood vessels. CVD includes coronary artery diseases (CAD) such as angina and myocardial infarction (commonly known as a heart attack). Other CVDs include stroke and heart failure.

In line with that, it can be used to investigate symptoms of a possible heart problem, such as chest pain, palpitations (suddenly noticeable heartbeats), dizziness and shortness of breath. An ECG can help detect arrhythmias is where the heart beats too slowly, too quickly, or irregularly.

After that, electrocardiography (ECG) is an important way to evaluate patients with cirrhosis and may reveal significant changes associated with liver disease. My review aimed to evaluate ECG changes in patients with diagnosed liver cirrhosis and compare them to patients with chronic hepatitis.

Nextly, arrhythmias is where the heart beats too slowly, too quickly, or irregularly. coronary heart disease is where the heart's blood supply is blocked or interrupted by a build-up of fatty substances. heart attacks is where the supply of blood to the heart is suddenly blocked.

In conclusion, the problem of the heart are normally monitored by ECG. ECG waveform comes in the slope of P-Q-R-S-T-U pattern. Q-R-S is the most critical part of the waveform. In this study of ECG signals and examination of different conditions, two must required parameters are Q-R-S duration and heart rate (BPM).[11]

1.4 Research Objectives

There are a few also learned how to develop a prototype hardware for patient has heart disease (called abnormal signal) or does not have heart disease (called normal signal), to study a system that can help patient has heart disease (called abnormal signal) or does not have heart disease (called normal signal) and to the ECG display at Oled Lcd Led for display "PQRSTU Wave And BPM Reading", to creating a suitable software AD8232 ECG Sensor connected to 3-Leads Electrodes and Photoplethysmography (PPG) for the patient has heart disease (called abnormal signal) or does not have heart disease (called normal signal), to develop Electrocardiogram (ECG) monitor with AD8232 sensor by using Arduino UNO R3 for heart disease, to evaluate effectiveness of ECG monitoring with AD8232 sensor, to study characteristics of heart disease and to make a design sensitive amplifier circuit that can detect ECG (Electrocardiogram) signals obtained from metal electrodes applied at the Left chest (LA), Right chest (RA) and below the Right chest (RL).[9]

1.5 Scope of Research

Medical Equipment is in area Biomedical at hospital always use ECG for check heart. In line with that, Electrocardiography And Cardiac Function is to check PQRSTU heart in condition normal. In conclusion, project the title is IOT Innovation And Sustainability For Electrocardiogram (ECG) Bluetooth (HC-05) Wireless Via Smartphone And Photoplethysmography (PPG) With ECG Display "PQRSTU Wave And BPM Reading" Based On IR Project Heart Rate Liver Monitoring System Sensor AD8232 Using Arduino UNO R3 For Heart Disease will be completed within 14 week , cost of developing project is RM 321.97 , hardware resources are available for four months.[12]

1.6 Project Significance

To the hospital management are government employees, private employees, society, nation is Malays, Chinese, Indians and other races in Malaysia and abroad who use this tool to help and identify an ECG signal shows whether a patient has heart disease (called abnormal signal) or does not have heart disease (called normal signal).

1.7 Chapter Summary

In this first chapter, I've described the background of the original idea for the beginning of this project. Then, I identified the problem statement about project. In addition, I have demonstrated the objectives of this project, scope of research, project significance. Finally, I came up with a project with the title IOT Innovation And Sustainability For Electrocardiogram (ECG) Bluetooth (HC-05) Wireless Via Smartphone And Photoplethysmography (PPG) With ECG Display "PQRSTU Wave And BPM Reading" Based On IR Project Heart Rate Liver Monitoring System Sensor AD8232 Using Arduino UNO R3 For Heart Disease.