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HEALTH MONITORING AND ALERT SYSTEM FOR ELDERLY PARENT

MUHAMMAD KHIR BIN HUSSIN

The report is submitted in partial fulfilment of the requirements for the Bachelor of Computer Science (System Development) with Honour

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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JUDUL: HEALTH MONITORING AND ALERT SYSTEM FOR ELDERLY PARENT

SESI PENGAJIAN: 2014/2015

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DECLARATION

I hereby declare that this project report entitle

HEALTH MONITORING AND ALERT SYSTEM FOR ELDERLY PARENT

Was my original work and not copy from any resources except a few parts that were mention in references section.

STUDENT: _____ DATE: 3 SEPT 2015

(MUHHAMD KHIR BIN HUSSIN)

SUPERVISOR: _____ DATE: 3 SEPT 2015

(ROSMIZA WAHIDA BINTI ABDULLAH)

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DEDICATION

To my beloved family, I love you all. To my supervisor, thank you so much for the assist and help. To my all my friends, thank you for your hardship and support.

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First of all, praise upon Allah for giving me strength and patient to complete the PSM throughout this semester. I would like to express my sincere gratitude to my guide Mdm. Rosmiza Wahida binti Abdullah for her invaluable guidance and steadfast support during the course of this project work. Fruitful and rewarding discussions with her on numerous occasions have made this work possible. It has been a great pleasure for me to work under her guidance.

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ABSTRACT

Health Monitoring and Alert System for Elderly Parent (HMAS) is a system for monitoring health the elderly parent. The heart rate can be measured by monitoring one's pulse using specialized medical devices such as an electrocardiograph (ECG), portable device e.g. wrist strap watch, or any other commercial heart rate monitors which normally consisting of a chest strap with electrodes. Despite of its accuracy, somehow it is costly, involve many clinical settings and elderly parent must be attended by medical experts for continuous monitoring. For the elderly parent whom already diagnosed with fatal heart disease, their heart rate condition has to be monitored continuously. This paper proposed an alert system that able to monitor the heart beat rate condition of elderly parent. The heart beat rate is detected using pulse sensor. This signal is processed using Arduinno to determine the heart beat rate per minute. Then, it sends SMS alert to the mobile phone of medical experts or patient's family members, or their relatives via SMS. Thus, their relative can know location the elderly parent and see on the map.

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ABSTRAK

Pemantauan kesihatan dan Sistem Isyarat untuk Ibu Bapa Tua (HMAS) adalah satu sistem untuk memantau kesihatan ibu bapa warga tua. Kadar jantung boleh diukur dengan memantau nadi seseorang menggunakan peranti perubatan khusus seperti elektrokardiograf (ECG), peranti mudah alih seperti pergelangan tangan jam tangan tali, atau mana-mana monitor kadar jantung komersial lain yang biasanya terdiri daripada tali dada dengan elektrod. Walaupun ketepatan, entah bagaimana ia adalah mahal, melibatkan banyak tetapan klinikal dan ibu bapa warga tua perlu dihadiri oleh pakar-pakar perubatan untuk pemantauan berterusan. Bagi ibu bapa yang tua yang telah disahkan menghidap penyakit jantung fatal, keadaan kadar jantung mereka perlu dipantau secara berterusan. Kertas ini mencadangkan satu sistem amaran yang dapat memantau keadaan kadar denyutan jantung ibu bapa tua. Kadar denyutan jantung dikesan menggunakan sensor nadi. Isyarat ini diproses menggunakan Arduinno untuk menentukan kadar degupan jantung per minit. Kemudian, ia menghantar SMS ke telefon bimbit pakar perubatan atau ahli keluarga pesakit, atau saudara mara mereka melalui SMS. Oleh itu, saudara-mara mereka boleh mengetahui lokasi ibu bapa warga tua dan lihat di peta.

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CHAPTER 1

INTRODUCTION

1.1 Project Background

Long time ago, between last quarters of the century, there has been a tremendous increase in the use of electrical and electronic equipment in the medical field for clinical and research purpose. In medical instrumentation, the main function is to measure or determine the presence some physical quantity that may be useful for diagnostic purpose. Therefore many type of instrumentation system are used and physician clinic. The primary purpose of medical instrumentation is to measure or determine the presence of some physical quantity that may assist the medical personnel to make better diagnosis and treatment. Accordingly, many type of instrument system are presently used in hospital and other medical facilities.

Heart measurement is one of the very important parameters of the human cardiovascular system. The heart rate of healthy adult at rest is around 72 beat per minute. Athletes normally have lower heart rates than less active people. Babies have much higher rate around 120 bpm, while order children have heart rate around 90 bpm. The rate rise gradually during exercise and the rate return slowly to the rest value after exercise. The rate when pulse return to normal is an indication of the fitness of the person.

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1.2 Problem Statement

The primary purpose of a problem statement is to focus the attention of the problem solving team. However, if the focus of the problem is too big for the scope, the objective will be out of range of the mission. Therefore, this project comes with the several problem statement.

i. Children or heir cannot stay next to the elderly for all the time because they have their own work to do.
ii. Today, many types of medical instrumentation are expensive and need go to the clinic or hospital.
iii. Elderly cannot do the daily activities such as gardening, chatting at relative home, and hangout with friend because they need to stay at home and monitor their health.

1.3 Objective

The objective of this project are

i. To monitor elderly parent health condition.
ii. To alert child/heir in case of emergency.
iii. To inform the child the location of their elderly parent.

1.4 Scope

Scope stands for project boundaries which determines what kind of work will be completed in the project lifecycle. It consist of two parties:

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This system use Arduino and pulse sensor to detect and process heart rate of user. The user of the product is an elderly parent to monitor their health.

ii. System

This system consist of two user which are admin and heir. This system comes with the objectives such as making the administrator easily manage elderly parent, can easily getting information detail of elderly parent and heir can get latest updated notification about their family members where ever the patient in dangerous.

1.5 Project Significance

There are four parties who gain the advantages in this project. The first parties is a doctor. Doctor can gain faster and precise information with an integrity without delaying the time. The second parties is a heir. The heir will always get the update information about their family members in case they are any dangerous which came around. The third parties is a patient. Patient can do his/her daily activities without any worries about the safety. Last but not least the fourth parties is the administrator. The administrator can easily do their job by saving their energy and money without any filing document.

1.6 Expected Output

The expected outcome of this project supposed to be the heir can easily see their family members by visualization on smartphone in the map that has been created. The doctors can get the latest update about their patient through their very own smart phone.

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1.7 Conclusion

As the conclusion, the output of this project has strong enough ideology that can overcome all the problems that has been stated in the problem statement of chapter one. Besides that, this chapter provide the best answer that archive all the objective for the problem statement. It's not hard to understand the flow of the system since the project significant is well explain in this chapter. The next chapter will be explain about the review and related research including project milestone, proposed solution and comparison of existing system.

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CHAPTER 2

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

Chapter 2 is the important chapter for any project that will be developed. The purpose of this chapter is to present a selected literature review, which is very important for the research this chapter also described and explains on the literature review carried out on the system. Besides that, previous research also will be discussed in this section which are existing system and methodologies that being used in this section which are existing system and methodologies that being used in other research which is related to this system will be explained and compare to highlight differences.

2.2 Facts and findings

2.2.1 Domain

This project describe the design of a simple, Arduino based heart rate and body temperature measuring device with pulse sensor and contactless temperature sensor. All the result of user can send massage directly to doctor. Heart rate of the subject is

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measure from the index finger using Infra-Red Device sensor and monitoring user remotely by using Global System for Mobile Communication (GSM).

i. Arduino

Arduino is an open source computer hardware and software that manufactures kits for building digital device and interactive object that can sense and control the physical world. In the project, Arduino use for manage data input from heart beat and body temperature to implement the output.

ii. Global System for Mobile Communication (GSM)

GSM is used to describe protocol for second-generation digital cellular networks use by mobile phone. Hence to remove human error and to lessen the burden of monitoring user health from doctor, this project presents the methodology for monitoring patient remotely using GSM network and Very Large Scale Integration (VLSI) technology. This hardware can monitor to measure physiological characteristic either continuously or at regular intervals of time.

iii. Heartbeat

When the heart beats, a pressure wave moves out along the arteries at a few meters per second (appreciably faster than the blood actually flows). This pressure wave can be felts at the wrist, but it also cause an increase in the blood volume in the tissues, which can be detected by a pulse sensor. The table shows the average heartbeat rate range versus the age of person.

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Table 2.1: Average heart beat per minute

Age	18-25	26-35	36-45	46-55	56-65	65+
Athlete	49-55	49-54	50-56	50-57	51-56	50-55
Excellent	56-61	55-61	57-62	58-63	57-61	56-61
Good	62-65	62-65	63-66	64-67	62-67	62-65
Above Average	66-69	66-70	67-70	68-71	68-71	66-69
Average	70-73	71-74	71-75	72-76	72-75	70-73
Below Average	74-81	75-81	76-82	77-83	76-81	74-79
Poor	82+	82+	83+	84+	82+	80+

iv. Global positioning System (GPS)

GPS is a satellite based navigation system that can be used to locate position anywhere on earth. Designed and operated by the U.S Department of defense, it consist of satellites, control and monitor station and receivers. GPS receivers take information transmitted from satellites and uses triangulation to calculate a user's exact location. GPS is used on incidents in a variety of ways, such as to determine distance between two points or how far you are from another location.

2.2.2 Existing system

i. Heartbeat detection and the experience of emotions

The heart rate can be measured by monitoring one' pulse using specialized medical device such as an electrocardiograph (ECG), portable device wrist strap watch or any other commercial heart rate monitors which normally consisting of chest strap with electrodes. Despite of its accuracy, somehow it is costly, involve many clinical setting and patient must be attend medical expert for continuous monitoring.

Based on previous research, there are Heartbeat detection and experience of emotions by Stefan Wien, Elizabeth S. Mezzacappa and Edward S. Katkin from State

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University of New York at Stony Brook, USA. Physiological measure divided into two such as heart rate and skin conductance. Heart rate no significant difference between good and poor heartbeat detectors in heart rate at rest or during heartbeat detection task. The finding of this experiment are consistent with the hypothesis that heartbeat detection as an index of self-perception of visceral activity is associated with intensity of emotional experience but not with valence. More specifically, good heartbeat detectors reported in response to film clips chosen to elicit a range of emotions.

Figure 2.1: Type of emotion

ii. Heart Rate Measurement using fingertip

The second of previous research is Heart Rate Measurement from fingertip. Heart rate measurement indicates the soundness of the human cardiovascular system. This project demonstrates a technique to measure the heart rate by sensing change in blood volume in a finger artery while the heart is pumping the blood. It consist of an infrared LED that transmits an IR signal through the fingertip of the subject, a part of which reflected signal is detected by a photo diode sensor.

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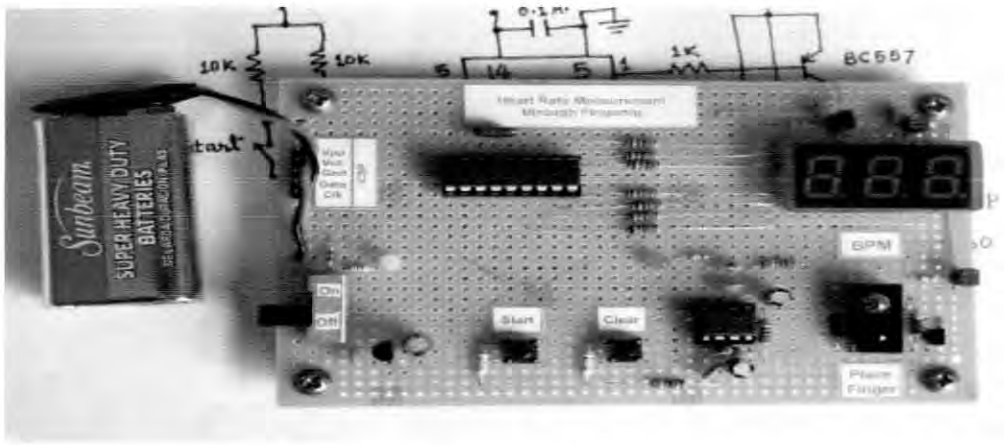

Figure 1.2: Heart sensor with finger *tip*

iii. Patient Monitoring System using GSM Technology

This project describes the design of a simple, microcontroller based heart rate & body temperature measuring device with LCD output. Heart rate of the subject is measured from the index finger using IRD (Infra-Red Device sensors and the rate is then averaged and displayed on a text based LCD). Also Saline Level is measured continuously for different levels.

The device alarms when the heart beat & the body temperature exceed the provided threshold value. This threshold value is defined by the programmer at the time of programming the microcontroller. The threshold value given for the project is as 20 to 120 pulses per minute for heart beat indication & 18°C to 38°C for temperature. This information i.e. the Heart Rate & the Body Temperature and saline level is then transmitted wirelessly to the doctor which in not in the vicinity of the patient through GSM technique. The sensors measure the information and transmit it through GSM Modem on the same frequency as on which cell phones work.

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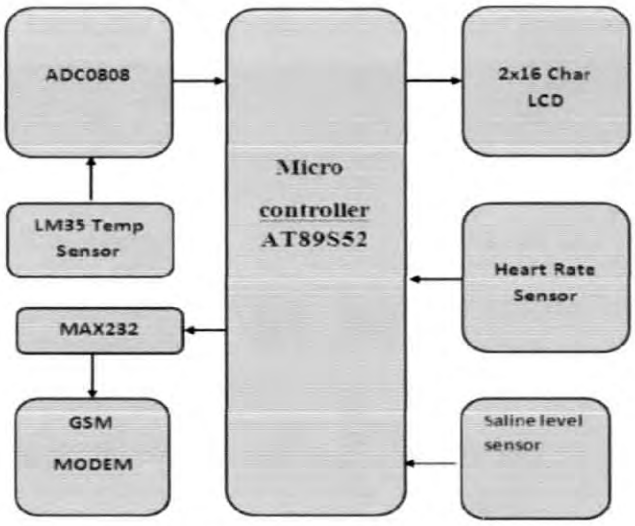

Figure 2.3: Block Diagram

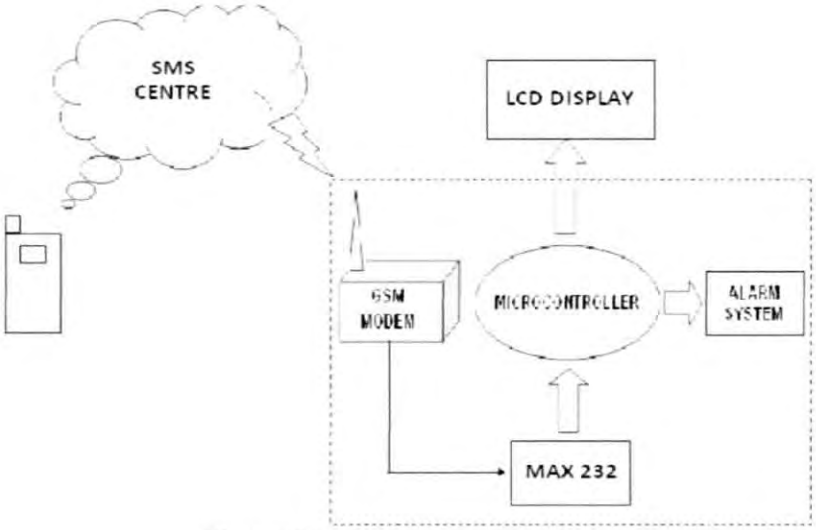

Figure 2.4: Schematic diagram

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