# HEARTBEAT READING AND ALERT SYSTEM FOR MONITORING ELDERLY

NURUL HAFIZAH BINTI MOHD ZAKI



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**BORANG PENGESAHAN STATUS TESIS**

JUDUL : _ Heartbeat Reading and Alert System for Monitoring Elderly_____

SESI PENGAJIAN : _2016/2017_____

Saya __NURUL HAFIZAH BINTT MOHD ZAKI_____
(HURUF BESAR)

mengaku membenarkan tesis (PSM/Sarjana/Doktor Falsafah) ini disimpan di Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dengan syarat-syarat kegunaan seperti berikut:

1. Tesis dan projek adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat Salinan untuk tujuan pengajian sahaja.
3. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. ** Sila tandakan (/)

_____ SULIT (Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

_____ TERHAD (Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

__/__ TIDAK TERHAD



(NURUL HAFIZAH BINTI MOHD ZAKI)

(ROSMIZA WAHIDA BT ABDULLAH)

ROSMIZA WAHIDA BINTI ABDULLAH
Pensyarah
Fakulti Teknologi Maklumat Dan Komunikasi
Universiti Teknikal Malaysia Melaka (UTeM)

(TANDATANGAN PENULIS)
Alamat tetap:
No 93, Lorong 12,
Taman Sri Kota 34000
Taiping Perak

Tarikh : 17TH August 2016

CATATAN: * Tesis dimaksudkan sebagai Laporan Akhir Projek Sarjana Muda (PSM)

** Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa.

# HEARTBEAT READING AND ALERT SYSTEM FOR MONITORING ELDERLY

NURUL HAFIZAH BINTI MOHD ZAKI



This report is submitted in partial fulfilment of the requirements for the award of Bachelor of Computer Science (Software Development)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITI TEKNIKAL MALYSIA MELAKA

2016

# DECLARATION

I hereby declare that this project report entitled

**HEARTBEAT READING AND ALERT SYSTEM FOR MONITORING ELDERLY**

is written by me and is my own effort and that no part has been plagiarized
without citations

STUDENT: (NURUL HAFIZAH BINTI MOHD ZAKI) Date: 17TH August 2016



I hereby declare that I have read this project report and found this project report is sufficient
in term of the scope and quality for the award of
Bachelor of Computer Science (Software Development) With Honours.

SUPERVISOR: (ROSMIZA WAHIDA BT ABDULLAH) Date: 17TH August 2016

ROSMIZA WAHIBA BINTI ABDULLAH
Pensyarah
Fakulti Teknologi Maklumat Dan Komunikasi
Universiti Teknikal Malaysia Melaka (UTeM)

**DEDICATION**

To my beloved family especially my beautiful mother Nurul Zaity, my late father Mohd Zaki, and my siblings Mohamad Hanif, Muhammad Syamin, Muhammad Mustaqim, Muhammad Iyad, Muhammad Azib Aisy and Shasha Nadia. Last but not least a friend that always assist and help me throughout my degree life to Mohammad Adib Fikri Bin Ghazali. I love you all, Thanks

17th August 2016

**ACKNOLEDGEMENT**

بِسْمِ اللهِ الرَّحْمَنِ الرَّحِيْمِ

First of all, praise upon Allah for giving me a strength and patient to complete my final year project throughout this semester.

I would like to express my sincere gratitude to my supervisor Mdm. Rosmiza Wahida binti Abdullah for gave passion and guideline throughout my project development.

Thanks to Universiti Teknikal Malaysia Melaka that give me opportunity to study and completed my Degree.

Many people, especially my academic advisor Mdm Mashanum, evaluator Sir Hariz, lecturers and friends have made valuable comment suggestions on this project. Thank all the people for their help directly and indirectly to complete my final project.

Last but not least, my beloved family that gave moral support and pray for me.

Thanks a lot to all that contribute directly or indirectly in my degree life.

Sincerely,
*Nurul Hafizah Bt Mohd Zaki*
*17th August 2016*

## ABSTRACT

Heartbeat Reading and Alert System for Monitoring Elderly (HRAS) is a system to monitor the health condition of elderly which live far away from their children. This project proposed an alert system that is able to monitor the current heartbeat reading if something goes wrong to the elderly. The heart rate is detected by using sensor pulse which will produced a signal. This signal will be processed using the Raspberry Pi in order to determine the heartbeat per minute. An alert message will be sent to the mobile phones of both their children and doctor if the heartbeat is detected as abnormal. Hence, the children can know the exact location as well as the reading of heartbeat through SMS. The development of this project has been inspired by the concern among the children who are staying far away from their parents but still desired to monitor the health condition of their parents. The methodology used is Extreme Programming while the programming language used is JavaScript, HTML, CSS, and Python. This project used a MySQL as a database language.

# ABSTRAK

*Heartbeat Reading and Alert System for Monitoring Elderly* (HRAS) adalah satu sistem untuk memantau keadaan kesihatan warga tua yang tinggal jauh dari anak-anak mereka. Projek ini mencadangkan satu sistem amaran yang mampu untuk memantau bacaan degupan jantung semasa jika ada masalah kepada warga tua. Kadar jantung dikesan dengan menggunakan sensor nadi yang akan dihasilkan isyarat. Isyarat ini akan diproses menggunakan Raspberry Pi untuk menentukan degupan jantung seminit. Mesej amaran akan dihantar ke telefon mudah alih kedua-dua iaitu kepada anak-anak dan doktor mereka jika degupan jantung dikesan sebagai tidak normal. Oleh itu, anak-anak boleh mengetahui lokasi sebenar serta bacaan degupan jantung melalui SMS. Pembangunan projek ini telah diilhamkan keranakebimbangan di kalangan anak-anak yang tinggal jauh daripada orang tua mereka tetapi masih ingin memantau keadaan kesihatan orang tuamereka. Kaedah yang digunakan adalah Pengaturcaraan Extreme manakala bahasa pengaturcaraan yang digunakan ialah JavaScript, HTML, CSS, dan Python. Projek ini menggunakan MySQL sebagai bahasa pangkalan data.

# TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# CHAPTER 1

# INTRODUCTION

## 1.1 Project Background

In medical field there has been tremendous increase in the use of electrical and electronic equipment for clinical and research purpose. 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. Many type of instrument systems are presently used in hospital and other medical facilities nowadays.



This project will contribute to the health field by using the Raspberry Pi as a device to get heartbeat reading. The system should be start by registering the patient into the system via the admin. Admin will register the patient into the web system and get the health record. Once the patient has been registered, the patient may start used the raspberry pi. The system will be start daily and in real time by read the heartbeat of the patient. The alert will trigger if the heartbeat reading of patient is abnormal. Once the Raspberry Pi detect the heartbeat is abnormal, the raspberry pi will identify the current location of the patient and send to their heir that been registered previously and the doctor in charge via SMS to mobile

## 1.2 Problem Statements

Nowadays, children or heir cannot stay with their parents for all the time because they have their own responsibilities and work to do. Moreover, elderly parents more prefer to stay at their own house rather than with their children. Because of that, a concern children want to know instantly if there is something happen to their parents that stay far away from them. Therefore, these stay alone parents especially the ones with critical illness need some mechanism for their children to monitor their health condition and able to notify them when there is emergency about their parents.

## 1.3 Objectives

The objectives of this project are:

1. To read patient heartbeat.
2. To alert the heir/children and doctor if there is abnormal heartbeat reading detected.
3. To notify the location of the patient.



## 1.4 Scope

The section discusses on scopes there will be three scope; scope limitation, user scope and system scope.

a. Scope Limitation

The scope limitation of this project is the system need to have an internet coverage and used a BulkSMS as a service to send an alert message.

b. User scope

**Table 1.1 User Scope**

| User | Role |
|---|---|
| Admin | User that use the web system to manage the patient and doctor. |
| Patient | User that use the heartbeat device. |
| Doctor and children/heir | User that received an alert message. |

c. System Scope

**Table 1.2 System Scope**

| Module | description |
|---|---|
| Authenticate | Authenticate of using the system by need a login, registration patient and logout. |
| Manage patient | Manage patient information of data need to be add, update, or delete |
| Manage doctor | Manage the information of the doctor needed and can add, view, update or delete |
| Process heartbeat data | Make a decision from data of heartbeat reading. |
| Alert management | Send a notify location to heir/children through mobile SMS. |

## 1.5 Project Significance

The significance of this project is able to help the heir/kids to know the real time condition of their parents if something happen. Besides, it's also help the heir/kids that concern about their elderly parents who lives far away from them.



## 1.6 Expected Output

The expected output is web based system and raspberry pi device as a device to detect heartbeat reading.

## 1.7 Conclusion

In conclusion, this project can use for elderly care. All objectives have been stated to solve the problem as state in problem statements. Next chapter is describing about project methodology that will be used in developing this application.

# CHAPTER 2

# LITERATURE REVIEW AND PROJECT METHODOLOGY

## 2.1 Introduction

In this chapter the literature review and project methodology will be described and explained. The purpose of this chapter is discuss about domain of the project, technology used and previous similar researches which are the existing systems. Furthermore, the methodology used will represent the flow of this project.



## 2.2 Facts and finding

### 2.2.1 Domain

i. Heartbeat

Based on Saunders Comprehensive Veterinary Dictionary the heartbeat is a cycle of heart muscle contraction. In a simple word heart beat is the single complete cycle of contraction and dilation of heart muscle. During the heart beats, the wave pressure moves along the arteries within few meter per second (significantly faster than usual blood flow). The waves can be felt in the wrist and it increase the blood volume in the tissues. Table 2.1 shows the average heart beat rate range for personality versus age of person.

**Table 2.1 heartbeat personality versus age**

| Age / Personality | 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 – 65 | 64 – 67 | 62 – 67 | 62 – 65 |
| Above average | 66 – 69 | 66 – 70 | 66 – 69 | 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+ |

ii. Raspberry Pi

Raspberry Pi is a device which is size as a credit card weight only 50g. It is cost effective than an actual computer with power rate 5V, 700mA. the features that available in the Raspberry Pi; SD card Slot to install the operating systems installed such as Raspbrian, Pidora and Raspbmc; four port USB2.0 to connect a different hardware like mouse, keyboard, Wi-Fi adapter; Ethernet port to connect to the network; GPIO pin to connect and control switches, sensors, LEDs and other devices; HDMI port to connect all kinds of monitors like projectors, LCD screens, Tvs; and some additional features include audio jack and camera connector for the camera interface. This feature allows many users to use the Raspberry Pi in a variety of applications. Figure 2.1 shows the raspberry pi board.

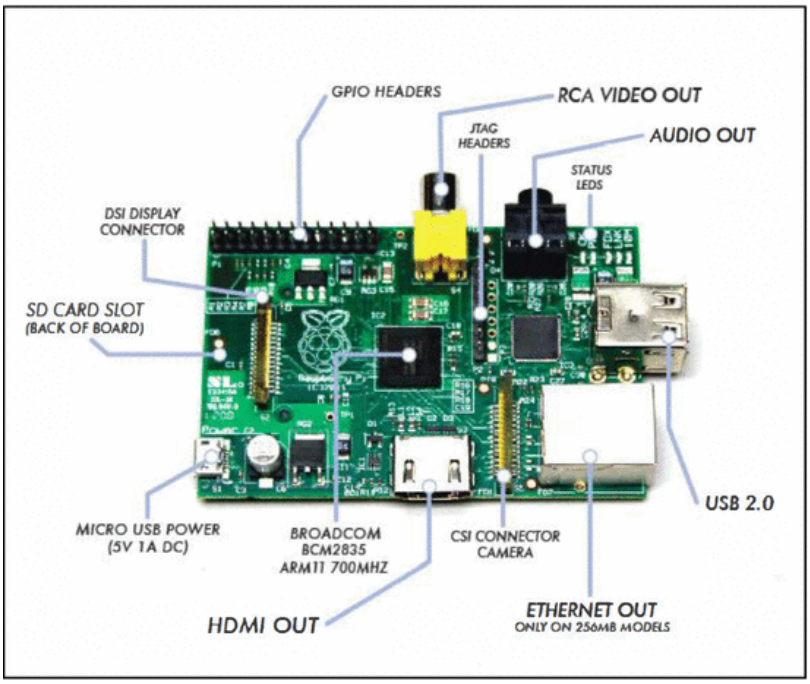


**Figure 2.1 Raspberry Pi Board**

For a past year it has become widely used device for learning. According to Journal of Theoretical and Applied Information Technology, there is many an automated system has been developed by using this device such as the system detect the intrude in the house by inform the owner in remote location. In this project, Raspberry pi is used to detect the heartbeat reading. Once the raspberry pi get the heartbeat it process the data and make a decision if want to send an alert to the children/heir about the patient condition and location.

iii. Global Positioning System (GPS)

GPS is designed and operated by the U.S Department of Defence. It uses the satellite to give the information of the location anywhere on earth. The GPS are consisting of satellite, control, monitor station and receivers. To detects the location, it uses a triangulation to calculate when receive an information form the satellite. Besides, the GPS can also calculate the distance between one location to other one location. GPS is used in this project is to detect the location of the patient.

### 2.2.2 Existing System

i. MonitorGO


**Figure 2.2 http://www.monitorgo.com/**

MonitorGO® is a personal alarm for parents who want to live alone and want a 'safety net' in case they need help. The allows a personal alarm to call for help when alone. There are 9 major features found in Monitor®: Raising Alarm; Fall detection; Alert unconscious; GPS location; Prevention of false alarms; Waterproof; Fully Mobile; Function handset and access to Medvivo 24/7 Help Line.



ii. Heart Rate Measurement using fingertip

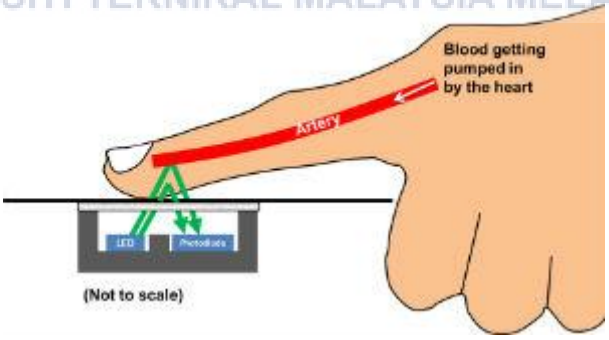


**Figure 2.3 https://arxiv.org/ftp/arxiv/papers/1304/1304.2475.pdf**

Heart rate is very important health parameters that are directly related to the strength of the human cardiovascular system. This project describes a technique to measure heart rate through the fingertips using the PIC microcontroller. While the heart beats, it is pumping blood throughout the body, and that makes the blood in the arteries finger to change. The fluctuation of blood can be detected by optical sensing mechanism is

placed at your fingertips. The signal can be amplified to a microcontroller to calculate the rate of fluctuation, which is actually the heart rate.

iii. Heartbeat monitoring alert using GSM technology

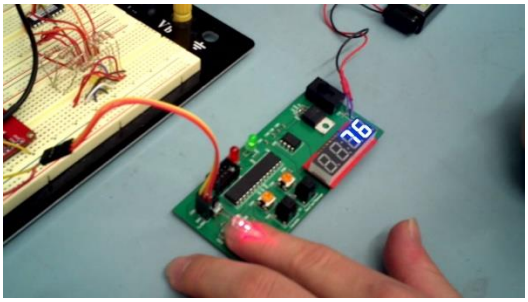

**Figure 2.4** [https://i.ytimg.com/vi/IsNLim4rk7M/maxresdefault.jpg](https://i.ytimg.com/vi/IsNLim4rk7M/maxresdefault.jpg)

The device alarms when the heartbeat and body temperature reading abnormal exceed the threshold value. The threshold value is defining by the programmer in the Arduino controller. The information send to doctor through GSM technique when the alarm is trigger. The doctor only received the data heartbeat of the patient it doesn't notify the location.

**Table 2.2 Comparison with existing system**

| | **Monitor Go®** | **Heart Rate Measurement using fingertip** | **Heartbeat monitoring alert using GSM technology** | **HRAS** |
|---|---|---|---|---|
| **GPS Detection** | ✓ | None | none | ✓ |
| **GSM notification** | none | None | ✓ | ✓ |
| **Controller** | none | ✓ | Arduino | Raspberry Pi |

## 2.3 Project Methodology

The project methodology will describe the project development life cycle. Basically the main phase will be including are plan, analysis, design and implementation. In this section, the activity will be taken will be describe briefly to show the overview how the project development life cycle.

The methodology used in this project is Extreme Programming.; which is an iterative and incremental development methodology. This methodology its allow flexibility within the modelling process. The main goal of Extreme Programming is to lower the cost of change in software requirements. The figure below shows the flow of phase that will be done in this project.

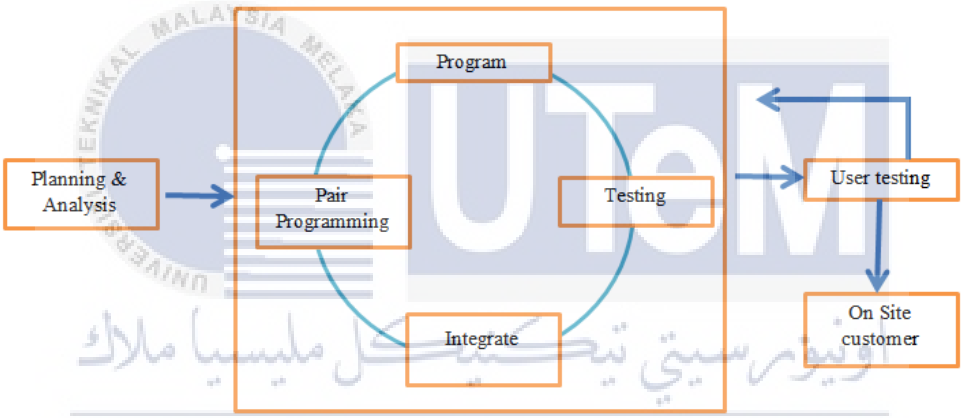




**Figure 2.5 Extreme Programming life cycle**

Table 2.3 briefly describe the activity based on the phase in Figure 2.5

**Table 2.3 life cycle phase description**

| Phase | Description |
|---|---|
| Planning & Analysis | Plan and Analysis the project by<br>• State the problem statement, objective, expected result<br>• Identify the methodology and flow of project activity<br>• Produce the Gantt chart, Identify milestone and date<br>• Record the plan<br>• Produce the proposal of project |

| Phase | Description |
|---|---|
| Pair Programing | In this phase, the activity that should be identify are:<br>• Type of programming language that integrate the raspberry pi and android. |
| **Phase** | **Description** |
| Program | In this phase, the implementation of project |
| Testing | Activity in this phase are:<br>• Identify if this project follows the requirement correctly.<br>• Creating test plan |
| Integrate | The integration of code and testing will be done in this phase to ensure the quality is achieving |
| User Testing | The testing will be on user site and identify the quality. |
| On Site Customer | Test the project with customer and identify the weakness |

## 2.4 Project Requirement

This section will briefly explain the requirement needs in this project development

### 2.4.1 Software requirement

Table 2-4 show the collection of software needs in this project development.

**Table 2.4 Software Requirement List**

| No | Software | Purpose |
|---|---|---|
| 1. | WampServer | Act as local server during development |
| 2. | Microsoft Office | Documentation tools |
| 3. | Star UML | Opens source modelling tools |
| 4. | Sublime text 2 | Integrated development environment |
| 5. | Raspbrian OS | Operating system for Raspberry pi |
| 6. | Windows 8.1 | Operating system for personal computer |