BLOOD PRESSURE MONITOR

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Specially dedicated to my beloved parents:

Mr Kamarazaman B Mohamed
Mrs Noorsiah Bt Mohd

Who encouraged and guided and inspired me throughout my journey of education.
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ABSTRACT

Blood pressure monitor has been use since long time ago. However, this blood pressure monitor been developing due to development of technology. Blood pressure monitor is used to check blood pressure and heart rate. The blood pressure for normal is about 120mmHg/80mHg. For the upper (systolic), the pressure is 120mmHg while for the bottom the value is 80mmHg. Nowadays, more people are becoming high and low blood pressure patients but they always run out of time to catch up an appointment with their doctors. Nevertheless, in designing this project with more modifications using piezoelectric film sensor to replace cuff and pressure sensor. It will be portable, cheap and easy to use. This piezoelectric sensor is in rectangular shape and is used to measure blood pressure. Furthermore, in this project, atmega32 circuit is use as main circuit to control amplifier circuit, piezoelectric sensor and LCD to display output. LCD is used to show the reading blood pressure. Last but not less, this newly designed blood pressure will have more usage and advantages

ABSTRAK

Penggunaan 'Blood pressure monitor' telah digunakan sejak dahulu lagi. Tetapi, hari semakin hari ianya semakin canggih selaras denagn pembangunan teknologi. 'Blood pressure monitor' digunakan untuk memeriksa tekanan darah dan jantung. Tekanan darah manusia normal adalah dalam lingkungan 120mmHg/80mmHg. Untuk tekanan darah pada tahap atas (systolic), ialah 120mmHg manakala untuk tekanan darah pada tahap bawah (diastolic) pula ialah 80mmHg. Setiap hari jumlah pengidap tekanan darah tinggi dan rendah semakin bertambah. Oleh itu, untuk projek ini saya mencipta 'Blood pressure monitor' yang lebih canggih dengan menggunakan piezoelctric sensor bagi menggantikan cuff dan pressure sensor. Ianya akan menjadi lebih senang untuk dibawa kemana-mana, murah dan senang untuk digunakan. Piezoelectric sensor berbentuk segiempat tepat yang diletakkan pada pergelangan tangan untuk menetukan tekanan darah pengguna. Di dalam projek ini microcontroller atmega32 digunakan untuk mengawal semua operasi termasuklah mengawal operasi litar amplifier, piezoelectric dan LCD untuk menunjukkan bacaan tekanan darah. Kesimpulannya, ciptaan baru saya akan lebih memudahakan pengguna untuk menggunakannya dimana sahaja.

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ABBREVIATION

ADC	-	Analog to Digital Converter
PCB	-	printed Circuit Board
MCU	-	Microcontroller
DC	-	Direct Current
LCD	-	Liquid Crystal Display
EEPROM	-	Electric Erasable Programmable Read Only Memory
AD	-	Analog to Digital
V	-	Voltage
UV	-	Ultra Violet
I/O	-	Input output
C	-	Celcius
RG	-	Resistor Gain
AC	-	Alternate current
ADCH	`-	Analog to digital Converter High
ADCL	-	Analog to digital Low
ALU	-	Arithmetic Logic Unit
GND	-	Ground
Hz	-	Hertz
IDE	-	Integrated Development Environment
I/O	-	Input/output
LSB	-	Least significant Bit
LSI	-	Large scale integration
MPU	-	Microprocessor Unit

RAM	-	Random Access Memory
ROM	-	Read Only Memory
UART	-	Universal Asynchronous Receive and Transmit
VLSI	-	Very Large scale Integration

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CHAPTER 1

INTRODUCTION

1.1 Background

The blood pressure monitor is a device that can measure a user's blood pressures and heart rate. Actually, the user's blood pressure and heart rate can measured through an inflatable hand cuff, but the hand cuff will be changed with use piezoelectric film sensor for this project. In this system, if the hand cuff is used, the air will be pumped into the cuff for about 20mmHg above average systolic pressure (about 120mmHg for an average).

After that, the air will be released slowly from the cuff and caused the pressure inside the cuff to decrease. When the cuff is slowly deflated, the tiny oscillation will be measured in the air pressure inside the arm cuff. The systolic pressure is the pressure where the oscillation starts to happen. The piezoelectric film sensor can provide the same function.

Then, the MCU will be used to detect the point where the oscillation starts to occur and the pressure inside the piezoelectric film will be recorded. After that, the pressure inside the piezoelectric film will slowly decrease. The diastolic pressure will be

taken at the point where the oscillation starts to disappear. For normal healthy people, the blood pressure reading is about 120/80 mmHg, where 120mmHg are for systolic and 80mmHg are for diastolic.

Normal blood pressure is usually said to be 120/80 (systolic/diastolic) or less, measured in millimeters of mercury (abbreviated as mm Hg). The higher (systolic) number represents the pressure while the heart is beating. The lower (diastolic) number represents the pressure when the heart is resting between beats. The systolic pressure is always stated first and the diastolic pressure second. For example: 122/76 (122 over 76); systolic = 122, diastolic = 76. Blood pressure of less than 120 over 80 is considered a normal reading for adults. A blood pressure reading equal to or greater than 120 (systolic) over 80 (diastolic) is considered elevated (high).

The piezoelectric sensor can provide the same function as the cuff function. It was selected because it is very sensitive to low level mechanical movements and it has an electrostatic shield located on both sides of the element (to minimize 50/60 Hz AC line interference). Besides that, it is responsive to low frequency movements in the 0.7 - 12 Hz range of interest and the foil size was about right (1 inch / 2.54 cm long) and lastly, it has an integral connector and cable for simple connections.

1.2 Objectives

This project is built for people that need to measure their blood pressure and heart rate regularly. This will allows a user to take it anywhere and perform a measurement whenever and wherever they want. There are a few objectives that have been achieved:

1. To measure user's blood pressure by using piezoelectric film sensor replacing the cuff and air pump.

2. To build the blood pressure monitor that can be used by a user without need to use the stethoscope.

3. To display the output reading through LCD screen.

1.3 Problem Statement

Nowadays, many people have high and low blood pressure. But they do not have enough time to see doctors and make checking their blood pressure. Because of that, I try to build the blood pressure monitor. Although the blood pressures many at markets, I still want to try building the more advance blood pressure monitor. So that, I choose to use piezoelectric film sensor and replace the cuff and pressure sensor. Besides that, use piezoelectric film sensor more portable, cheap and easy to use.

1.4 Scope Of Project

1. The method of measurement that we used is called the oscillometric method. It is usually deployed in commercial products due to its reliability. However, this method is not as accurate as the auscultator method, in which the doctor uses the stethoscope to listen to the noise in the artery.

2. In this system, the pressure inside the piezo film sensor will never exceed the maximum limit of 160mmHg. This is because the 160mmHg is approximately more than the systolic pressure of normal healthy people.

1.5 Project Methodology

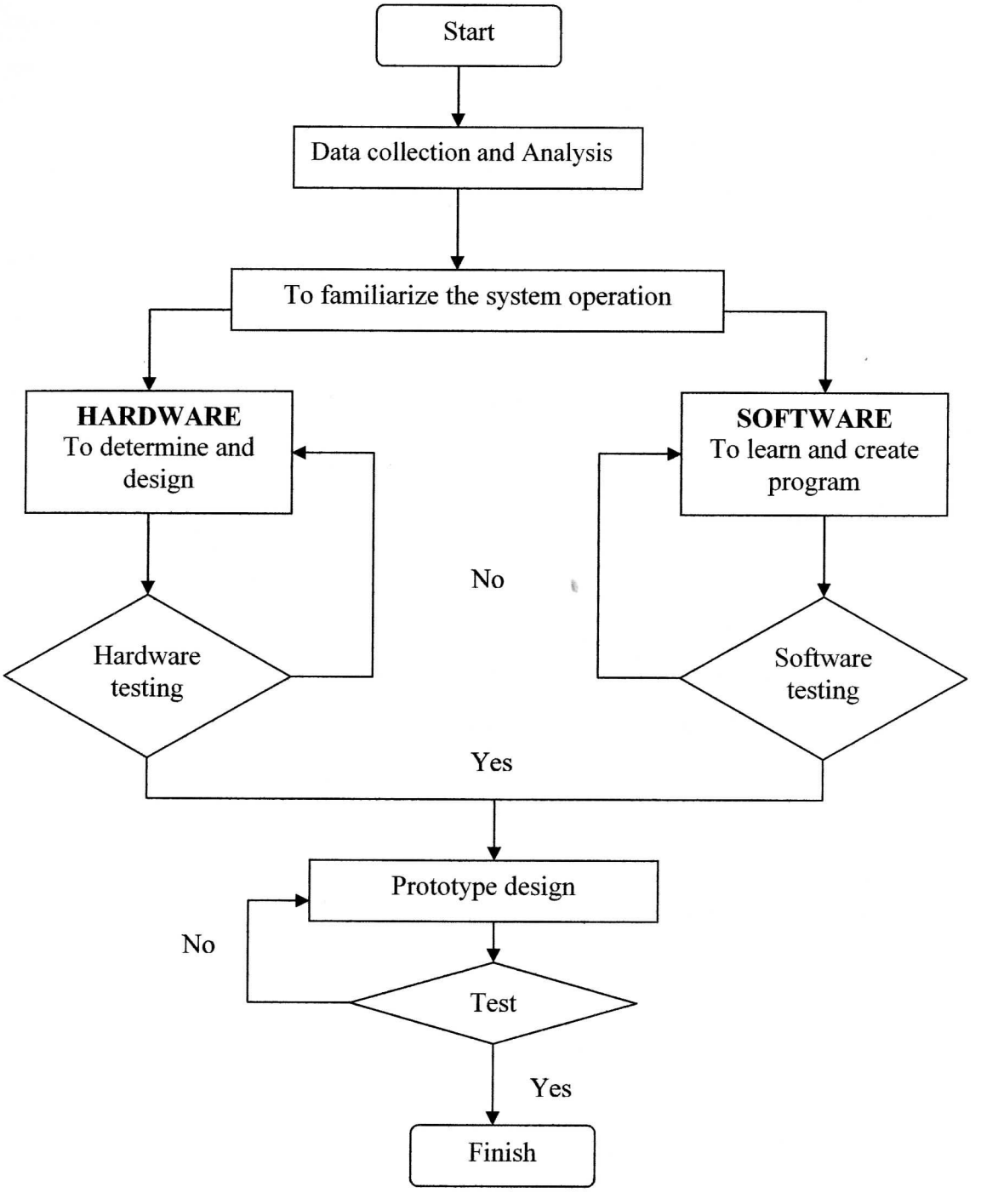

Figure 1.1: Flow chart for methodology

Figure 1.1 shows about the project work flow during to finish this project. In this work, it is involved circuit designing, circuit testing and PCB fabrication. The flow chart shows our work progress during to finish this project. We must to rework or repaired the work until the project success.

1.6 Report Structure

Chapter I including the explanation of the introduction for this project, objective, scope of project, and a simple project methodology.

Chapter II is about the background research of the blood pressure monitor. This chapter contains the literature review, about the main components in this project.

In chapter III the project methodology is explained. It includes on how the Code VisionAVR C Compiler is used to build the coding system for software programming. As for the hardware part, how the microcontroller controls the circuit and the operation of piezoelectric film sensor are explain in detail.

In chapter IV, is the result and discussion about the project. A few suggestions also had been made as a technical discussion to overcome the problem that occurred during the development of the project.

Chapter V concludes the report. The features suggestions are also included in the project.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

The blood pressure monitor is a device that can measure a user's blood pressures and heart rate through a piezoelectric sensor. The piezoelectric sensor will count the wrist pulse and then stop until the tiny oscillation will be measured in the air pressure inside the piezoelectric sensor. The systolic pressure is the pressure where the oscillation starts to happen. Then, the microcontroller will be used to detect the point where the oscillation starts to occur and the pressure inside the piezoelectric sensor and will be recorded. After that, the pressure will slowly decrease. The diastolic pressure will be taken at the point where the oscillation starts to disappear. For normal healthy people, the blood pressure reading is about 120/80 mmHg, where 120mmHg are for systolic and 80mmHg are for diastolic.

In this project, we chose to use the oscillometric technique in order to build the digital blood pressure monitor. The oscillometric method is based on measurements of detected complex amplitudes at various cuff pressures. It has been found that these pulses, called "complexes", have peak-to-peak amplitude which is minimal for applied cuff pressures above the systolic pressure and below the diastolic pressure. The