HYDROTHERAPY FOR FEVER PATIENT

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ENDORSEMENT

"I hereby acknowledge that I have read this report and I find that its contents meet the requirements in terms of scope and quality for the award of the Diploma in Electronic Engineering (Medical)"

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DECLARATION

"We hereby declare that the work in this report is our own except for quotation and summaries which have been duly acknowledge"

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ABSTRACT

Hydrotherapy for fever patient is an equipment that have a temperature sensor to detect our body temperature, and more like a water heater it's give us a suitable water to our body. This equipment also will show the temperature of water and body temperature display on LCD. The water will flow out according to the body temperature. This equipment is more suitable as a shower but we represent it as a hand washing.

When we take a bath using cold water, there are a lot of benefits such as will speed up our metabolism, stimulates immune system, improves productivity and improves concentration. Besides, using hot water during take a bath also will relieves nasal congestion, tiredness, headache and it also will reduces anxiety and swelling. Commonly, when someone get a fever, their body temperature will get higher than normal body temperature which is more than 37.5°C. This product also one of the treatment that can help reduces fever.

ABSTRAK

Hidroterapi untuk pesakit demam adalah peralatan yang mempunyai sensor suhu untuk mengesan suhu badan kita, dan lebih seperti pemanas air itu memberi kita air yang sesuai kepada badan kita. Peralatan ini juga akan tunjukkan suhu air dan suhu badan paparan pada LCD. air akan mengalir keluar bergantung kepada suhu badan. Peralatan ini adalah lebih sesuai pancuran tetapi kami mewakilinya sebagai mencuci tangan.

Apabila kita mandi menggunakan air sejuk, terdapat banyak faedah seperti akan mempercepatkan metabolisme kita, merangsang sistem imun, meningkatkan produktiviti dan meningkatkan tumpuan. Selain itu, menggunakan air panas semasa mandi juga akan melegakan kesesakan hidung, letih, sakit kepala dan ia juga akan mengurangkan kebimbangan dan bengkak. Biasanya, apabila seseorang mendapat demam, suhu badan mereka akan mendapat tinggi daripada suhu badan yang normal iaitu lebih daripada 37.5 ° C. Produk ini juga merupakan salah satu rawatan yang boleh membantu mengurangkan demam.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Hydrotherapy for fever patient is one of the device that can help patient to reduce their body temperature back to normal. This device is more suitable to use for bathing but we represent it as a handwashing. It also can be used as a hydrotherapy bath. Besides that, cool bath water or cool towels applied to a person's skin may also help reduce fevers; cool fluids taken orally will also rehydrate and cool a person.[1]

This device can be use at the hospital and house and it also suitable to all level of ages. This device also can be used for normal person. The function of this device is when the the temperature sensor detect the body temperature is high or over the normal body temperature which is above 37.5°C, the water that will flow out is a cold water. But when

the temperature sensor detect the temperature that below than normal body temperature, the hot water will flow out.

1.2 Problem Statement

Majority of people make a mistake of bathing with hot water when they have fever. When we got fever, the body temperature is increase and it is important to bring this temperature down to normal level. One way through which we can bring the temperature at normal levels is by bathing with cold water. By using this product, people will get the cold water automatically when the body temperature is getting higher. Commonly, when someone get a fever, their body temperature will get higher than normal body temperature which is more than 37.5°C. This product also one of the treatment that can help reduces fever and also it can read the body temperature of patient that have fever through the LCD display.

1.3 Objective

The objective of this project is:-

1) To develope a hydrotherapy device for fever patient.
2) To analyzes the product.
3) To reduce the body temperature of fever patient.

1.4 Study Population

In this study, the subject are consist of public that have fever. The population of subject are from Polytechnic Premier Sultan Salahuddin Abdul Aziz Shah, Shah Alam especially from Electrical Engineering Department and the citizen from TTDI Jaya area. From this study, we can divide it to 2 group of study which is the first group is focusing on the individual that get fever and the other group is for the normal individual.

1.5 Sample Size and Sampling Technique

In this study, Krejcie and Morgan theory has been used to determine the sample size. The population of limitation for this study is 30 subjects, so the sample size are including fever patient from Polytechnic Premier Sultan Salahuddin Abdul Aziz Shah, Shah Alam and the citizen from TTDI Jaya areas for the analysis of technical and evaluation test.

Table 3.1

Table for Determining Sample Size of a Known Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size *Source: Krejcie & Morgan, 1970*

Table 1.1 : Krejcie and Morgan table for determine sample size

1.6 Significant of Study

This study is to analyze the problem that usually occur to fever patient and find the solution to solve it. By producing this product, it can help fever patient to reduce their body temperature back to normal without need to the clinic. But if the fever is not getting better, they should go for a medical check up. This product can be used to all level of ages.

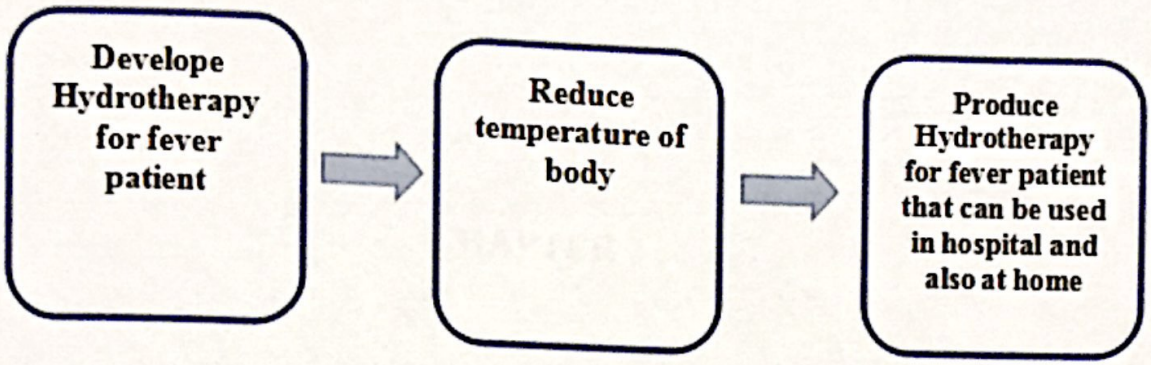


Figure 1.1 : Significant of study

1.7 Theoretical of study

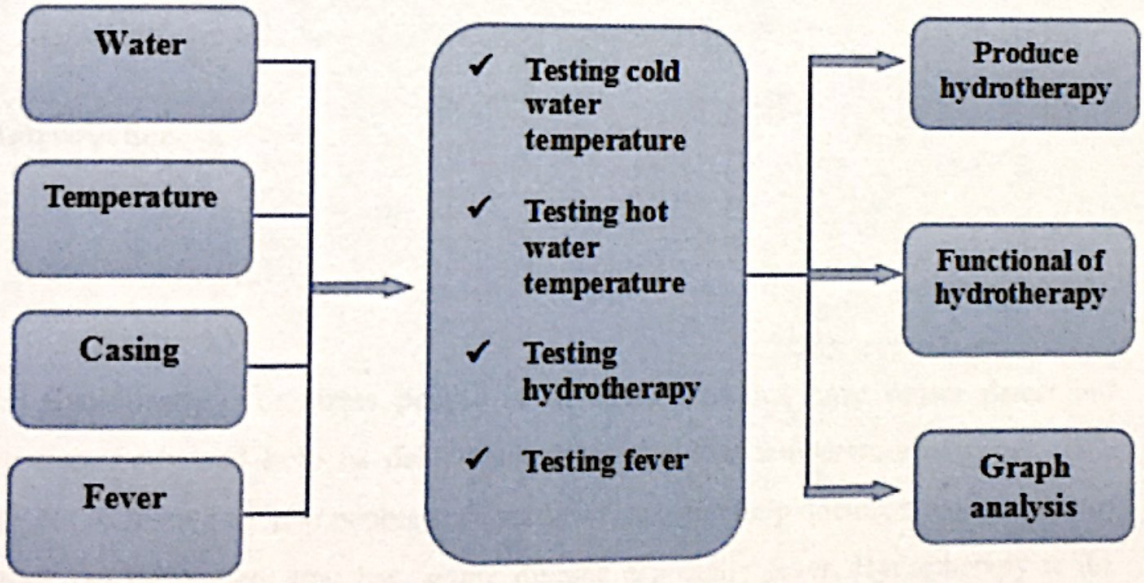


Figure 1.2 : Theoretical of study

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Hydrotherapy for stress people is an equipment that have sensor detect our temperature body and help us detect how high and low temperature of water. This equipment is created to help people reduces fever also can help doctor in their routine of watching out the patient that has severe disease especially fever. Hydrotherapy is the external or internal use of water in any of its forms (water, ice, steam) for health promotion or treatment of various diseases with various temperatures, pressure, duration, and site. It is one of the naturopathic treatment modality used widely in ancient cultures including India, Egypt, China, etc.[2]

Though many countries used water to produce different physiological/therapeutic effects on different part of the system for maintaining health, preventing, and treating the diseases, the scientific evidence-based effects are not well documented. There are many studies/reviews that reported either physiological or therapeutic or combination of both the effects of hydrotherapy on particular system but did not report in all the major systems of the body, which made us to do this review with the aim and objective to report scientific evidenced-based effects of hydrotherapy on various systems of the body.

Fever is a common symptom of childhood illness, and much time and effort is spent in the pursuit of reducing high temperature. Although, antipyretic drugs are the main form of treatment, this report considers the part that physical treatment might play in reducing the temperature of febrile children. Such treatment include tepid sponging, removing clothing and cooling the environment with fans and improved ventilation. The most extensively studied of these is like tepid sponging the aim of which is to reduce temperature by conduction of heat from the skin into the cooler water.

The sponging action ensures that the water film is constantly moving replacing the water in contact with the skin with a fresh layer of cooler water, thus maximising heat conduction. Conduction and evaporation further enhance heat loss.[3] It has been hypothesised that physical cooling method might be more effective in tropical climates, and although sponging as a treatment has been demonstrated to be effective a study using sponging as a mono-therapy has shown that although it initially led to a greater fall in temperature at one hour paracetamol was a superior treatment. This suggest that even in hot humid climates, although radiation and evaporation are important in the immediate loss of heat this is only a short term effect and antipyretic drugs are more efficacious in the longer term.

2.2 Fever

The definition of fever is an elevation in body temperature or a high body temperature. Technically, any body temperature above the normal oral measurement of 98.6 Fahrenheit (37 Celsius) or the normal rectal temperature of 99 F (37.2 C) is considered elevated. However, these are averages, and one's normal body temperature may actually be 1 F (0.6 C) or more above or below the average of 98.6 F. Body temperature can also vary up to 1 F (0.6 C) throughout the day.

Fever is not considered medically significant until body temperature is above 100.4 F (38 C), which is the temperature considered to be a fever by medical professionals. Anything above normal but below 100.4 F (38 C) is considered a low-grade fever. Fever serves as one of the body's natural defenses against bacteria and viruses that cannot live at a higher temperatures. For that reason, low-grade fevers should normally go untreated, unless accompanied by troubling symptoms or signs.[4] Also, the body's defense mechanisms seem to work more efficiently at a higher temperature.

Fever is just one part of an illness, many times no more important than the presence of other symptoms such as cough, sore throat, sinus congestion, fatigue, joint pains or aches, chills, nausea, etc. Fevers of 104 F (40 C) or higher may be dangerous and demand immediate home treatment and prompt medical attention, as they can result in delirium and convulsions, particularly in infants, children, and the elderly. Fever should

not be confused with hyperthermia, which is a defect in your body's response to heat (thermoregulation), which can also raise the body temperature. This is usually caused by external sources such as being in a hot environment. Heat exhaustion and heat stroke are forms of hyperthermia.

Other causes of hyperthermia can include side effects of certain medications or medical conditions. Fever should also not be confused with hot flashes or night sweats due to hormonal changes during perimenopause (the time period around menopause). Hot flashes and night sweats cause a sudden and intense feeling of heat, and may be accompanied by flushing (skin redness and tingly feeling) and sweating, but are not the same thing as a fever.

2.2.1 Symptom of Fever

A fever can cause a person to feel very uncomfortable. Signs and symptoms of a fever include the following:

1) Temperature greater than 100.4 F (38 C) in adults and children
2) Shivering, shaking, and chills
3) Aching muscles and joints or other body aches
4) Headache
5) Intermittent sweats or excessive sweating
6) Rapid heart rate and/or palpitations
7) Skin flushing or hot skin

8) Feeling faint, dizzy, or lightheaded
9) Eye pain or sore eyes
10) Weakness
11) Loss of appetite
12) Fussiness (in children and toddlers)
13) Also important to note in children are symptoms that can accompany an infection, including sore throat, cough, earache, vomiting, and diarrhea.
14) With very high temperatures (>104 F/40 C), convulsions, hallucinations, or confusion is possible. Always seek medical attention for a high fever or if these symptoms occur. [5]

2.2.2 Level of Fever

Low-grade fevers range from about 100 F-101 F; 102 F is intermediate grade for adults but a temperature at which adults should seek medical care for an infant (0-6 months). High-grade fevers range from about 103 F-104 F. Dangerous temperatures are high-grade fevers that range from over 104 F-107 F or higher (extremely high fevers are also termed hyperpyrexia). The preceding fever values may vary somewhat according to the condition and age of the patient, but they offer a reader a way to judge the terms "low," "high," and "dangerous" when they are used in reference to fever in the medical literature.

Consequently, regarding the question of "when to worry" or better, "when to act" about a fever, it is usually considered to be in the case of intermediate- and high-grade fevers. Low-grade fevers that last more than about four to seven days may need investigation by a medical caregiver while persistent fevers (low-, intermediate-, or high-grade) always need investigation.

Other terms are used to describe fever or fever types:

1) Prolonged or persistent fever is fever lasting longer than about 10-14 days; these are usually low-grade fevers.
2) Constant fever is also termed continuous fever; it is usually low-grade fever and does not change by much (by about 1 degree F over 24 hours).
3) Chronic: fever lasts longer than three to four days; some physicians consider intermittent fevers that recur over months to years as "chronic" fevers.
4) Intermittent: temperature either varies from normal to fever levels during a single day or fever may occur one day and recur in about one to three days
5) Remittent: fevers come and go at regular intervals.
6) Hyperpyrexia: fever that is equal to or above 106.7 F; this temperature is too high -- it constitutes a medical emergency for the patient.[6]

2.2.3 Relationship between Hydrotherapy for Stress People and Reduces Fever

Hydrotherapy was very effective in temperature reduction within the first 30 min having their temperature reduced to within normal limits. Superficial cold application may cause physiologic reactions such as decrease in local metabolic function, local edema, nerve conduction velocity (NCV), muscle spasm, and increase in local anesthetic effects. One hour head-out water immersions (WI) in various temperatures (32°C, 20°C, and 14°C) produced various effects. Immersion at 32°C did not change metabolic rate (MR) and rectal temperature (Tre), but it lowered the heart rate (HR) by 15%, systolic blood pressure (SBP) and diastolic blood pressure (DBP) by 11% and 12%, respectively, compared, with controls at ambient air temperature.

Along with HR and blood pressure (BP), the plasma renin activity, plasma cortisol, and aldosterone concentrations were also lowered by 46%, 34%, and 17%, respectively, while diuresis was increased by 107%. Immersion at 20°C produced similar decrease in plasma renin activity, HR, SBP, and DBP, in spite of lowered Tre and increased MR by 93%. Plasma cortisol concentrations tended to decrease, while plasma aldosterone concentration was unchanged. Diuresis was increased by 89%. No significant differences in changes in plasma renin activity, aldosterone concentration, and diuresis compared with subjects immersed in 32°C.

2.2.4 Why cold and hot water works?

When the body is subject to the outside temperature is cold, the circulation flow is directed inward toward the internal organs. When the outdoor temperature gets hot, the circulation flow goes outward toward the skin. The alternating hot and cold water circulation make the move in and out like an accordion. This has the effect of flow restriction is stuck, increase the rate of detoxification and nutrients more easily move to various parts of the body.

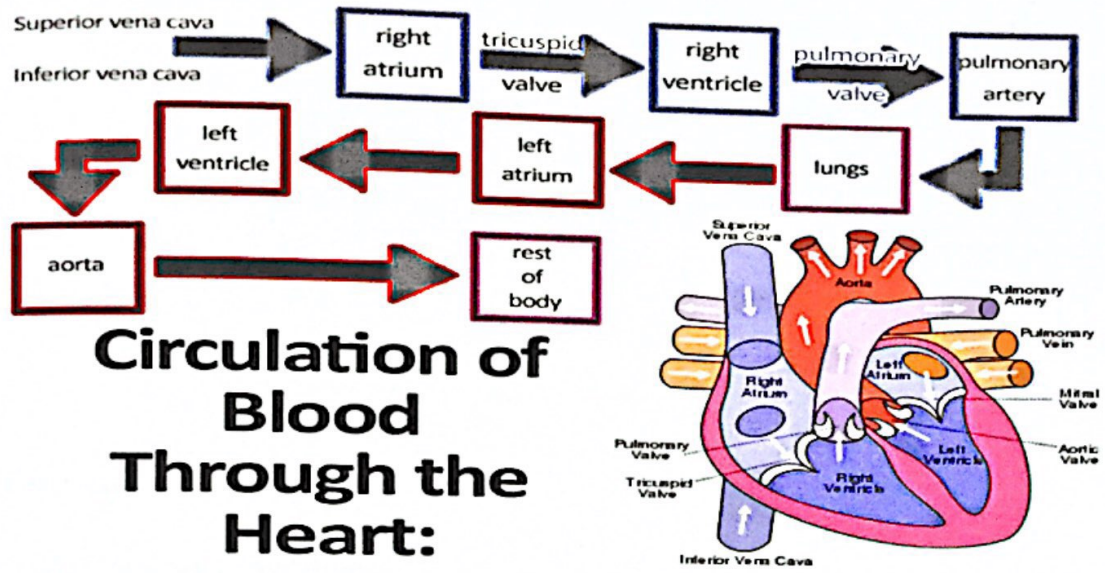


Figure 2.1 : The Circulation of blood.

2.2.5 Benefits hot and cold water

Showering is an essential part of a healthy routine, but depending on the temperature, your time spent under the water can offer different benefits. Hot showers have water of temperatures from 96 to 105 degrees Fahrenheit. A hot shower not only feels good, it can also be beneficial to your health. The key is not to stay in there too long, as it can dry out your skin. But five to 10 minutes under hot water can work wonders for your body, muscles, joints and overall mood.[7] Cold showers have been proven to have an amazing effect on your well being and health. Something, as simple as rotating the temperature range can really have a big improvement on your life.[8]

Cold water

1) Increases Alertness
2) Refines Hair and Skin
3) Improves Immunity and Circulation
4) Stimulates Weight Loss
5) Speeds Up Muscle Soreness and Recovery
6) Eases Stress
7) Relieves Depression

Hot water

1) Improve Circulation
2) Cleanse the Skin
3) Warming Up
4) Relieve Stiff Neck and Shoulders
5) Relieve Coughs
6) Decrease Stress and Insomnia

2.3 IC LM 35

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to

+150°C temperature range. Low cost is assured by trimming and calibration at the wafer level.

The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

2.3.1 The Features of LM35

1) Calibrated directly in ° Celsius (Centigrade)
2) Linear + 10.0 mV/°C scale factor
3) 0.5°C accuracy guaranteeable (at +25°C)
4) Rated for full −55° to +150°C range
5) Suitable for remote applications
6) Low cost due to wafer-level trimming
7) Operates from 4 to 30 volts
8) Less than 60 μA current drain
9) Low self-heating, 0.08°C in still air
10) Nonlinearity only ±1⁄4°C typical
11) Low impedance output, 0.1 W for 1 mA load

2.3.2 Circuit LM35

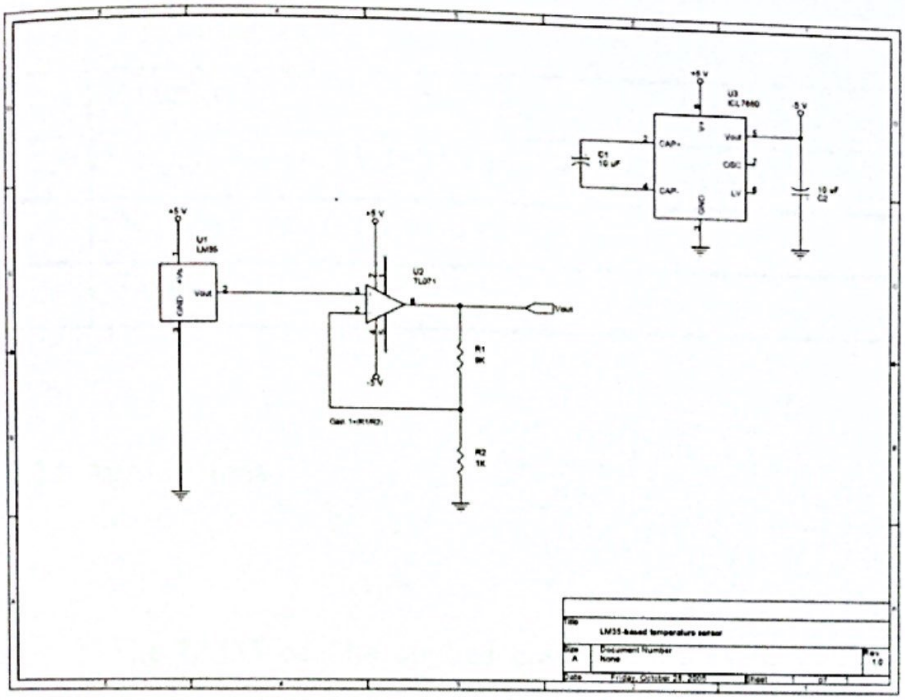


Figure 2.2 : Circuit of LM35

2.3.3 LM35

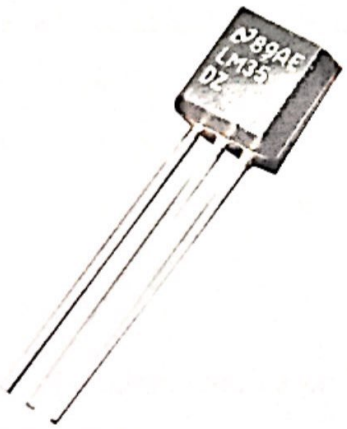


Figure 2.3 : LM35

2.3.4 Pin Description:

Table 2.1 : Pin Description

Pin No	Function	Name
1	Supply voltage; 5V (+35V to -2V)	Vcc
2	Output voltage (+6V to -1V)	Output
3	Ground (0V)	Ground

2.3.5 Applications

The LM35 can be applied easily in the same way as other integrated-circuit temperature sensors. It can be glued or cemented to a surface and its temperature will be within about 0.01°C of the surface temperature. This presumes that the ambient air temperature is almost the same as the surface temperature; if the air temperature were much higher or lower than the surface temperature, the actual temperature of the LM35 die would be at an intermediate temperature between the surface temperature and the air temperature. This is expecially true for the TO-92 plastic package, where the copper leads are the principal thermal path to carry heat into the device, so its temperature might be closer to the air temperature than to the surface temperature.

To minimize this problem, be sure that the wiring to the LM35, as it leaves the device, is held at the same temperature as the surface of interest. The easiest way to do this is to cover up these wires with a bead of epoxy which will insure that the leads and wires are all at the same temperature as the surface, and that the LM35 die's temperature will not be affected by the air temperature. The TO-46 metal package can also be soldered to a metal surface or pipe without damage. Of course, in that case the V− terminal of the circuit will be grounded to that metal. Alternatively, the LM35 can be mounted inside a sealed-end metal tube, and can then be dipped into a bath or screwed into a threaded hole

in a tank. As with any IC, the LM35 and accompanying wiring and circuits must be kept insulated and dry, to avoid leakage and corrosion.

This is especially true if the circuit may operate at cold temperatures where condensation can occur. Printed-circuit coatings and varnishes such as Humiseal and epoxy paints or dips are often used to insure that moisture cannot corrode the LM35 or its connections. These devices are sometimes soldered to a small light-weight heat fin, to decrease the thermal time constant and speed up the response in slowly-moving air. On the other hand, a small thermal mass may be added to the sensor, to give the steadiest reading despite small deviations in the air temperature.

2.4 Peripheral Integrated Circuit

PIC microcontrollers are a family of specialized microcontroller chips produced by Microchip Technology in Chandler, Arizona. The acronym PIC stands for "peripheral interface controller," although that term is rarely used nowadays. A microcontroller is a compact microcomputer designed to govern the operation of embedded systems in motor vehicles, robots, office machines, medical devices, mobile radios, vending machines, home appliances, and various other devices. A typical microcontroller includes a processor, memory, and peripherals.

The PIC was designed to improve the performance of I/O operations from a computer's peripheral devices. It works as a standard microcontroller that has small processors, memory, registers and storage. Typically, a PIC enhances I/O operations from a peripheral devices by separating I/O-based programs and data from the core central processing unit (CPU).

A PIC has a built-in data memory, data bus and dedicated microprocessor for processing all I/O functions and processes. It consists of temporary and permanent storage mechanisms, in the form of random access memory (RAM) and erasable programmable read-only memory (EPROM), where RAM stores data/processes that are used and EPROM stores created values. It also may contain a flash memory, which is used to perform multiple instances of READ, WRITE and ERASE functions.

2.4.1 Microcontroller PIC16F1938

The PIC16F1938-I/SO is a 8-bit 28-pin Microcontroller with LCD driver featuring nanoWatt XLP technology. This device has a hardware stack memory 15-bit wide and 16 words deep. A stack overflow or underflow will set the appropriate bit (STKOVF or STKUNF) in the PCON register and if enabled will cause a software reset. There are two 16-bit file select registers (FSR). FSRs can access all file registers and program memory, which allows one data pointer for all memory. When an FSR points to program memory, there is one additional instruction cycle in instructions using INDF allows the data to be fetched.

The PIC microcontrollers appeal to hobbyists and experimenters, especially in the fields of electronics and robotics. Key features include wide availability, low cost, ease of reprogramming with built-in EEPROM (electrically erasable programmable read-only memory), an extensive collection of free application notes, abundant development tools, and a great deal of information available on the Internet. The PIC microcontrollers often appear under the brand name PICmicro.

Every PIC microcontroller has a set of registers that also function as RAM (random access memory). Special purpose control registers for on-chip hardware

resources are also mapped into the data space. Every PIC has a stack that saves return addresses. The stack was not software-accessible on the earlier versions of the PIC, but this limitation was removed in later devices.

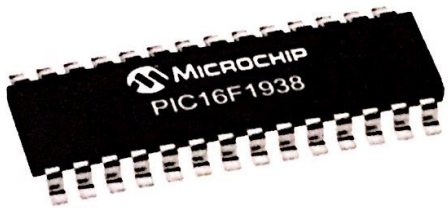


Figure 2.4 : PIC 16F1938

2.4.2 Pin configuration and description of PIC 16F1938

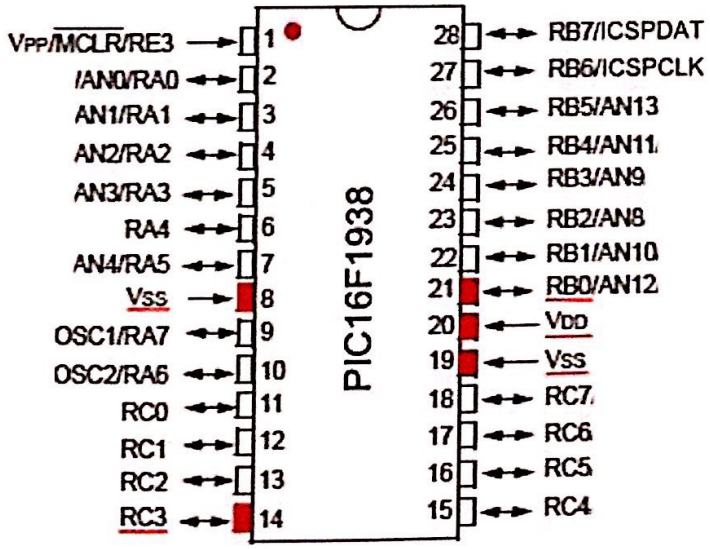
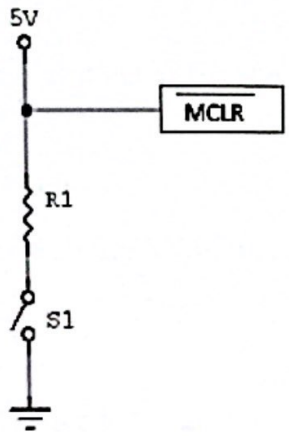


Figure 2.5 : Pin configuration

PIN 1: MCLR

The first pin is the master clear pin of this IC. It resets the microcontroller and is active low, meaning that it should constantly be given a voltage of 5V and if 0 V are given then the controller is reset. Resetting the controller will bring it back to the first line of the program that has been burned into the IC.



A push button and a resistor is connected to the pin. The pin is already being supplied by constant 5V. When we want to reset the IC we just have to push the button which will bring the MCLR pin to 0 potential thereby resetting the controller.

PIN 2: RA0/AN0

PORTA consists of 6 pins, from pin 2 to pin 7, all of these are bidirectional input/output pins. Pin 2 is the first pin of this port. This pin can also be used as an analog pin AN0. It is built in analog to digital converter.

PIN 3: RA1/AN1

This can be the analog input 1.

PIN 4: RA2/AN2/Vref-

It can also act as the analog input2. Or negative analog reference voltage can be given to it.

PIN 5: RA3/AN3/Vref+

It can act as the analog input 3. Or can act as the analog positive reference voltage.

PIN 6: RA4/T0CKI

To timer0 this pin can act as the clock input pin, the type of output is open drain.

PIN 7: RA5/SS/AN4

This can be the analog input 4. There is synchronous serial port in the controller also and this pin can be used as the slave select for that port.

PIN 8 and 19: VSS

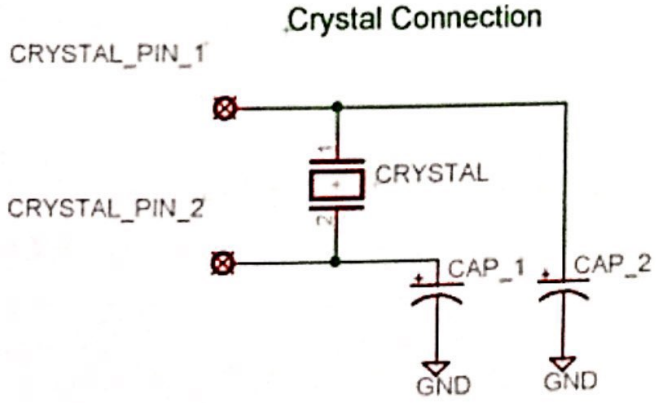
These pins are the ground reference for input/output and logic pins. They should be connected to 0 potential.

PIN 9: RA7/OSC1/CLKIN

This is the oscillator input or the external clock input pin.

PIN 10: RA6/ OSC2/CLKOUT

This is the oscillator output pin. A crystal resonator is connected between pin 13 and 14 to provide external clock to the microcontroller. ¼ of the frequency of OSC1 is outputted by OSC2 in case of RC mode. This indicates the instruction cycle rate.



PIN 11: RC0/T1OCO/T1CKI

PORTC consists of 8 pins. It is also a bidirectional input output port. Of them, pin 15 is the first. It can be the clock input of timer 1 or the oscillator output of timer 2.

PIN 12: RC1/T1OSI/CCP2

It can be the oscillator input of timer 1 or the capture 2 input/compare 2 output/ PWM 2 output.

PIN 13: RC2/CCP1

It can be the capture 1 input/ compare 1 output/ PWM 1 output.

PIN 14: RC3/SCK/SCL

It can be the output for SPI or I2C modes and can be the input/output for synchronous serial clock.

PIN 15: RC4/SDI/SDA

It can be the SPI data in pin. Or in I2C mode it can be data input/output pin.

PIN 16: RC5/SDO

It can be the data out of SPI in the SPI mode.

PIN 17: RC6/TX/CK

It can be the synchronous clock or USART Asynchronous transmit pin.

PIN 18: RC7/RX/DT

It can be the synchronous data pin or the USART receive pin.

PIN 20: VDD

These two pins are the positive supply for the input/output and logic pins. Both of them should be connected to 5V. It can be the synchronous data pin or the USART receive pin.

PIN 21-28: PORT B

All these pins belong to PORTB. Out of which RB0 can be used as the external interrupt pin and RB6 and RB7 can be used as in-circuit debugger pins.

2.4.3 Applications

Home appliances – intercom, telephones, security systems, garage door openers, answering machines, fax machines, home computers , TVs, cable TV tuner , VCR, camcorder, remote controls, video games, cellular phones, musical instruments, sewing machines, lighting control, paging, camera, pinball machines, toys, exercise machines etc.

Office equipment – telephones , computers , security system, fax machines, microwave, copier, laser printer, colour printer, paging etc.

Automobiles – trip computers, engine control, air bag, ABS, instrumentation, security system, transmission control, entertainment, climate control, cellular phone, keyless entry, flight control systems, printers etc.

Industrial applications – industrial controller , DAS etc.

2.4.4 The Features of Microcontroller PIC16F1938

1) Enhanced Mid-range Core with 49 Instruction, 16 Stack Levels
2) Flash Program Memory with self read/write capability
3) 60 LCD segment drive support
4) Internal 32MHz oscillator
5) Integrated Capacitive mTouch Sensing Module
6) Integrated Temperature Indicator
7) MI2C, SPI, EUSART w/auto baud
8) 3 ECCP & 2 CCP (Enhanced/Capture Compare PWM)
9) Comparators with selectable Voltage Reference

10) 11 Channel 10b ADC with Voltage Reference
11) 25mA Source/Sink current I/O
12) Four 8-bit Timers (TMR0/TMR2/TMR4/TMR6)
13) One 16-bit Timer (TMR1)
14) Extended Watchdog Timer (EWDT)
15) Enhanced Power-On/Off-Reset
16) Brown-Out Reset (BOR)
17) In Circuit Serial Programming (ICSP)
18) Wide Operating Voltage (1.8V – 5.5V)
19) Low Voltage PIC16LF1938 variant (1.8V – 3.6V)

2.5 LCD Display

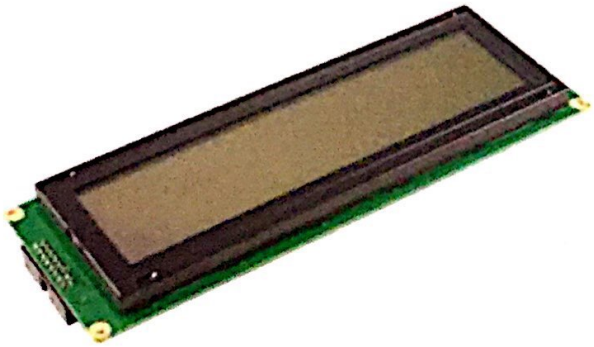


Figure 2.6 : LCD

LCD (liquid crystal display) is the technology used for displays in notebook and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it.

An LCD is made with either a passive matrix or an active matrix display display grid. The active matrix LCD is also known as a thin film transistor (TFT) display. The

passive matrix LCD has a grid of conductors with pixels located at each intersection in the grid. A current is sent across two conductors on the grid to control the light for any pixel. An active matrix has a transistor located at each pixel intersection, requiring less current to control the luminance of a pixel.

2.6 IR Sensor

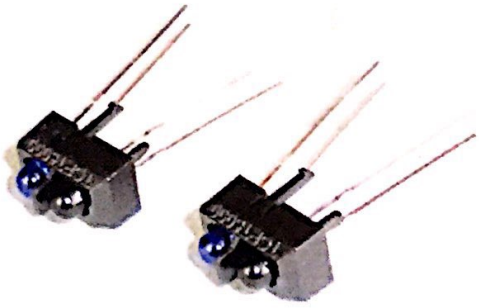


Figure 2.7 : IR LED

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion.These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor.

The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

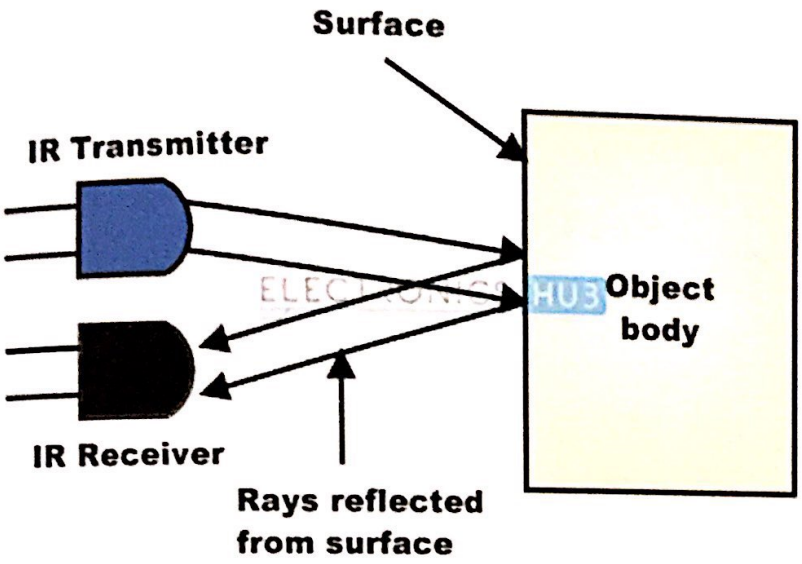


Figure 2.8 : IR LED Diagram

CHAPTER 3

METHODOLOGY

3.1 Introduction

Methodology is a systems of methods used in a particular area of study or activity. This chapter describes the research methodology to understand the whole system of hardware and software in sequences. This chapter also explains the development of the software and system operation including the block diagram and program of the system in the project. It is very important to choose appropriate components with correct specifications in order to get functioning circuit.

The idea applies for the hardware construction and software development. Methodology includes a philosophically coherent collection of theories, concepts or ideas as they relate to a particular discipline or field of inquiry. Methodology refers to more than a simple set of methods, rather it refers to the rationale and the philosophical assumptions that underlie a particular study relative to the scientific method.

This is why scholarly literature often includes a section on the methodology of the researchers. Each step of project is a process to complete the project. Every step must be followed one by one and must be done carefully. If some error occurs it can make a project probably could not operate or do not look neat and perfect. Before the project finish, various process needs to be done according to proper procedures to ensure that projects do not have any problems.

3.2 Planning

Planning is an important part of this project. In this part, planning of overall project must be identify of the information and requirement such as hardware and software. From writing a planning of the project, we also can get knowing the problem statement and background study. In the earlier stage, we can collect the data by give a questioner to the people for a survey. We also will know what kind of component that we need to use for this project and the design that suitable for the design.

3.2.1 Block diagram for main project.

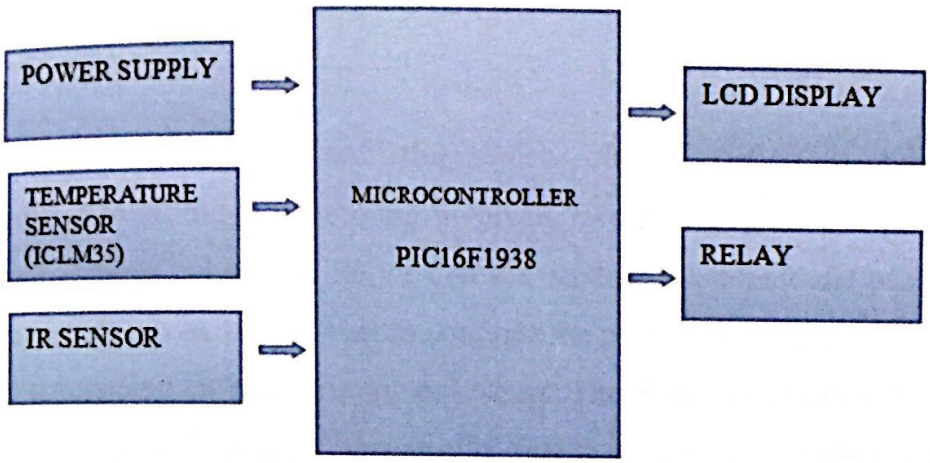


Figure 3.1 : Block diagram

3.3 Data Collection

The questionnaires of data collection are distributed to the people from Polytechnic Premier Sultan Salahuddin Abdul Aziz Shah, Shah Alam and the citizen in the area of Taman TTDI Jaya. From this data, we can get some conclusion. At this stage, project resources and requirements, literature studies and schedule to get more information in this study are planned. All materials are collected from journal, internet, research paper, and text books.

3.4 Requirement of Hardware and Software

For this project, we are using Mplab software, DEV C++ software and Cadsoft Eagle to build the programming involved, circuit of project and to combined both of programming and circuit. So we can see weather the circuit and programming can run together or not before we start to continue the process of etching, drilling, soldering, put the component on board circuit and others. The important component for this project is the PIC16F1938 as a microcontroller that will process the input and output, peltier TEC-12706 as a cooling device, LM35 as a temperature sensor and infrared (IR) sensor to detect the movement.

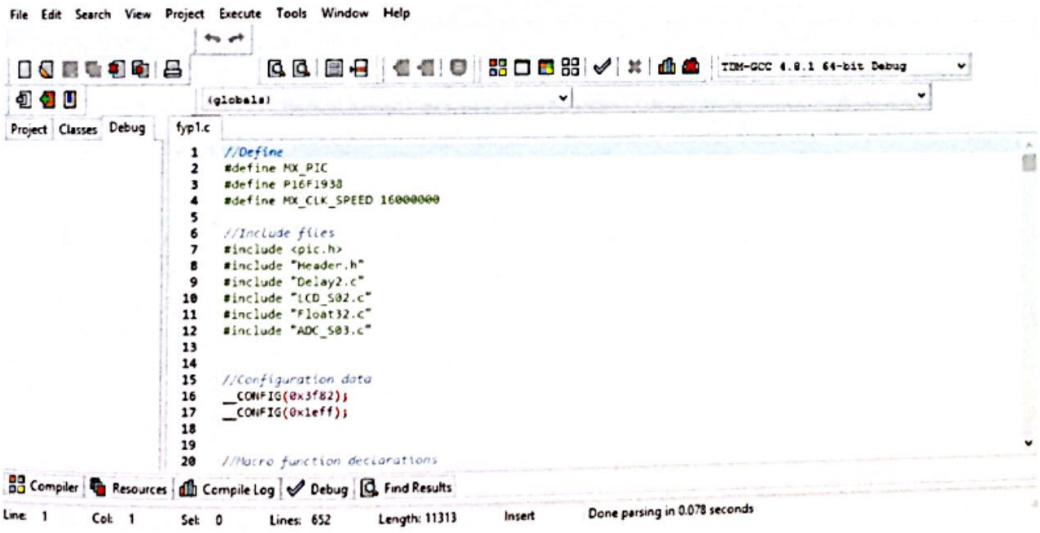


Figure 3.2 : DEV C++ software

3.4.1 Hardware requirement

Here is the component that used for this project;-

1) Infrared (IR) sensor
2) Peltier TEC1-12706
3) LM35 - temperature sensor
4) Relay
5) LCD display
6) Heatsink
7) Power supply
8) Mini water pump
9) Fan
10) Coil

3.4.2 Process of built the circuit with component

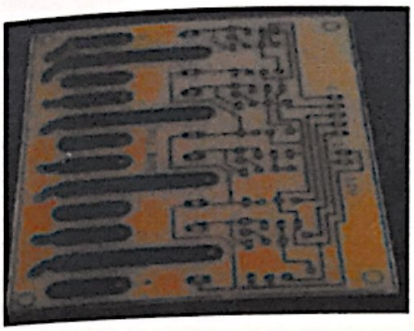


Figure 3.3 : PCB that has been etching

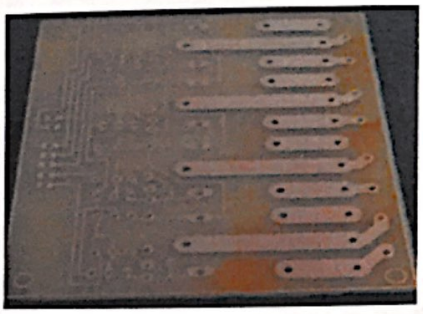


Figure 3.4 : Board have done drill and ready to put on the component

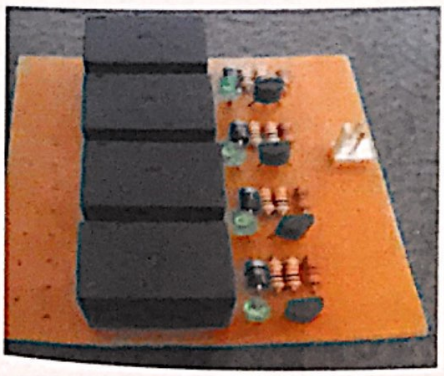


Figure 3.5 : Put on the component

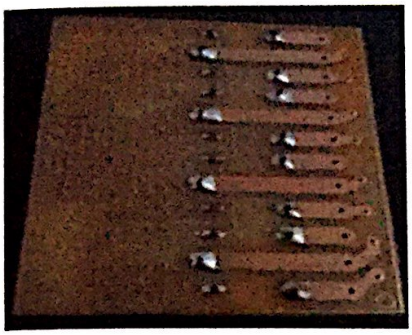


Figure 3.6 : Done soldering

3.4.3 Software Requirement

EAGLE is a scriptable electronic design automation application with schematic capture, printed circuit board layout, auto-router and computer-aided manufacturing features.[9] EAGLE stands for Easily Applicable Graphical Layout Editor (German: Einfach Anzuwendender Grafischer Layout-Editor) and is developed by CadSoft Computer GmbH. Cadsoft Computer GmbH was acquired by Autodesk Inc. in 2016.[10] Popular DIY electronics site SparkFun uses EAGLE, and releases the EAGLE files for boards designed in-house. Other notable users include Adafruit, Arduino[11] and Dangerous Prototypes

EAGLE contains a schematic editor, for designing circuit diagrams. Parts can be placed on many sheets and connected together through ports. The PCB layout editor allows back annotation to the schematic and auto-routing to automatically connect traces based on the connections defined in the schematic. EAGLE saves Gerber and PostScript layout files and Excellon and Sieb & Meyer drill files. These standard files are accepted by many PCB fabrication companies.

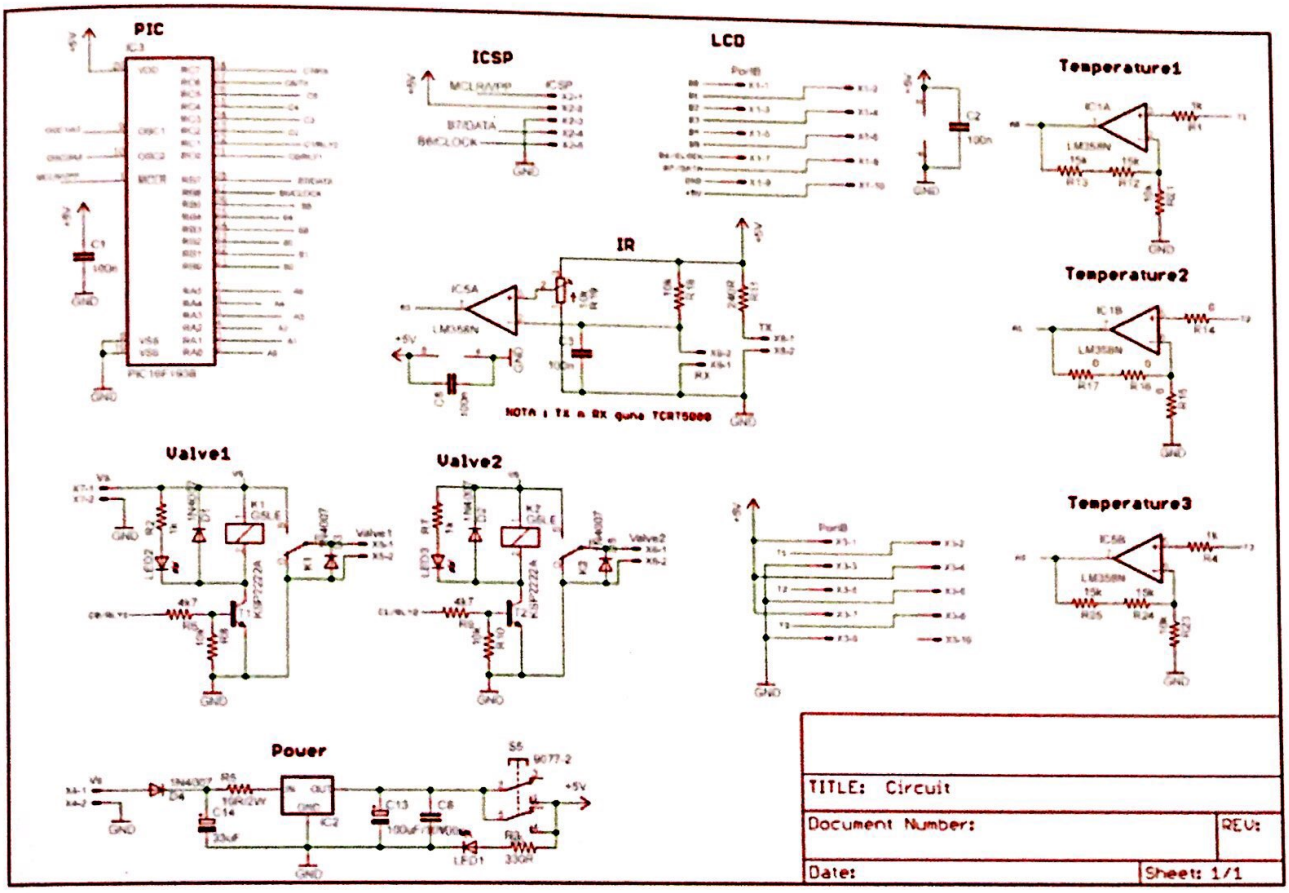


Figure 3.7 : Schematic diagram

3.5 Implementing

3.5.1 PIC16F1938

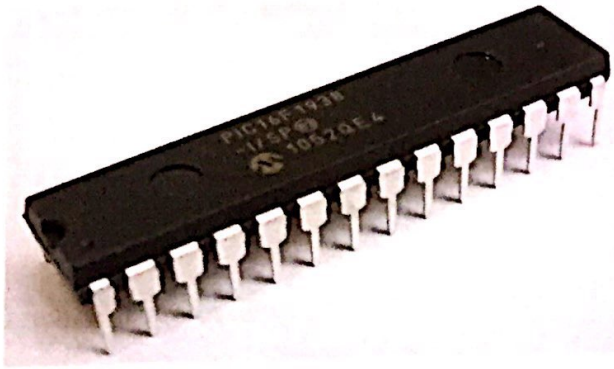


Figure 3.8 : PIC16F1938

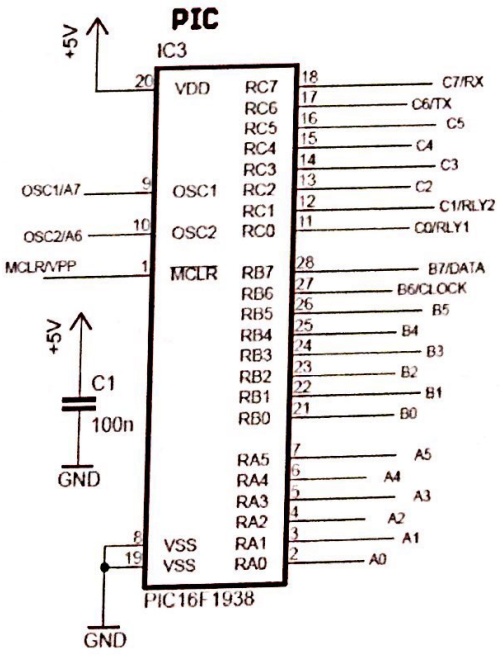


Figure 3.9 : Schematic diagram of PIC16F1938

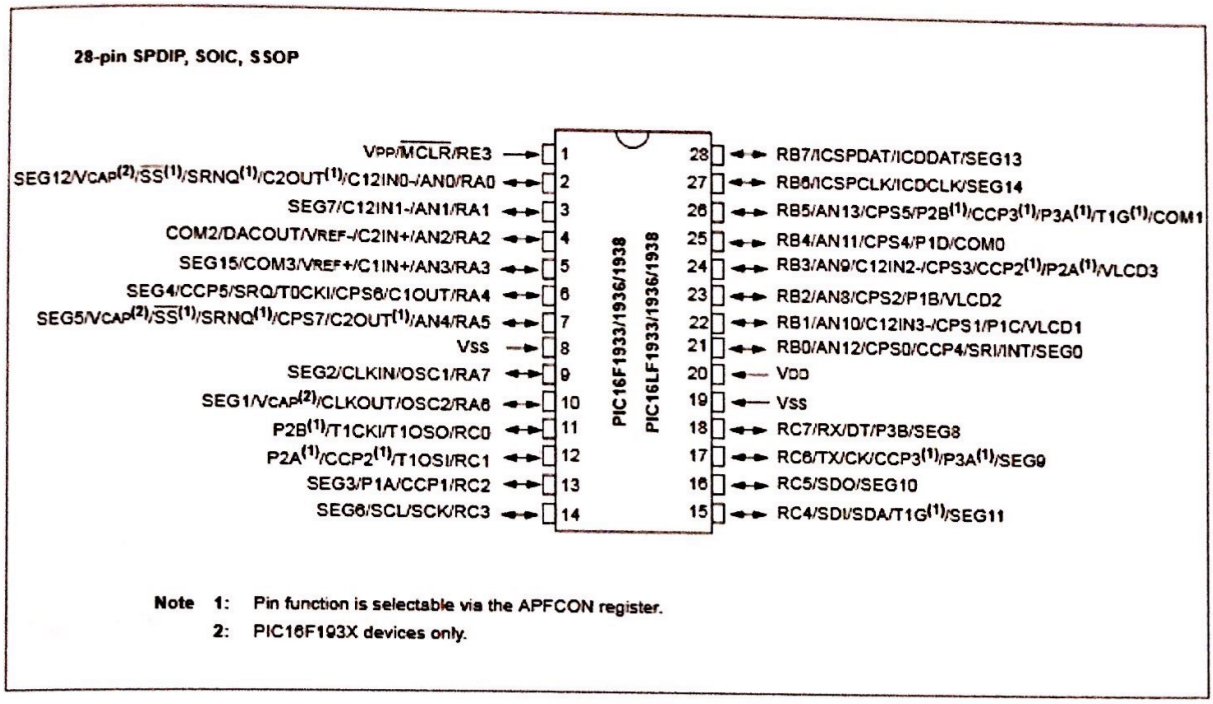


Figure 3.10 : Pin diagram of PIC16F1938

Peripheral integrated controller (PIC) features is it is up to 35 I/O Pins and 1 Input-only pin which have high-current source/sink for direct LED drive, individually programmable Interrupt-on-pin change pins and individually programmable weak pull-ups. Then the integrated LCD controller have up to 96 segments, variable clock input, contrast control and internal voltage reference selections. For A/D converter it have 10-bit resolution and up to 14 channels and also selectable 1.024/2.048/4.096V voltage reference. Enhanced Timer1 is dedicated low-power 32 kHz oscillator driver, 16-bit timer/counter with prescaler, external Gate Input mode with toggle and single shot modes and also interrupt-on-gate completion.

Timer2, 4, 6: 8-Bit Timer/Counter with 8-Bit Period Register, Prescaler and Postscaler. The two capture, compare, PWM modules (CCP) have 16-bit Capture, max. resolution 125 ns, 16-bit Compare, max. resolution 125 ns and 10-bit PWM, max. frequency 31.25 kHz. Three enhanced capture, compare, PWM modules (ECCP) have 3 PWM time-base options, auto-shutdown and auto-restart, PWM steering and programmable Dead-band Delay.

3.5.2 Peltier TEC1-12706

Figure 3.11 : Peltier TEC1-12706

Peltier TEC1-12706 is a thermoelectric module that made of selected high performance ingot to achieve superior cooling performance and greater delta T up to 70 °C, designed for superior cooling and heating up to 100 °C requirement. The operation of a Peltier cooler can be temporarily enhanced by utilizing the transient response of a current pulse. The performance of such a device,using (Bi,Sb)2Te3-based thermoelectric elements, was examined from −70 to 55°C. We establish both theoretically and experimentally the essential parameters that describe the pulse cooling effect,such as the minimum temperature achieved, maximum temperature overshoot, time to reach

minimum temperature, time while cooled, and time between pulses.

Using simple theoretical and semiempirical relationships the dependence of these parameters on the current pulse amplitude, temperature, thermoelectric element length, thermoelectric figure of merit and thermal diffusivity is established. At large pulse amplitudes the amount of pulse supercooling is proportional to the maximum steady-state difference in temperature. This proportionality factor is about half that expected theoretically. This suggests that the thermoelectric figure of merit is the key materials parameter for pulse cooling.

For this cooler, the practical optimum pulse amplitude was found to be about three times the optimum steady-state current. A pulse cooler was integrated into a small commercial thermoelectric three-stage cooler and it provided several degrees of additional cooling for a period long enough to operate a laser sensor.The improvement due to pulse cooling is about the equivalent of two additional stages in a multistage thermoelectric cooler.

3.5.3 LM35

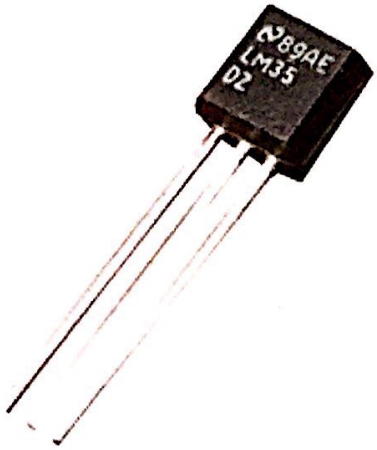


Figure 3.12 : LM35 temperature sensor

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1°C temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every °C rise/fall in ambient temperature, *i.e.,*its scale factor is 0.01V/°C.

By using the LM35 temperature sensor, we can measure temperature more accurately than a using a thermistor. The sensor circuitry is sealed and not subject to oxidation. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

It has an output voltage that is proportional to the Celsius temperature. The scale factor is .01V/°C. The LM35 does not require any external calibration or trimming and maintains an accuracy of +/-0.4 °C at room temperature and +/- 0.8 °C over a range of 0 °C to +100 °C. Another important characteristic of the LM35DZ is that it draws only 60 micro amps from its supply and possesses a low self-heating capability. The sensor self-heating causes less than 0.1 °C temperature rise in still air.

3.5.4 IR Sensor

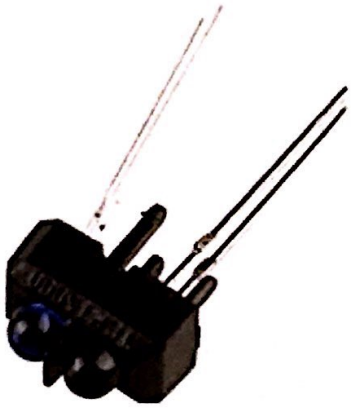


Figure 3.13 : IR sensor

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion.These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor.The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to

IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

3.6 Flow Chart Of Methodology

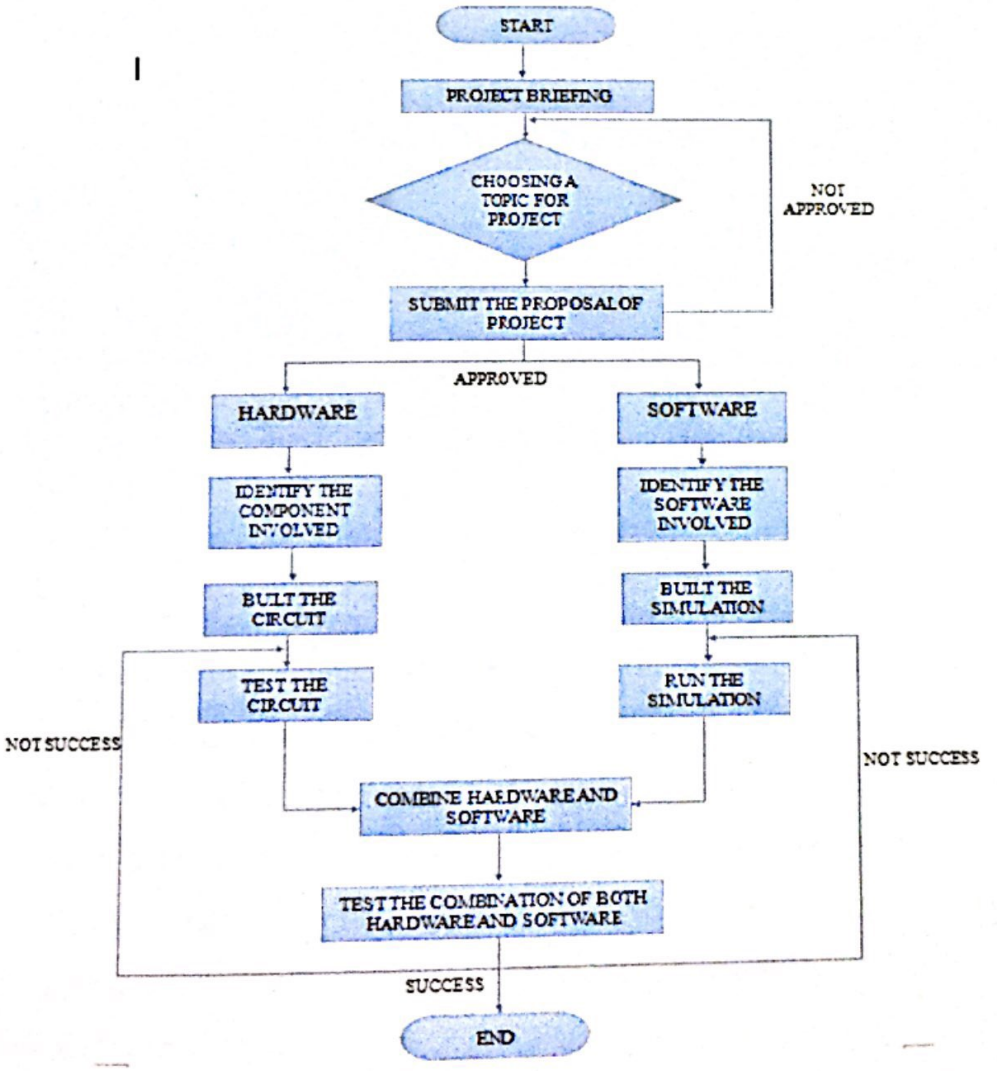


Figure 3.14 : Flowchart

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

This chapter present about the result and discussion that we study from the starting of our project. In this chapter , we also conclude and entered the feedback from people surround us to give supported and information about our project. The data from the feedback were analyzed and shown in graph and table. The final output of our project also been showed in this chapter. We discuss and put the result the data from effectiveness of hydrotherapy for patient. The data from feedback about knowledge towards fever.

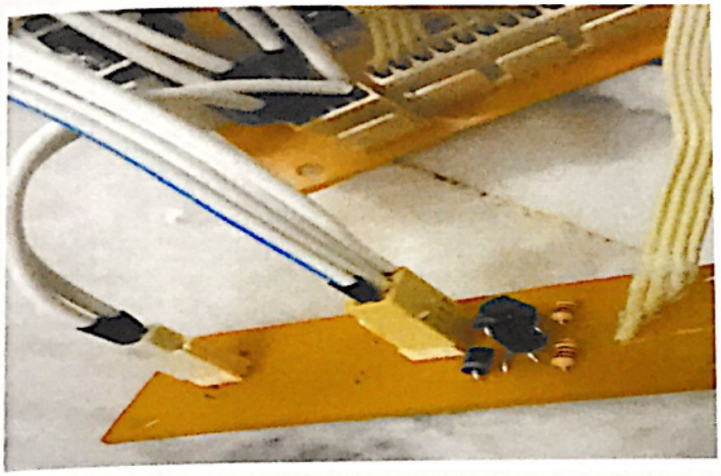


Figure 4.1 : Connector of water pump.

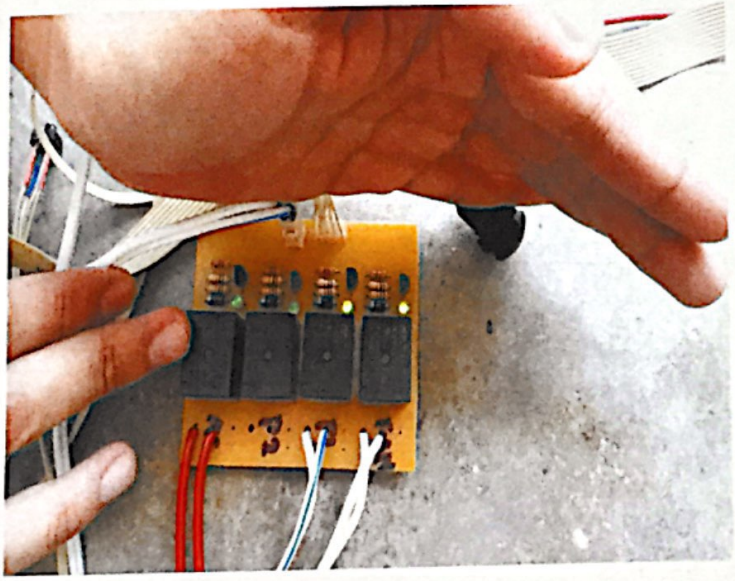


Figure 4.2 : Testing relay.

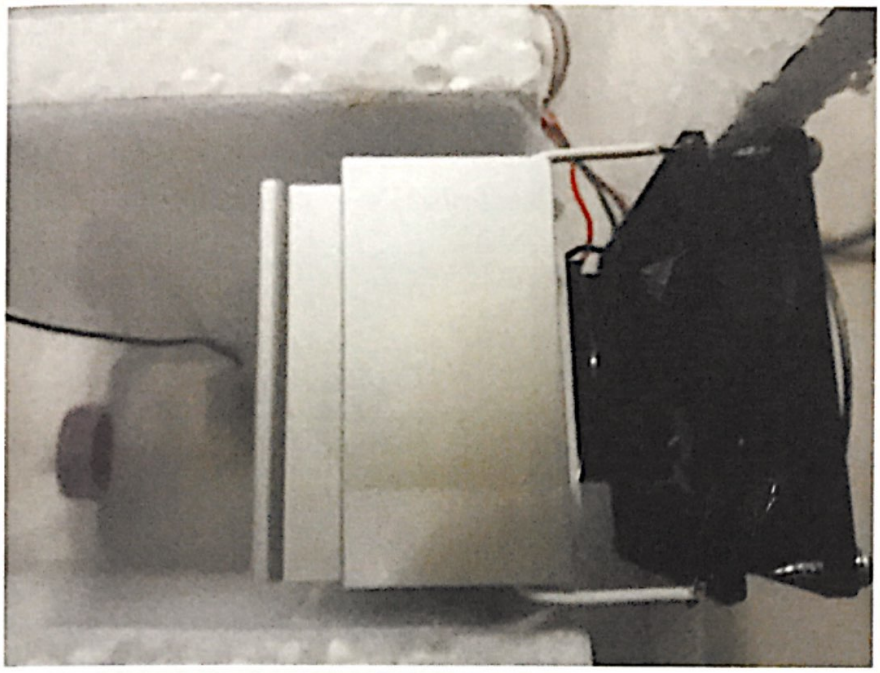


Figure 4.3 : Peltier with heatsink and fan

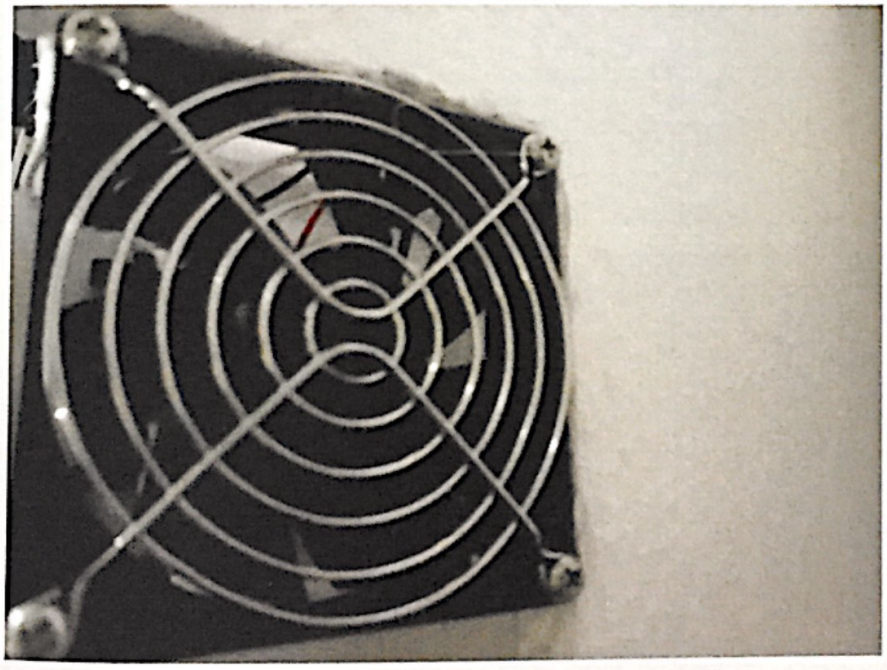


Figure 4.4 : Heatsink and fan (cooling process)

Table 4.1 : Effectiveness of Hydrotherapy for fever patient

NO.	QUESTION	VERY AGREE	AGREE	DISAGREE	VERY DISAGREE
1.	This product should be introduced to public.	25	4	1	0
2.	This product can help reduces fever.	15	10	5	0
3.	This product suited with all range of age.	25	5	0	0
4.	This product can save cost from going to clinic.	14	13	3	0
5.	This product is safe to used.	23	7	0	0

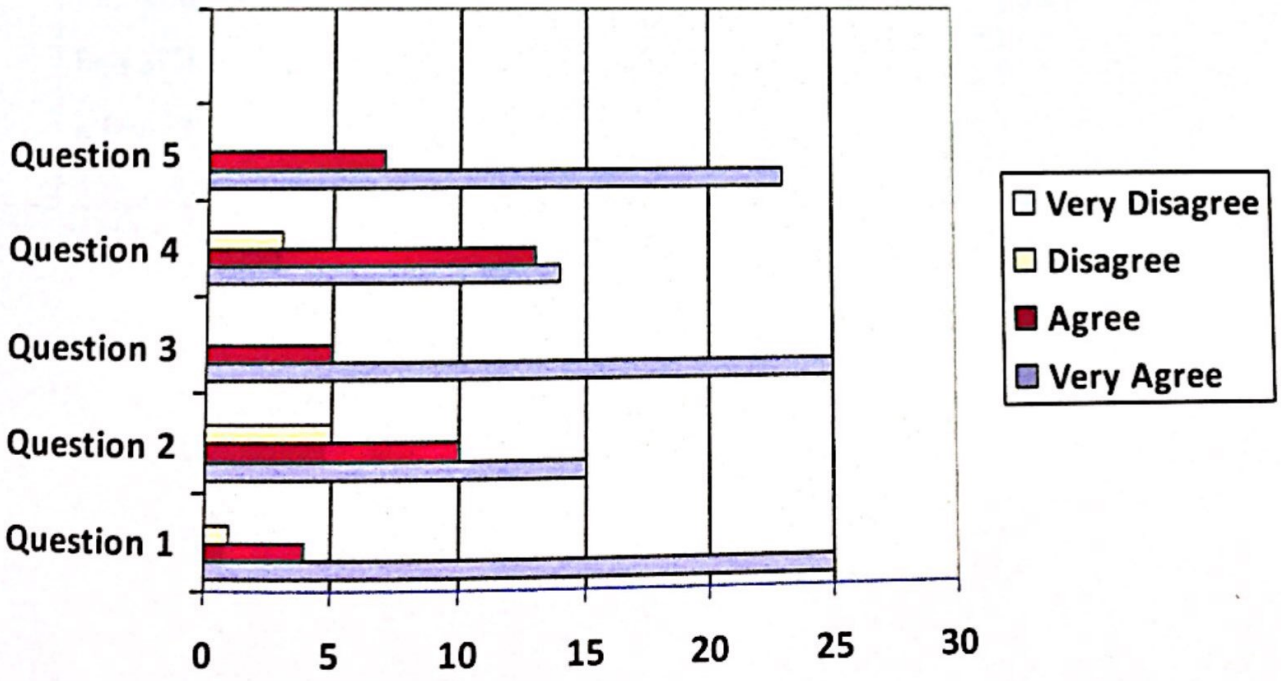


Figure 4.5 : Graph of Effectiveness of hydrotherapy for fever patient

4.4 Knowledge about fever

Table 4.2 : Knowledge about fever.

NO.	QUESTION	YES	NO
1.	Do you always fever?	5	25
2.	Do you always go to clinic if u had a fever?	3	27
3.	When you had a fever, do you shower with cold water?	7	23
4.	When you had a fever, do you shower with warm/ hot water?	2	28
5.	Do you know by showering will affects your fever?	15	15
6.	Do you know cold water is good for our body when we had a fever?	10	20
7.	Do you know hot water will give bad affects to our body when we had a fever?	18	12

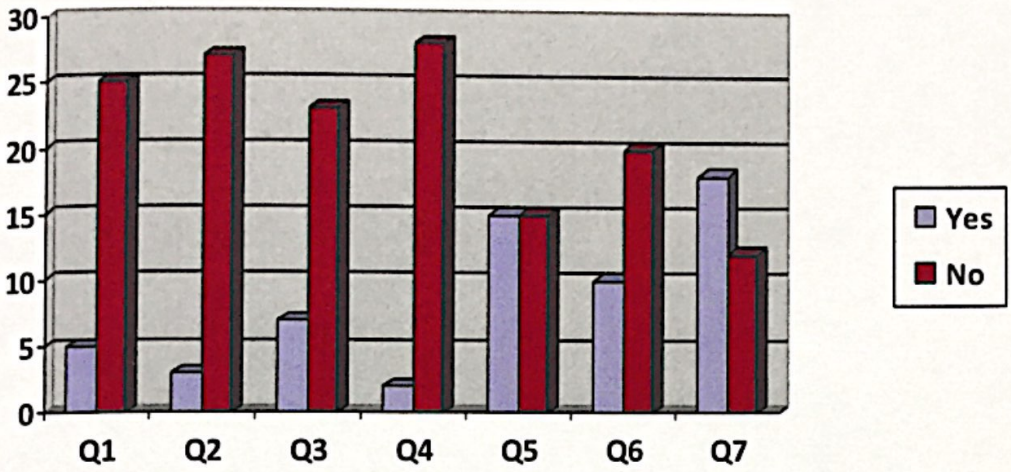


Figure 4.6 : Graph 2 Knowledge about fever

CHAPTER 5

CONCLUSION AND RECOMMENDATION

In conclusion, almost 99% of the objective is achieved. At the end of this project, this device can help fever patient to reduce the body temperature back to normal. It can be functioning as we plan earlier for this project which is when the the temperature sensor detect the body temperature is high or over the normal body temperature (37.5°C), the water that will flow out is a cold water. But when the temperature sensor detect the temperature that below than normal body temperature, the hot water will flow out. Infrared (IR) sensor also functioning as we plan which is the water will flow out when there is a movement detected and when the IR sensor cannot detect the movement, the water will stop flowing out.

For the future recommendation, this device can be upgrade by creating the interesting and unique design for the bathing shower. It also can be renovate by adding some button for hot water, cold water and a button for hydrotherapy bath (taking bath using hot and cold water in sequences). Besides that, using the suitable material for casing such as a durable, lightweight and resistant to hot and cold.

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