CHAPTER 1

INTRODUCTION

The main aim of designing the system is to feel patient relief from each Hassel and also to make sure of each safety. The system is very helpful for paralysed and physically illed person in hospital to control their bed height by themselves. The microcontroller is capable of communicating with all input and output modules. The voice recognition system which is the input module to the microcontroller takes the voice instruction gives by the user as input instruction is to lift upward or to the downward and according to the user's voice command, the appropriate action will be performed. To control the bed height two servo motors are used. The motor for head side and leg side. Also, the temperature of the patient is continuously monitored on LCD. This system also has a buzzer alarm system which is horned if patient crosses the normal temperature and if it feels panicked.

Speech recognition is the process of recognizing the spoken words to take the necessary actions accordingly. User can also control the electrical devices like fan, light, door etc. with the help of voice recognition system. This device is very helpful for paralysis, and physically challenged persons especially in hospitals to control their bed height by themselves. The speech recognition system provides the communication between the user and the microcontroller-based bed control mechanism. This project makes use of a DC motor for moving the bed based on the voice/speech commands given by the user and voice recognition chip is used for recognition of the voice commands. Also, switches Relay are interfaced to controller to which electrical appliances are connected. Microcontroller is programmed, with the help of embedded C instructions. The microcontroller is capable of communicating with all input and output modules. The voice recognition system which is the input module to the microcontroller takes the voice instructions given by the user as input and the controller judges whether the instruction is to lift upwards or to the downwards or to control electrical devices, and according to the user's voice command, the appropriate action will be performed. Also, LCD display is available for visual information of operations being performed.

CHAPTER 2

LITERATURE SURVEY

A literature review is an overview of the previously published works on a specific topic. The term can refer to a full scholarly paper or a section of a scholarly work such as a book, or an article. Either way, a literature review is supposed to provide the researcher/author and the audiences with a general image of the existing knowledge on the topic under question. A good literature review can ensure that a proper research question has been asked and a proper theoretical framework and/or research methodology have been chosen. To be precise, a literature review serves to situate the current study within the body of the relevant literature and to provide context for the reader. In such case, the review usually precedes the methodology and results sections of the work.

2.1: Literature Survey

Ignacio Ghersi *et al* [1] proposed paper on **"Modern Push-Button Hospital-beds to 20th Century Mechatronic Beds"**. This paper represents a clear view on electronic medical beds, which is defined as "smart beds", as part of an increasingly protective patient-care habitat. Raspberry pi is interfaced with a stepper motor using a motor driver circuit and is then brought forward with an audio input. The accuracy for detecting the voice commands was found to be troublesome. Wireless communication can be a hinderance to the patient.

G. Panik *et al* [2] proposed paper on **"Voice Operated Intelligent Wheelchair".** This paper talks about the plan of voice-controlled automatic wheelchair-using Arduino. The structure is made with a voice acknowledgment framework, which empowers thephysically incapacitated individual to control the wheelchair by voice direction who have issues near to improvement as a result of the loss of motion or loss of movement for joystick-controlled wheelchairs. In the proposed arrangement the discourse preparing is done only with the coordinated module of voice recognition (VR3) which takes out the requirement for any bulky complex extra processing

modules. Moreover, the proposed plan is relatively less complex and more affordable to execute with the all-around accessible electronicgadgets interestingly with other existing structure which impacts under developingnations.

Tawfik *et al* [3] achieved that the main aim of the **"Smart Beds"** proposed model is to simplify the way toward dealing with a patient who can't move and for all time lies on a bed. The proposed medicinal bed is to automate it whenrequired to be specific, a bed that rotates by itself every a few hours. The electrical buttons of the bed control the moving parts and been pre-programmed for the desiredpositions.

A.Alice Linsie *et al* [4] investigated a paper that described **"An Automated Bed Positioning and Windows Using MEMS Accelerometer"**. This paper presents a prototype model for gesture recognition using MEMS accelerometer. This system can be used in hospitals, homes etc., not only for patients we can use this technique for normal bed position changing on top & bottom side. By this application people don't need to rely on others. Similarly another application of this work is automated window. Without using remote, manual operation we can simply control windows using gestures from the place where we are. Since they used RF transmitter for this windows application the coverage area is restricted. The main drawback of this system is that as this work is intended for beds, weight of patients also have to be considered. According to the weight we need to put more efficient motors for lifting. However it requires more cost. And also if the machine is not maintained properly there is a choice for noise pollution which might cause disturbance to patient itself.

Yudi Zhu *et al* [5] proposed a paper on **"Wheelchair Automatic Docking Method for Body-Separated Nursing Bed Based on Grid Map"**. This paper proposes a method of wheelchair/nursing-bed automatic docking based on Lidar and V-shaped artificial landmark. The docking method can realize the automatic separation and merger between wheelchair and bed. While retaining the function of turning over the nursing bed, reducing the secondary injury of bedridden patients in the transfer process, and greatly improving the self-nursing ability of bedridden patients. If the wheelchair is far from the bed, the docking success rate is low. Besides, due to the docking method adopts the backward driving method, the turning radius of the wheelchair will be comparatively

large.

Shih-Wei Peng *et al* [6] proposed a paper on **"Mechanism Desjgn and Mechatronic Control of a Multifunctional Test Bed for Bedridden Healthcare"**. In this paper, the mechanism design concept and the mechatronic control system of the multifunctional main bed and nursing bed. The main bed system is introduced as a test bed for performing the posture changing task and the body transferring task of bedridden people, and the nursing bed can be transformed into a wheelchair for transporting bedridden people with lying or sitting posture. For smoothly transferring the bedridden people from the main bed to the nursing bed or the wheelchair, a belting system is also installed surrounding each bedplate surface. Furthermore, in order to manipulate complicated bed mechanism, a mechatronic control system and complete graphical user interface software are developed and implemented for connecting the computer and hardware and bridging the user and the bed system, respectively. Experimental results show that the proposed robotic bed system successfully performs the posture changing and body transferring for bedridden people. The set of multifunctional beds is designated as a test bed for mechatronic engineers and healthcare personnel to test and evaluate potential healthcare activities designed for assisting bedridden people.

Wei Zou *et al* [7] proposed a paper on **"Contour Detection and Localization of Intelligent Wheelchair for Parking into and Docking with U-Shaped Bed"**. This paper provides a U-shape contour detection and localization method for the wheelchair to park into and dock with a U-shape bed automatically. Based on the information of the detected U-shape boundary lines, the wheelchair can determine its orientation and position relative to the bed. Experiments are conducted on a rough made U-shape bed, whose results present larger errors comparing to dead reakoning, but exhibit the method's feasibility when a high-precision manufactured and special-painted U-shape bed is provided.

Binayak Roy *et al* [8] proposed a paper on **"Repositioning of a Rigid Body With a Flexible Sheet and Its Application to an Automated Rehabilitation Bed"**. This paper provides a new method for repositioning a rigid body with a flexible sheet. This methodology has been applied to a rehabilitation bed for repositioning and

transferring patients. Since the body is not securely connected to the sheet, it may slip during the repositioning operation, resulting in loss of control of the body as well as severe damage to the patient's fragile skin in the rehabilitation bed application. First obtained no-slip conditions for rigid bodies with a smooth, uniform cross section. The no-slip condition was experimentally verified for the repositioning operation using the rehabilitation bed. This ignores slip between the patient's skin and clothing. We have also assumed that the bed sheet is completely inextensible, while the real sheet is extensible to some extent. Therefore, the body may sag more at a heavy part than at a lighter part, creating errors in the analysis.

Huy Hoang Nguyen *et al* [9] proposed a paper on **"An advanced control strategy of an electrical-powered hospital bed"**. This paper develops a multivariable control technique for low-level control of an intelligent hospital bed. First, multivariable hospital bed models, nominal, upper bounded and lower bounded models, are obtained via an experimental identification procedure. As various uncertain factors impact the hospital bed system when it performs in the real environment, it is retreated as a linear multivariable system with uncertainties. By combining decoupling technique with adaptive neural network control approach, the proposed control strategy transforms a multivariable control problem into single variable control problems. Both simulation and real-time experiment confirm that the desired performance of the overall system has been achieved even under condition of system uncertainties.

Kajol H *et al* [10] **"Design and Development of a Voice Actuated Hospital bed for Patient Care"**. The developed intelligent bed actuated using voice commands, put the bed in a motion responding to the user's voice and also the bed inclined and reclined at precise angles. The methods and methodology for every procedure followed during the construction of this bed are discussed. With the help of stress and load analysis, the components requirements were understood though revisiting for conceptualization was necessary. The challenges faced during the misalignment of the bed made us overcome about 80% of the problems.

Moeid M Elsokah *et al* [11] proposed a paper on **"Next Generation of Medical Care Bed with Internet of Things Solutions"**. In this paper, the bed not only helps

patients but will also help to provide worldwide demand which will help all patients, the elderly and people with special needs. The medical progress and technological development of the world has led to focus to achieve the best results. Patients with special needs need their families on a daily basis. Automatic bed can make life a bit easier for nurses, with 85 percent of back injuries having to deal with patients. Hopefully this helps to keep it better and healthier. Similarly, the efficient use of resources, nurses and medical personnel has outpaced human efforts, reduced costs and achieved productivity. One of the most important features of the smart bed is the receipt of voice commands and connected to the Internet and also read room temperature and measurement of heartbeat and oxygen level in the blood, and this feature to connect to the network provides comfort and help and independence of the patient.

Zachary Brush *et al* [12] published a paper on **"Design and Control of a Smart Bed for Pressure Ulcer Prevention"**. This work details the design, modeling, simulation, and open loop testing of the actuating mechanism for a smart hospital bed manufactured to prevent the development of bed sores. The use of polynomial curve fitting techniques, trapezoidal velocity propagation, and leadscrew dynamics in the model transform the dynamic modeling and computed torque equations from a simple academic exercise into a viable, applicable control system. Further work on this project would be focused on the implementation of position sensing, more complex user input, and closed-loop feedback on the mechanism. In addition, modeling and design of the pneumatic system is necessary in order to account for the air bladders on top of each plate. Finally, a control system would have to be developed to combine the 84 rods and 28 air bladders into one coordinated patient-manipulating Smart bed system.

Asri Bin Mat Desa *et al* [13] published a paper **on "Designing A Smart Transfer Patient Bed"**. Smart Patient Transfer Bed was developed to help reduce or eliminate back pain among nurses due to transferring patient from one bed to another for medical reasons. By transferring the patient load to the Smart Patient TransferBed, the nurse will not need a lot of energy to carry out the job. This innovation helps nurses a lot especially transferring obese patient. The patient also will not be in pain during the transferring process. It is significant particularly to patient with in orthopedic injury. Minimizing patient's movement during the transfer process could reduce risk of patient's

injury.

AbdallahKassem *et al* [14] proposed a paper on **"MedBed: Smart Medical Bed"**. Med Bed is a smart hospital bed that has mainly 4 components: the Raspberry Pi, the Server, the Website and the Smartphone Application. It is easy to implement and has many great features with a lot of room for even more improvement in the future. It can help the patient at their stay in the hospital and reduce the workload on the nurses. This project tackles the comfort of stay of a patient having difficulties to move with a great response time. Talking has always been the easiest way of communication and it is this capacity that is added to the bed. It represents a remarkable step forward in combining a strictly everyday hospital ordinary process, with a continuously developing device, to yield an additional smooth, easy, and efficient application to be used by anyone who owns a smart phone. With its ease of installation and use, minimum complexity, wide applicability options, and strong feasibility.

Guan-DuoYang *et al* [15] proposed a paper on **"Six-stage Hospital Beds Arrangement Management System"**. Six-stage HBAMS is full of humanity and has been proved to be more practical and efficient than FCFS HBAMS. And the data in the Six-stage FBAMS requires are accessible and calculable.The application of Six-stage HBAMS will help the hospital managers make their decisions more realistic, scientific and free from subjective bias. However, it might be noted that, to achieve a better outcome and estimation, parts of Six-stage HBAMS should be properly modified according to the matter of fact, including but not limited to the selection of indicators, the upper limit of waiting time and the table of priority, all of which are up to the situation of hospital itself.

2.2: PROBLEM STATEMENT

In previous system the movement of bed according to requirement was controlled manually but this system works automatically by using voice i.e., command, given by patient requirement. Also, the monitoring system has been installed in the system such as heartbeat, temperature and alerting switch which has been continuously displayed on LCD. Also, if the patient crosses any normal temperature or heartbeat, one alerts SMS will send to the Doctor or relative person whose number has been saved in the system

and also the buzzer will horn.

2.3: OBJECTIVES

The main objectives of the project are:

1. Movement of hospital bed through Voice commands.
2. Controlling of electrical appliances through voice commands.
3. LCD display for status of devices and heartbeat of the patient.
4. Designing a system for better patient care.
5. Reduce hospital operating costs.

CHAPTER 3

METHODOLOGY

BLOCK DIAGRAM

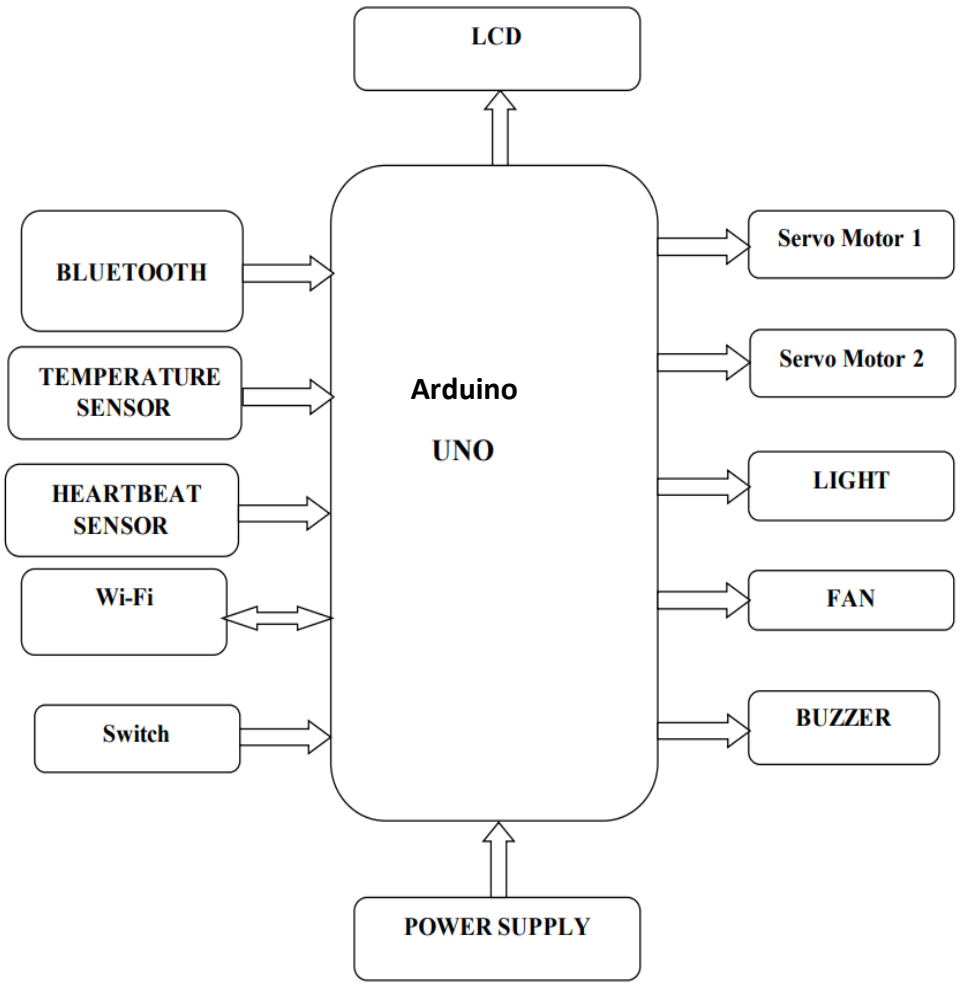


Figure 3.1: Block Diagram of voice actuated hospital bed control, monitoring and alerting system

The block diagram consists of main bed control through voice and monitoring parts. They are temperature and panic. The main part of the system is to control bed which totally

works on command. The command given to the gives is through programming. Total 4 commands has being used they are either up or down head side and leg side. Only one command will work at a time. The use of android phone in the system to record the voice i.e. to give the commands. The Bluetooth of android system is connected to UART Bluetooth what even the command has being recorded it will send to Bluetooth and then Bluetooth will transmit it to microcontroller. As Bluetooth transmitter pin has been used and microcontroller receiver pin has been used. The microcontroller will function according to command it will check in coding and then it will precede the function. Whatever commands has been given by the person will go to the driver IC and then the movement of bed is takes place. To measure the temperature of patient body system uses Temperature sensor which will sense the temperature of the patient body. The temperature which is sensed by Temperature sensor in analog form. The microcontroller will convert it into digital form as it has inbuilt ADC. The measured temperature is in ^{0}C but the displayed temperature is in ^{0}F and ^{0}C by using formula.

The calculated output will give to LCD to display the current temperature of patient. we have set some temperature i.e. 40^{0}C if patient crosses this temperature one alert system will be given to the doctor and buzzer will horn. This is a panic switch which is available nearby patients' bed. If the patient feels any type of panic he/she will push the button. The command will give to the microcontroller. The microcontroller will give two outputs. First is the alert message and second to horn the buzzer. If we need air and just say Fan ON and Fan will be ON. If we want Light and say light ON and light will be ON.

CHAPTER 4

SYSTEM REQUIREMENTS SPECIFICATION

4.1: Software Requirements

- To control the microcontroller, embedded C logic is used to control the motors simultaneously.
- Arduino IDE
- Android Application
- ThingSpeak

4.2: Hardware Requirements

- Regulated Power Supply
- Arduino UNO
- Heartbeat sensor
- Temperature sensor
- Wi-Fi Module
- Bluetooth Module
- LCD Display
- L298
- Buzzer
- Servo Motor
- Relay
- Fan
- Light

CHAPTER 5

IMPLEMENTATION

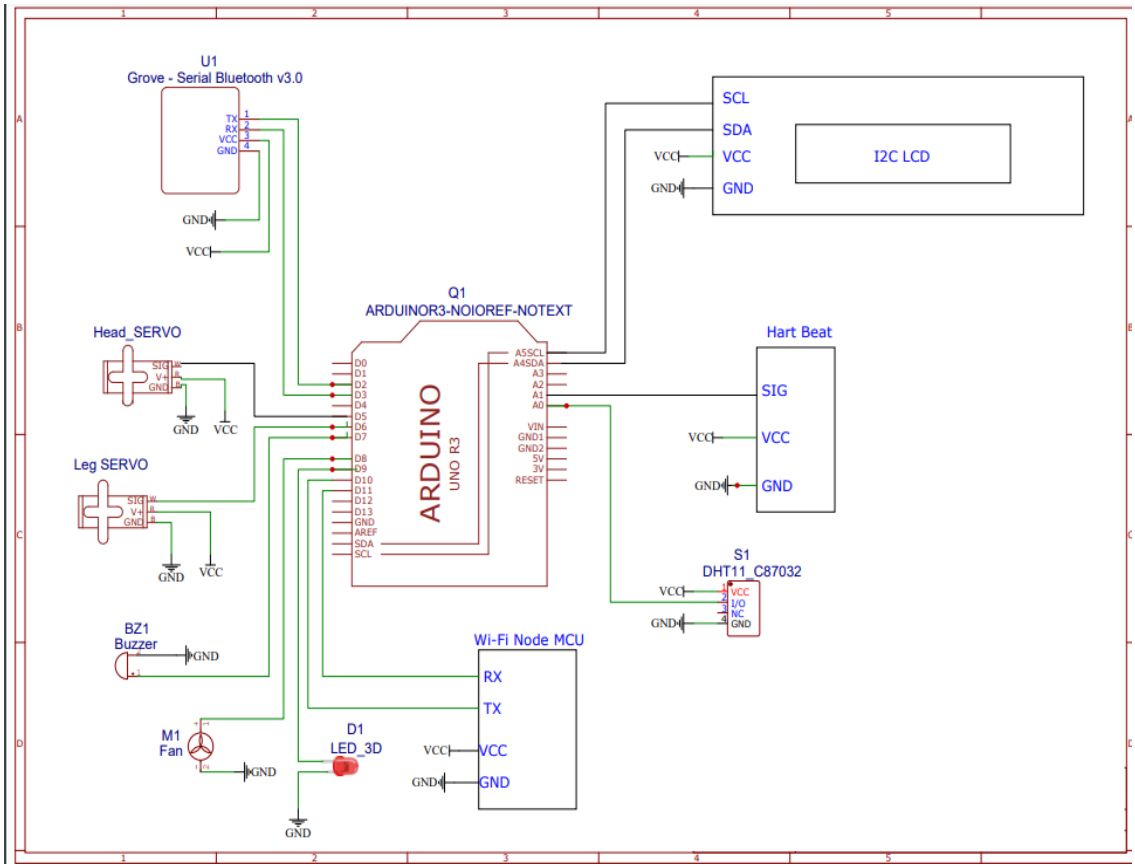


Figure 5.1: Circuit diagram of hospital bed management

5.1: Embedded C

Having decided to use an 8051 processor as the basis of your embedded system, the next key decision that needs to be made is the choice of programming language. In order to identify a suitable language for embedded systems, we might begin by making the following observations:

Computers (such as microcontroller, microprocessor or DSP chips) only accept instructions in 'machine code' ('object codes'). Machine code is, by definition, in the

language of the computer, rather than that of the programmer. All software, whether in assembly, C, C++, Java must ultimately be translated into machine code in order to be executed by the computer.

There is no point in creating 'perfect' source code, if we then make use of a poor translator program (such as an assembler or compiler) and thereby generate executable code that does not operate as we intended. Embedded processors – like the 8051 – have limited processor power and very limited memory available: the language used must be efficient.

To program embedded systems, we need low-level access to the hardware: this means, at least, being able to read from and write to particular memory locations.No software company remains in business for very long if it generates new code, from scratch, for every project. The language used must support the creation of flexible libraries, making it easy to re-use (well-tested) code components in a range of projects.

The language chosen should be in common use. This will ensure that you can continue to recruit experienced developers who have knowledge of the language. It will also mean that your existing developers will have access to sources of information which give examples of good design and programming practice.

Even this short list immediately raises the paradox of programming language selection. From one point of view, only machine code is safe, since every other language involves a translator, and any code you create is only as safe as the code written by the manufacturers of the translator.

C's features are as follows:

It is 'mid-level', with 'high-level' features (such as support for functions and modules), and 'low-level' features (such as good access to hardware via pointers).

It is very efficient.

It is popular and well understood.

Even desktop developers who have used only Java or C++ can soon understand C syntax.

Good, well-proven compilers are available for every embedded processor (8-bit to 32-bit or more).

Experienced staff is available.

Overall, C's strengths for embedded system development greatly outweigh its weaknesses. It may not be an ideal language for developing embedded systems, but it is unlikely that a 'perfect' language will ever be created.

5.2: Arduino IDE

IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go. Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module. It is an officialArduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. It is easily available for operating systems like MAC, Windows, Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.

A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more. Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.

5.3: Android Application

5.3.1: Bluetooth terminal HC-05

HC-05 is a Bluetooth android application used for wireless communication with Bluetooth enabled devices (like smartphone). It communicates with microcontrollers using serial communication (USART). Default settings of HC-05 Bluetooth module can be changed using certain AT commands.

5.3.2: Bluetooth voice

Bluetooth voice is an android application Voice dialing is a feature of most mobile phones. All Plantronics Bluetooth headsets have the ability to initiate voice dialing on the cell phone, but the phone must support this feature. Note that while some mobile phones have the voice dialing feature, they may not allow a Bluetooth headset to initiate it. Refer to your user's manual or contact your cell phone provider for specific information about your phone. If your phone supports voice dialing, you can activate it from the headset by pressing and holding the control button for about two seconds, until you hear a tone.

5.4: Regulated Power Supply Unit

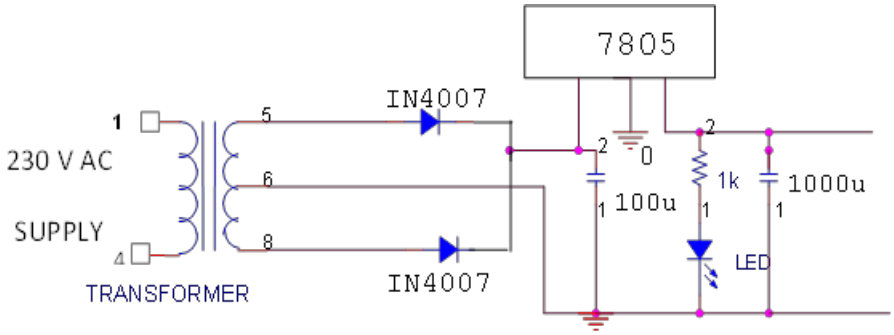


Figure 5.4: Circuit Diagram of power supply

The step-down transformer is provided with Supply of 230v, 50Hz ac signal from main supply board. The transformer is selected based on its output ranges from 10v to 12v.This power supply is mainly used to provide voltage supply of +5v. The transformer is provided with input ac voltage typically 230v, this transformer is used to step the ac voltage down. Initially, capacitor filter is used to produce a dc voltage from ac voltage. This dc voltage usually has some ripple or ac Voltage variation. To remove this ripple voltage a regulator circuit is used and thus the output is regulated dc. A proper number of voltage regulation IC units should be used to produce voltage regulation.

5.4.1: Transformer

A transformer is required to couple the mains to the actual power supply circuit. This is required to isolate the mains from the actual regulated power supply circuit and the other

part of the kit. This isolation eliminates the dame of the kit to any power supply variations or from a faulty shock.

5.4.2: Rectifier

Rectification is a process of conversion of AC to DC. Here, the AC of transformer output is given to the rectifier input, which converts it to DC output. Basically, bridge rectifiers or diodes arranged in bridge called Diode arrangement are used for power supply design. A bridge rectifier makes use of four diodes in a bridge arrangement to achieve full wave rectification. This is a widely used configuration, both with individual diodes wired as shown and with single component bridges where the diode bridge is wired internally

For both positive and negative swings of the transformer, there is a forward path through the diode bridge. Both conduction paths cause current to flow in the same direction through the load resistor, accomplishing full-wave rectification. While one set of diodes is forward biased, the other set is reversing biased and effectively eliminated from the circuit.

5.4.3: Diode Bridge

A diode bridge is an arrangement of four diodes connected in a bridge circuit as shown below, that provides the same polarity of output voltage for any polarity of the input voltage. When used in its most common application, for conversion of alternating current (AC) input into direct current (DC) output, it is known as a bridge rectifier. The diagram describes a diode-bridge design known as a full-wave rectifier or Graetz circuit. This design can be used to rectify single phase AC when no transformer center tap is available

5.4.4: Bridge Rectifier Circuit

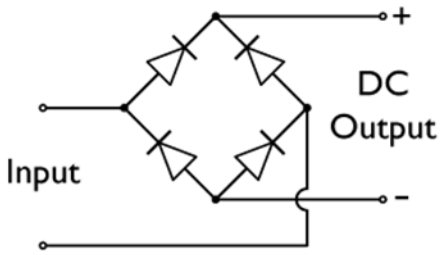


Figure 5.4.4: Bridge rectifier circuit

The essential feature of this arrangement is that for both polarities of the voltage at the bridge input, the polarity of the output is constant.

5.4.5: Capacitors

Capacitive filters are used stabilized or perfect regulation of the voltage. The capacitive filters are opted because, they are more efficient. But they are also more costly.

Different types of capacitors are:

1. Ceramic capacitors.
2. Electrolyte capacitors.
3. Paper/Mica capacitors.
4. Silver capacitors.
5. Tantalum capacitors.

Ceramic, Paper/Mica, Silver are nonpolarized capacitors. Electrolyte and Tantalum are polarized capacitors. For high frequency, Ceramic capacitors are used. For low frequencies, Electrolyte capacitors are used.

5.4.6: Linear regulated IC's

Linear regulated IC's are used for best regulated output. The output from these regulated IC's is given to microcontroller and DTMF receiver. These linear regulated IC's are self protective (any accidental shot circuit in the IC is grounded automatically).

- 78xx series ICs are used for '+ve' supply.
- 79xx series ICs are used for '-ve' supply.
- 78xx and 79xx series ICs are fixed voltage regulators.
- LM 317 is a variable voltage regulator.

5.5:ARDUINO UNO

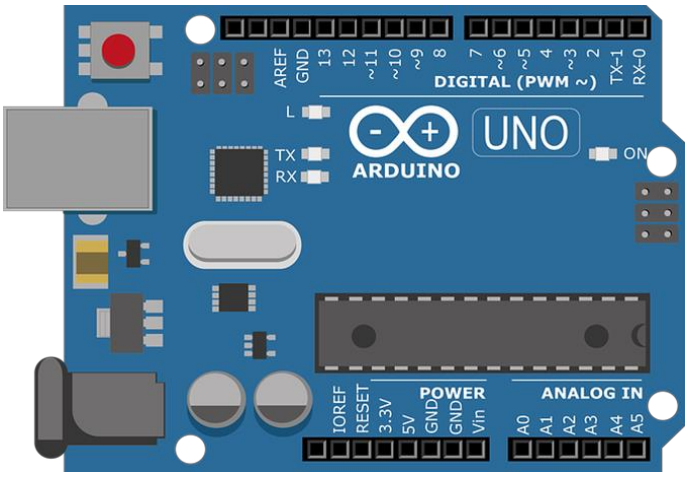


Figure 5.5: Arduino UNO

Arduino UNO Microcontroller Board depends on the Atmel ATmega328 8-bit Microcontroller (MCU). Arduino Uno highlights 14 digital input/output pins,six analog inputs, and a 16MHz quartz crystal. Uno also includes a USB association, a power jack, serial port, and a reset button. This Arduino MCU board contains everything the user needs to support the MCU. The user can begin by interfacing the Uno to a PC with a USB cable or by driving it with an AC-to-DC connector or battery. The Uno can be modified with Arduino Software (Integrated Development Environment). The Arduino is shown in the figure 2. The ATmega328 on the Uno comes pre-programmed with a bootloader that enables the user to transfer new code to the MCU without the utilization of an external hardware programmer.

5.6: LCD Display

Figure 5.6: LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and locate an extensive variety of uses. A 16x2 LCD display is extremely essential module and is regularly utilized as a part of different gadgets and circuits. These modules are favored more than seven segments and other multi section LEDs. The reasons being: LCDs are economic; easily programmable; have no confinement of showing uncommon and even custom characters. A 16x2 LCD implies it can show 16 characters for each line and there are 2 such lines.

5.7: LM-35 Temperature Sensor

Figure 5.7: LM-35 Temperature Sensor

Sensor used is LM35.Integration of this temperature sensor with the Microcontroller to measure the temperature. The microcontroller will then read this measured value from the LM35 and translate into degrees Fahrenheit and Celsius, which we will be able to read from the Microcontroller to the LCD. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The output of sensor converted to digital that easy connecting with microcontroller.

It has two main part one is used for temperature measurement and other is used for humidity measurement. It also contain on IC which is used to send data to other Microcontroller.

5.8:Buzzer

Figure 5.8: Buzzer

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave ovens, & game shows. The word "buzzer"

comes from the rasping noise that buzzers made when they were electromechanical devices, operated from stepped down AC line voltage at 50 or 60 cycles. Other sounds commonly used to indicate that a button has been pressed are a ring or a beep. The buzzer is simplest sort of doorbell, an electromagnet is used to operate a self-interrupting circuit. A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystrokes.

5.9: Servo Motor

Figure 5.9: Servo motor

A DC motor relies on the fact that like magnet poles repels and unlike magnetic poles attracts each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°

5.10: L298N Motor drive

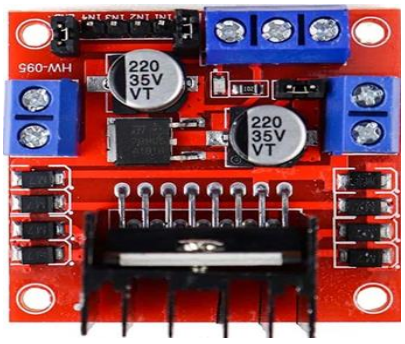


Figure 5.10: L298N Motor drive

The L298N is a dual-channel H-Bridge motor driver capable of driving a pair of DC motors. That means it can individually drive up to two motors making it ideal for building two-wheel robot platforms. The L298N motor driver module is powered through 3-pin 3.5mm-pitch screw terminals. It consists of pins for motor power supply (Vs), ground and 5V logic power supply (Vss). The L298N motor driver IC actually has two input power pins viz. 'Vss' and 'Vs'.From Vs pin the H-Bridge gets its power for driving the motors which can be 5 to 35V. Vss is used for driving the logic circuitry which can be 5 to 7V. And they both sink to a common ground named 'GND'.

5.10.1: Controlling a DC Motor

In order to have a complete control over DC motor, we have to control its speed and rotation direction. This can be achieved by combining these two techniques.

- PWM – For controlling speed
- H-Bridge – For controlling rotation direction.

5.10.2: PWM – For controlling speed

The speed of a DC motor can be controlled by varying its input voltage. A common technique for doing this is to use PWM (Pulse Width Modulation). PWM is a technique where average value of the input voltage is adjusted by sending a series of ON-OFF pulses.

5.10.3: H-Bridge-for controlling rotation direction

The DC motor's spinning direction can be controlled by changing polarity of its input voltage. A common technique for doing this is to use an H-Bridge. An H-Bridge circuit contains four switches with the motor at the center forming an H-like arrangement. Closing two particular switches at the same time reverses the polarity of the voltage applied to the motor. This causes change in spinning direction of the motor.

Using the direction control pins, we can control whether the motor spins forward or backward. These pins actually control the switches of the H-Bridge circuit inside L298N IC.

The module has two direction control pins for each channel. The **IN1** and **IN2** pins control the spinning direction of the motor A while **IN3** and **IN4** control motor B.

The spinning direction of a motor can be controlled by applying either a logic HIGH (5 Volts) or logic LOW (Ground) to these inputs. The below chart illustrates how this is done.

Table 5.10.3: Spinning direction of motor

Input1	Input2	Spinning Direction
Low(0)	Low(0)	Motor OFF
High(1)	Low(0)	Forward
Low(0)	High(1)	Backward
High(1)	High(1)	Motor OFF

5.11: Relay Module

Figure 5.11: Relay Module

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

5.12:Fan

Figure 5.12: Fan

An electric fan is an electric motor to which the blats are fixed so that then the motor of the fan rotates, the blades through the air A D.C fan are of DC series motor in which the rotating part armature is connected in series with the stationary part and when the current is given to the motor, the magnetic field is set up in the field winding which experience a force in the armature to move it at right angle to the feed and blades attached with shaft of armature displaced the air.

5.13: Light

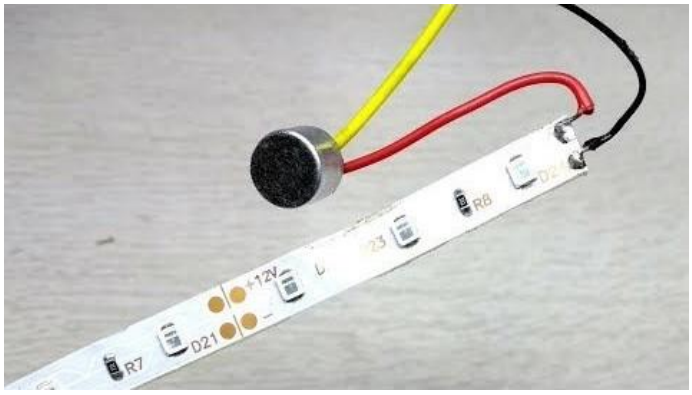


Figure 5.13: Light

Light or visible light is electromagnetic radiation within the portion of the electromagnetic spectrum that can be perceived by the human eye. Visible light is usually defined as having wavelengths in the range of 400–700 nanometers (nm), or 4.00 × 10 to

7.00 × 10 m, between the infrared (with longer wavelengths) and the ultraviolet (with shorter wavelengths).

5.14: WI-FI Module

Figure 5.14: WI-FI Module

The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existanceinterfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

5.15: Heartbeat Sensor

Figure 5.15: Heartbeat Sensor

The Green Easy pulse sensor heart beat sensor HRM2511E is DIY pulse sensor that is designed for hobbyists and educational applications. It is used to illustrate the principle of phot plethysmography (PPG), PPG is a non-invasive technique for detecting the cardiovascular pulse wave from a fingertip. The esay pulse sensor uses a transmission mode PPG probe (HRM-2511E) sensor.

This Sensor uses an infrared light source to illuminate the finger on one side, and On the other side of the sensor there is a photodetector that measures small variations in the transmitted light intensity due to changes in blood volume inside the tissue.

- The onboard components & instrumentation provide a clean and filtered analog PPG waveform.
- The on-board LED also indicates the digital pulse output.
- The analog and digital signals are both synchronous with the heartbeat.

Features of Easy Pulse Sensor:

- Stable PPG signal output (Generate Phot plethysmography PPG with Arduino)
- MCP6004 Op amp based instrumentation with rail-to-rail output capability for maximum output signal swing
- Separate analog& digital outputs
- Potentiometer gain control for the analog output
- Pulse width control for the digital output

- Additional test points on board for analyzing signals at different stages of instrumentation
- Output as +3.3V & +5V
- Simple to interface Easy Pulse Sensor with Arduino& any other Microcontroller.

5.16: ThingSpeak

ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize, and analyze live data streams. Once you send data to ThingSpeak from your devices, you can create instant visualizations of live data without having to write any code. With MATLAB® analytics inside ThingSpeak, you can write and execute MATLAB code to perform more advanced preprocessing, visualizations, and analyses. Get started with building your IOT systems without setting up servers or developing web software.

The Integration with The Things Network allows you to seamlessly forward data from The Things Network to ThingSpeak for analysis and visualization.

Setup ThingSpeak

1. Create a free MathWorks account or sign into ThingSpeak using an existing account.
2. Select the ThingSpeak channel you want your data to stream into. See Collect Data in a New Channel for help creating a new channel.
3. Record the following for the selected channel:
   - Channel ID, which is listed at the top of the channel view.
   - Write API key, which can be found on the API Keys tab of your channel view.

Create Integration on The Things Network

1. In The Things Network Console, go to your application and click on Integrations > add an integration > ThingSpeak.
2. Enter your write API key in the Authorization field and your channel ID in the Channel ID field.

5.16: Flow chart of voice actuated hospital bed using Arduino IDE

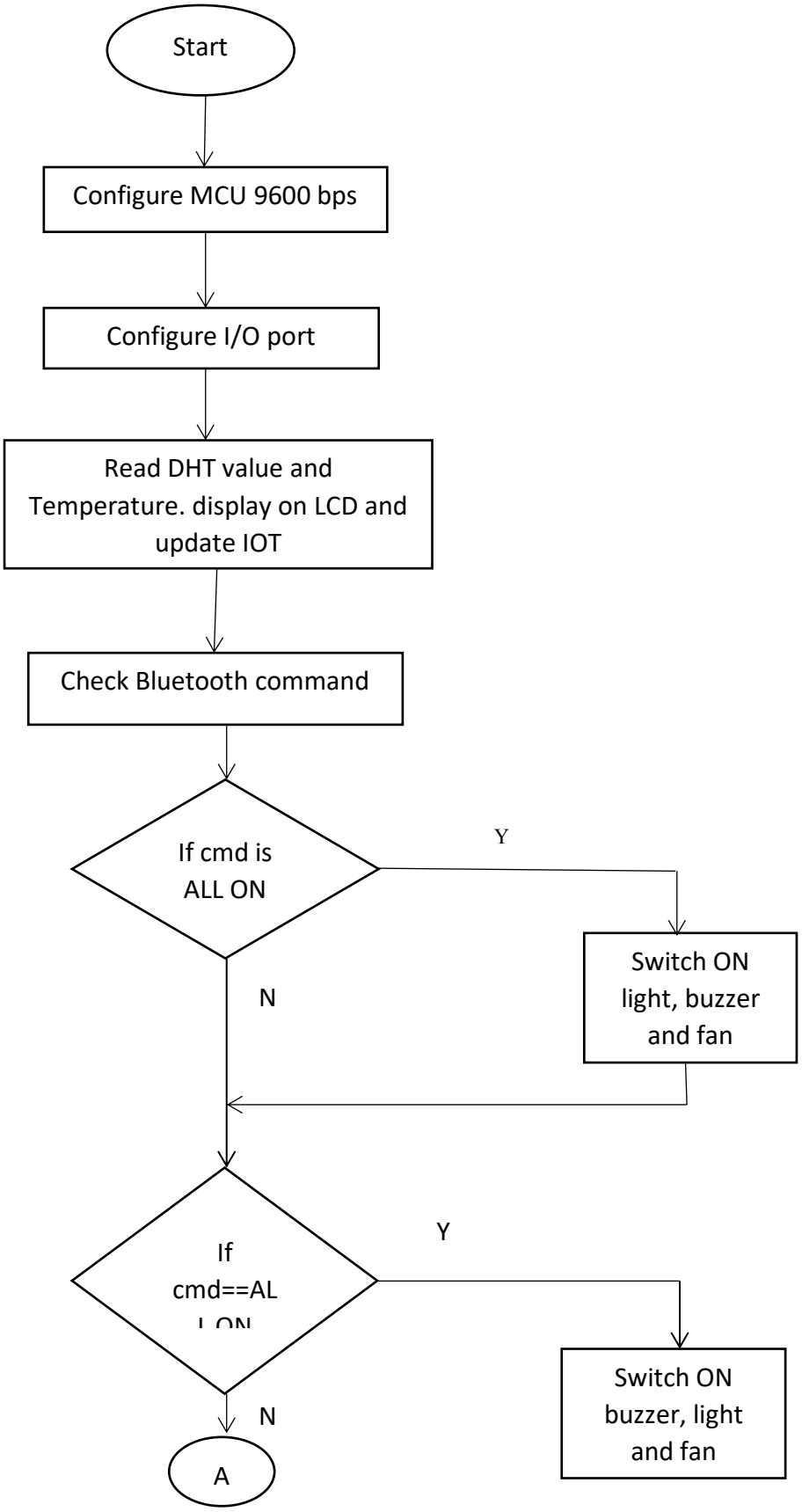


Figure 5.16: Flow chart of voice actuated hospital bed using Arduino IDE

5.17: Flow chart for working of light and fan

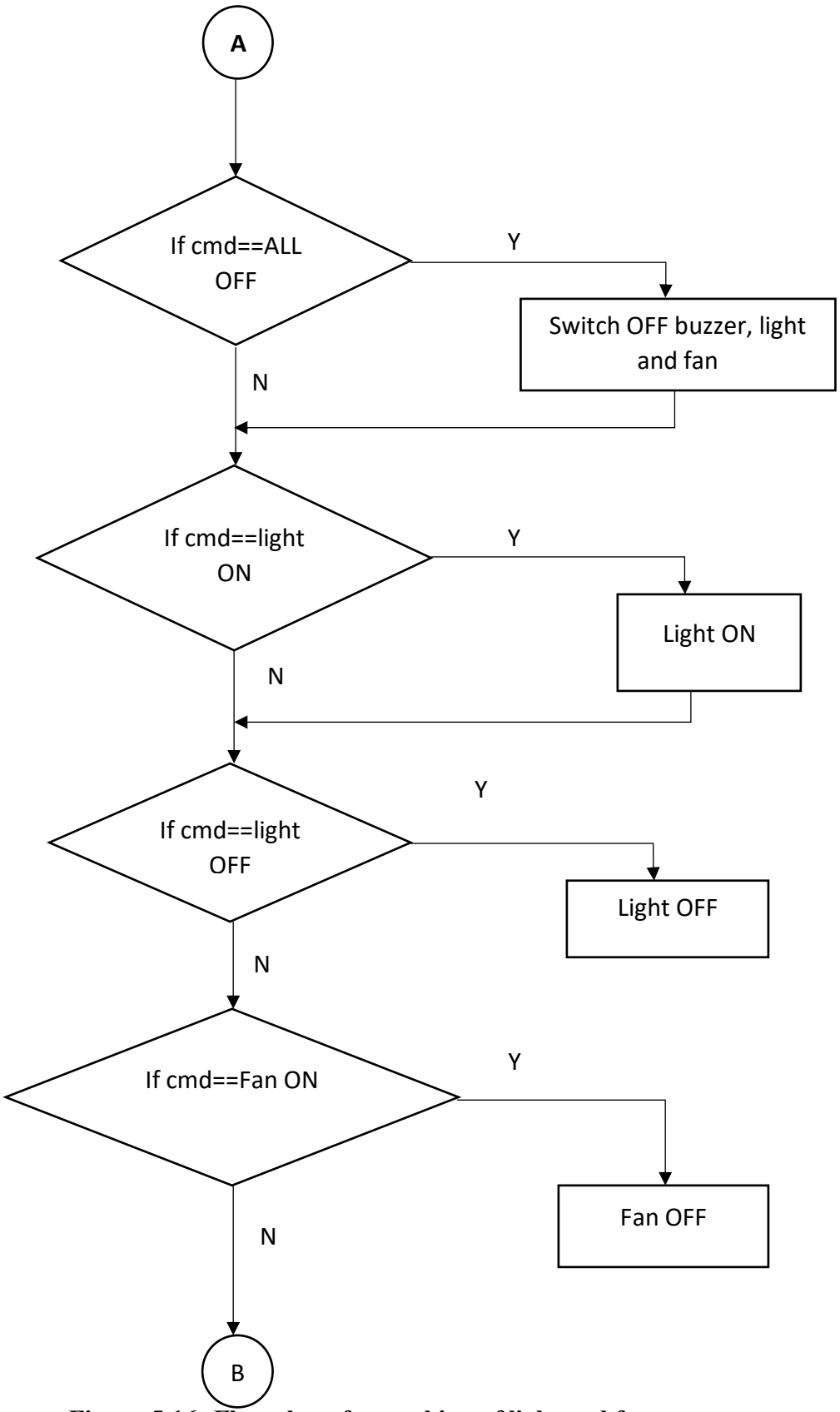


Figure 5.16: Flow chart for working of light and fan.

5.18: Flow Chart for buzzer, head up or down and leg up or down

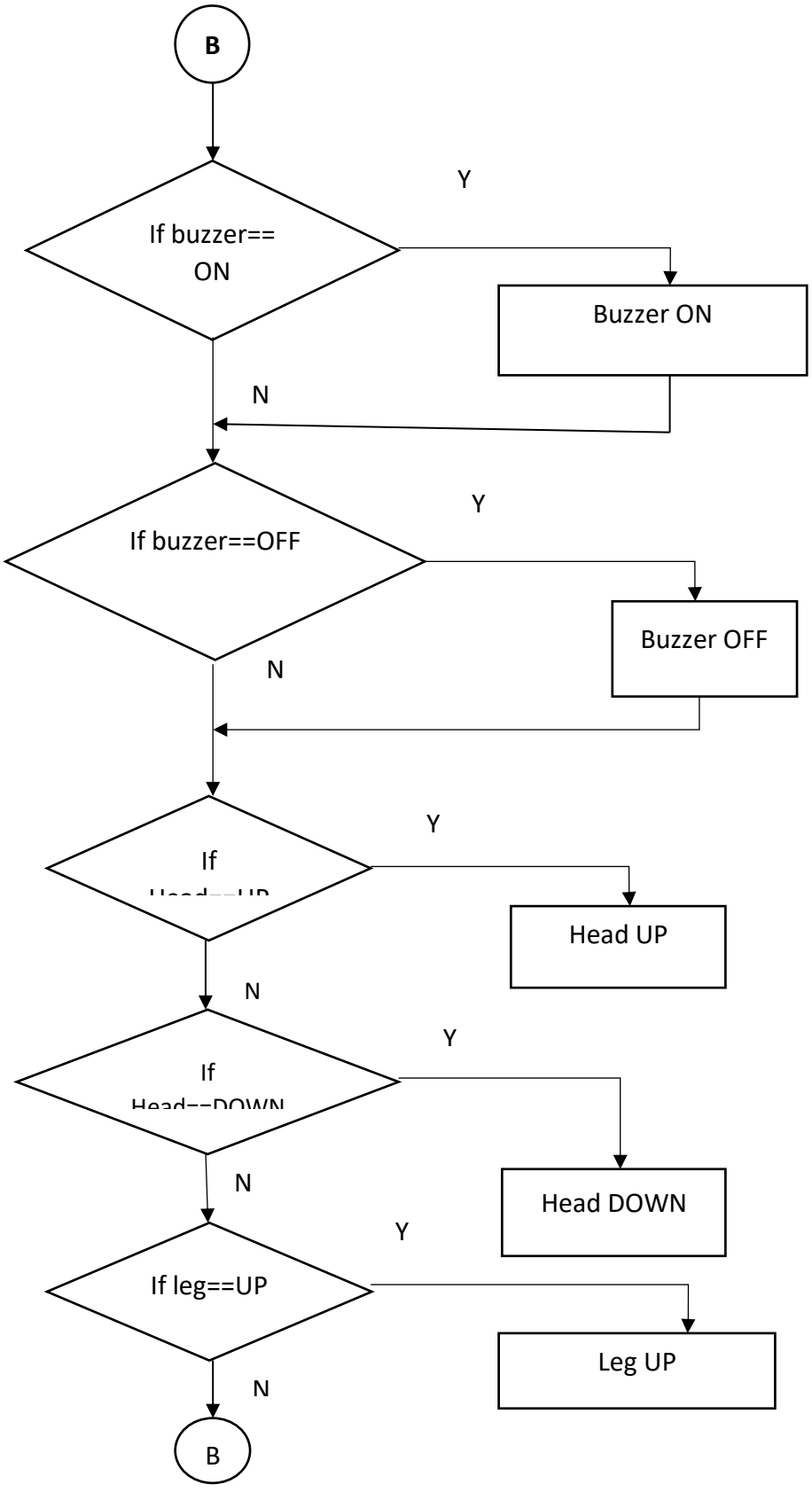


Figure 5.18 Flow chart for buzzer, head up or down and leg up or down

5.19: Flow chart reading heartbeat

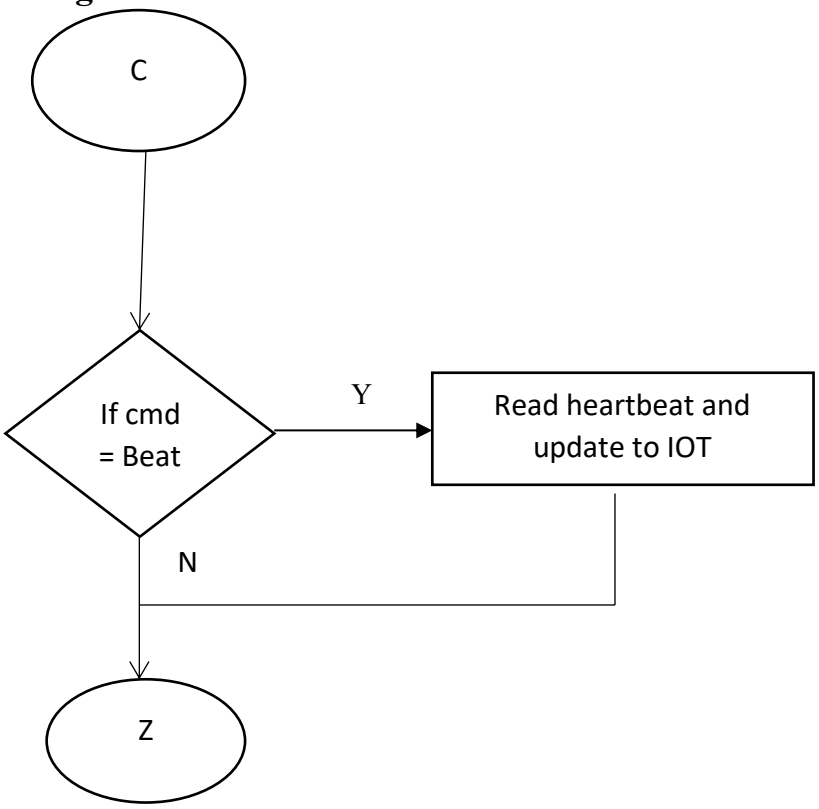
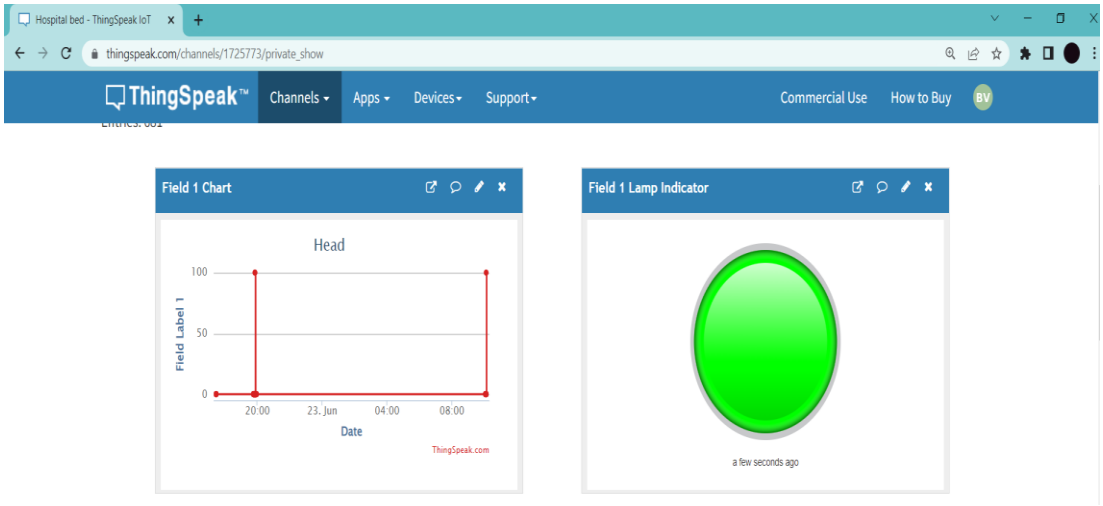
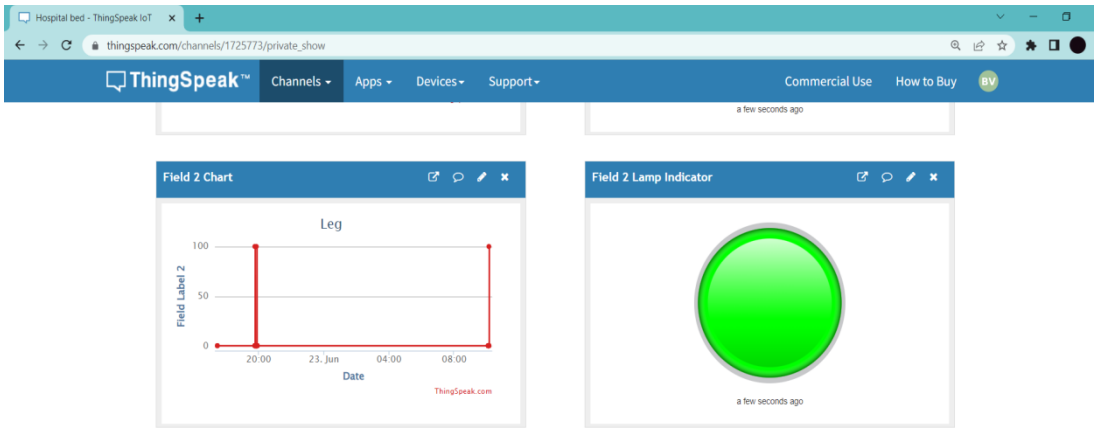


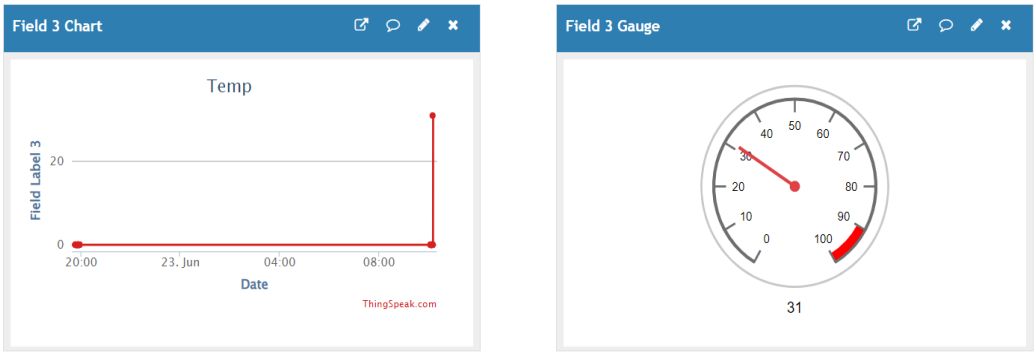
Figure 5.19: flow chart for reading heartbeat

CHAPTER 6

RESULT ANALYSIS







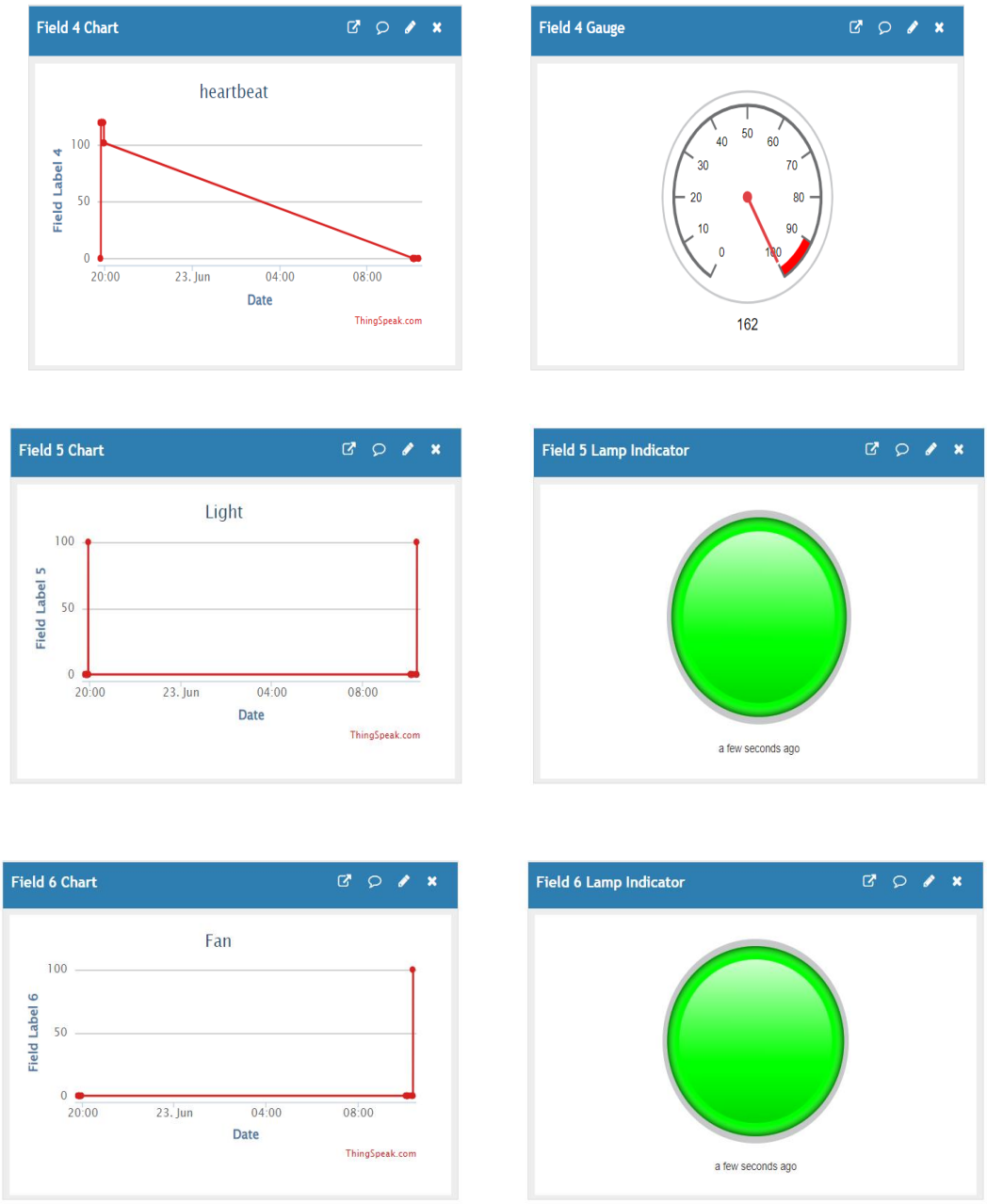


Figure 6.1: Result analysis

ThingSpeak is used for monitoring purpose. If any command is given through voice or by manually the ThingSpeak will update the result for every 15 seconds.

CHAPTER 7

ADVANTAGES AND DISADVANTAGES

7.1: ADVANTAGES

- People can speak, but not in all cases can they type or write efficiently.
- Permits the verification of a speakers identity.
- Light and fan can be operated with voice command.
- Permits phone to serve as a computer terminal.

7.2: DISADVANTAGES

- It does not understand the unrecognizable sentences when spoken.
- Could confuse computer by speaking something to another human.
- Lack of privacy if other humans are present.
- Sensitive to dialects and differences in pronunciation.
- Interfering noise can make accurate recognition difficult.

CHAPTER 8

APPLICATIONS

Applications of voice actuated hospital bed control, monitoring and alerting system are,

- It is used in hospital to control bed automatically without any manual use.
- Very helpful for the self monitoring patients in home.

CHAPTER 9

CONCLUSION AND FUTURE SCOPE

9.1: CONCLUSION

The developed intelligent bed actuated using voice commands, put the bed in amotion responding to the user's voice and also the bed inclined and reclined at precise angles. With the help of stress and load analysis, the components requirements were understood though revisiting for conceptualization was necessary.ATmega328 was used to control the logic level of this system which drove the motor driver circuit for every voice input from the user was initiated. In this project, the desired angles were already decided for easy development of the concept which could be further modified according to the user. The entire system functionedusing C logic for which Arduinowas compatible. Chip HM2007 is also Arduino compatible making the system a whole lot easier for implementation. This approach reduced the complexity of the project thereby decreasing the cost and increasingefficiency. Bugs and debugs were the common issues faced during the implementation of the Smart Bed which includes both hardware and electronic aspects. The Software requirements with a little team effort made us achieve the desired output. The load analysis of the entire subsystem consumed enough time due to the special mechanism introduced by us making the bed hassle-free and less complex. The challenges faced during the misalignment of the bed made us overcome about 80% of the problems. The cost estimation of the intelligent bed is nearly around Rs.8000/-. Most of the patients will be benefitted using this prototype since its simple, user-friendly and cost-effective. Extension of the same prototype will make it more advance and help us combat the disadvantages faced. Overall, our proposed prototype of the Hospital Bed is made eco friendly without any signals which are hazardous for the Hospital environment even after the system is wireless.

9.2: FUTURE SCOPE

- Increasing the precision of the motors for slow movement of the bed.

- Introducing more Artificial Intelligence interfaced systems so as to avoid electronics on the whole which is a hazardous environment adding on to the disadvantages of the module.
- The speech processing chip can be completely avoided and instead mind-ware controls can be introduced which overcomes the disability of speaking and other special disorders.
- Advanced control systems like robots can be introduced for patient care.
- Add bed sensors such as heartbeat and temperature sensors.
- Development of the application so that the doctor can write medications and prescriptions, follow up on the patients medication and follow his/her condition through the added measuring devices.

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