

SMART BRAILLE BASED COMMUNICATION DEVICE FOR VISUALLY IMPAIRED PERSONS

A Project Report Phase - II

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in Electronics and Communication Engineering

By

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(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

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BONAFIDE CERTIFICATE

This is to certify that this Final Project Report is the bonafide work of **ROSHAN S (39130381)** and **RAKESH K (39130367)** who carried out the project entitled **"SMART BRAILLE BASED COMMUNICATION DEVICE FOR VISUALLY IMPAIRED PERSONS"** under our supervision from November 2022 to April 2023.

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ABSTRACT

Communication plays a vital role for communicating one person to another person. Human beings who have problem in their vision and hearing, cannot able to communicate one people to another. Here is the some of the unique languages available for the deaf-blind persons which includes tactile signing, Braille, moon etc. Among these communication for visual and hearing persons one of the most important communication they are using this Braille patterns/Keypad. Braille contains arrangement of dots which form letters, numbers and punctuation marks. The Braille pattern convert this alphanumeric pattern to braille forms. Braille is nothing but it is a system of reading and writing by touch used by the blind. It consists of arrangement of dots which make up letters of the alphabet, numbers, and punctuation marks. In this project an abled person is sending some messages through the deaf blind person through the vibration motors in the palm of the deaf blind persons they can able to sense the message through these motors on the palm after that through matrix keypad they are pressing one button with that the braille keypad starts vibration with that the blind person can able to identify with that LCD board is attached deaf person can able to seen the messages also in this proposed project we are implementing that deaf blind person can able to communicate with the abled person through the matrix keypad of predefined strings installed in arduino uno board.

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LIST OF ABBREVIATIONS

LCD	Liquid Crystal Display
RAM	Random Access Memory
ROM	Read Only Memory
RTOS	Real Time Operating System
ADC	Analog Digital Converter
IDE	Integrated Development Environment
LAN	Local Area Network
WAN	Wide Area Network
TCP/IP	Transmission Control Protocol/Internet Protocol
RSIC	Resilient Sound Isolation Clip
GSM	Global System for Mobile communication
GPS	Global Positioning System
ESD	Electrostatic Discharge
CMOS	Complementary Metal Oxide Semiconductor
MCU	Microcontroller Unit

CHAPTER 1

INTRODUCTION

1.1 GENERAL INTRODUCTION

In today's world communication plays a vital role in every one's life especially for deaf-blind persons, whereas normal people communicate via mobiles etc. So let's see the deaf-blind people's communication through abled person's.

Deaf-blind people usually communicate by sign language, tadoma, tactile finger spelling, braille etc. Usually for deaf-blind person, without any knowledge of the sign languages. The most common languages used by deaf-blind person is of braille format. In this project deaf person can able to see the screen that is nothing but LCD display but the blind person understand via touching the braille motor .The braille format contains six motors that are arranged one after the another ,when the abled persons is sending the messages deaf-blind persons understand via vibration RF LINK in their palm through this vibration in braille motors started after that deaf-blind persons holding the D button for understanding the numbers one after the another and also incoming messages they can identify.

People with deaf-blindness have both hearing and visual impairments. Some deaf-blind people have profound blindness and deafness, while others can use their hearing and vision to varying extents. This condition can make it challenging for affected individuals to communicate with others. Luckily, recent advances in communication technology make it easier for deaf-blind people to communicate with and understand other people.

The main objective of this project is to given reply messages from the unabled persons through the abled persons is by pressing matrix keypad which contains predefined strings, with that the deaf-blind persons are communication one after the another.

1.2 MICROCONTROLLER

Even at a time when Intel presented the first microprocessor with the 4004 there was already a demand for microcontrollers: The contemporary TMS1802 from Texas Instruments, designed for usage in calculators, was by the end of 1971 advertised for applications in cash registers, watches and measuring instruments. The TMS 1000, which was introduced in 1974, already included RAM, ROM, and I/O on-chip and can be seen as one of the first microcontrollers, even though it was called a microcomputer. The first controllers to gain really widespread use were the Intel 8048, which was integrated into PC keyboards, and its successor, the Intel 8051, as well as the 68HCxx series of microcontrollers from Motorola. Today, microcontroller production counts are in the billions per year, and the controllers are integrated into many appliances we have grown used to, like

- Household appliances (microwave, washing machine, coffee machine, etc.,)
- Telecommunication (mobile phones)
- Automotive industry (fuel injection, ABS, etc.,)
- Aerospace industry
- Industrial automation.

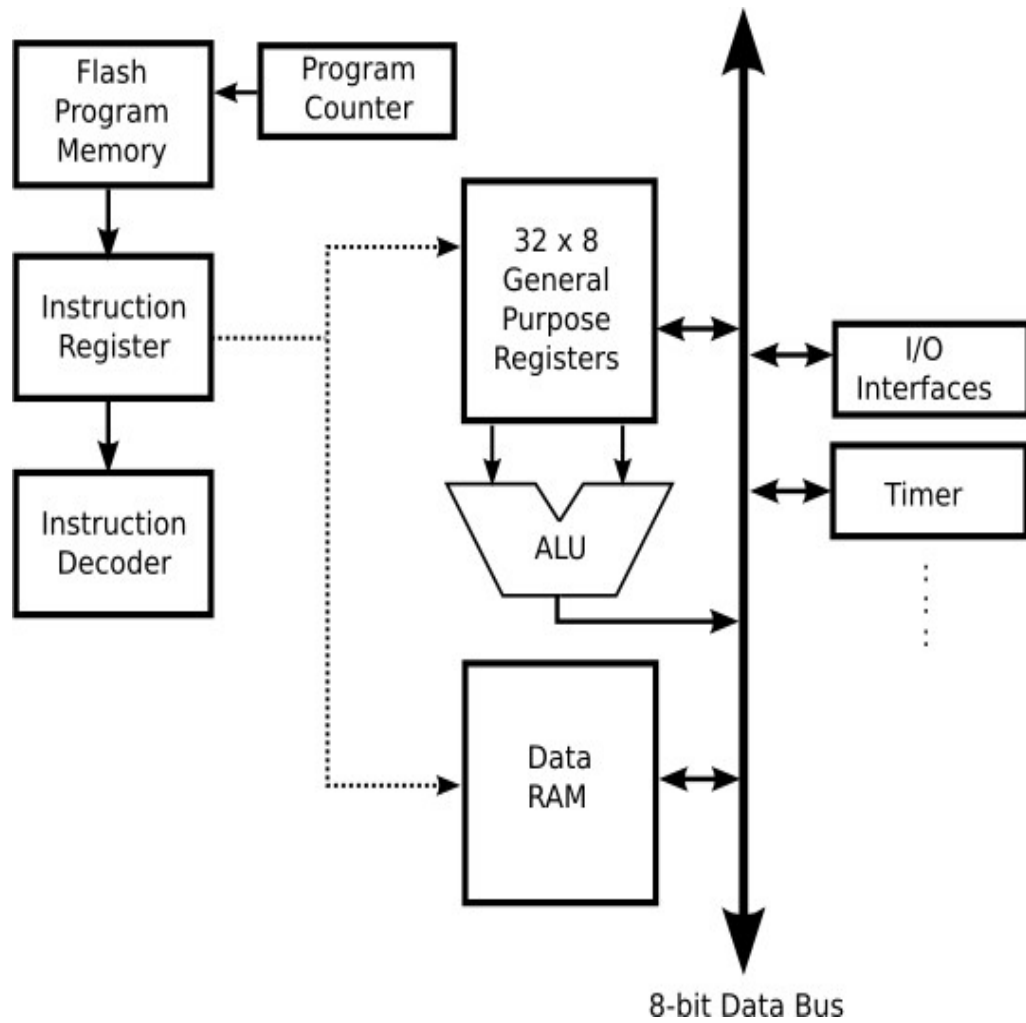


Fig: 1.1 Basic Architecture of Microcontroller

1.3 EMBEDDED SYSTEM

It can also be defined as a way of working, organizing or doing one or many tasks according to a fixed plan. For example, a watch is a time displaying system. Its components follow a set of rules to show time. If one of its parts fails, the watch will stop working. So we can say, in a system, all its subcomponents depend on each other. An embedded system is a system that has software embedded into computer-hardware, which makes a system dedicated for an application or specific part of an application or product or part of a larger system. An embedded system is one that has a dedicated purpose software embedded in a computer hardware. It is a dedicated computer based system for an application or product. It may be an independent system or a part of large system. Its software usually embeds into a ROM (Read Only Memory) or flash.

As its name suggests, Embedded means something that is attached to another thing. An embedded system can be thought of as a computer hardware system having software embedded in it. An embedded system can be an independent system or it can be a part of a large system. An embedded system is a microcontroller or microprocessor based system which is designed to perform a specific task. For example, a fire alarm is an embedded system; it will sense only smoke. An embedded system has three components such as hardware, application software, Real Time Operating system (RTOS) that supervises the application software and provide mechanism to let the processor run a process as per scheduling by following a plan to control the latencies. RTOS defines the way the system works. It sets the rules during the execution of application program. A small scale embedded system may not have RTOS. So we can define an embedded system as a Microcontroller based, software driven, reliable, real-time control system.

In an embedded system the following components such as sensor, analog to digital converter(ADC), processor and ASICs, digital to analog converter, actuator. The sensor is used to measure the physical quantity and converts it to an electrical signal which can be read by an observer or by any electronic instrument like an A2D converter. A sensor stores the measured quantity to the memory. Analog-to-digital converter converts the analog signal sent by the sensor into a digital signal. Processors process the data to measure the output and store it to the memory.

1.3.1 CHARACTERISTICS OF EMBEDDED SYSTEM

- Single-functioned– An embedded system usually performs a specialized operation and does the same repeatedly. For example: A pager always functions as a pager.
- Tightly constrained– All computing systems have constraints on design metrics, but those on an embedded system can be especially tight. Design metrics is a measure of an implementation's features such as its cost, size, power, and performance. It must be of a size to fit on a single chip, must perform fast enough to process data in real time and consume minimum power to extend battery life.
- Reactive and Real time– Many embedded systems must continually react to changes in the system's environment and must compute certain results in real time without any delay. Consider an example of a car cruise controller; it continually monitors and reacts to speed and brake sensors. It must compute acceleration or de-accelerations repeatedly within a limited time; a delayed computation can result in failure to control of the car.
- Microprocessors based– It must be microprocessor or microcontroller based.
Memory– It must have a memory, as its software usually embeds in ROM. It does not need any secondary memories in the computer.
- Connected– It must have connected peripherals to connect input and output devices.
- HW-SW systems – Software is used for more features and flexibility.
Hardware is used for performance and security.
- Frequently connected to physical environment through sensors and actuators,
- Hybrid systems (analog + digital parts).
- A real-time system must react to stimuli from the controlled object (or the operator) within the time interval dictated by the environment.
- For real-time systems, right answers arriving too late (or even too early) are wrong.
- All other time-constraints are called soft.

- A guaranteed system response has to be explained without statistical arguments
- Reliability, maintainability, safety and security.
- Dedicated functions.
- Dedicated complex algorithms.
- Dedicated and other user interfaces for the application.

1.3.2 CLASSIFICATION OF EMBEDDED SYSTEMS

Embedded systems can be classified into different types based on performance, functional requirements and performance of the microcontroller.

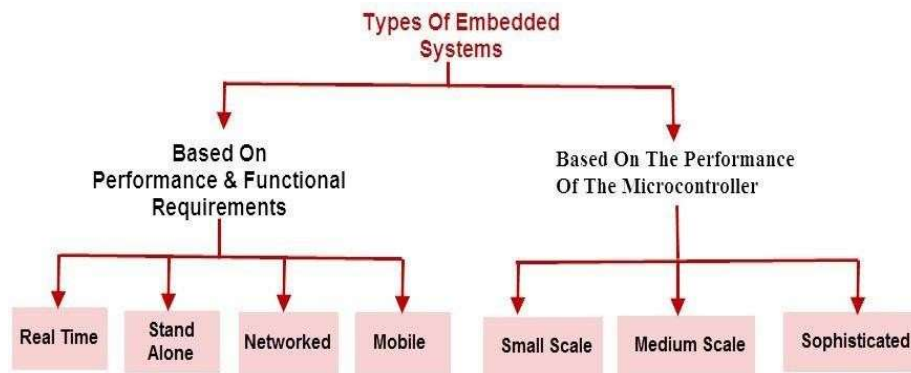


Fig: 1.2 Types of Embedded Systems

- **Stand alone embedded systems-** Does not require a host system like a computer, it works by itself. It takes the input from the input ports either analog or digital and processes, calculates and converts the data and gives the resulting data through the connected device-Which either controls, drives and displays the connected devices. Examples for the stand alone embedded systems are mp3 players, digital cameras, video game consoles, microwave ovens and temperature measurement systems.
- **Real time embedded systems-** A real time embedded system is defined as, a system which gives a required o/p in a particular time. These types of embedded systems follow the time deadlines for completion of a task. Real time embedded systems are classified into two types such as soft and hard real time systems

- **Networked embedded systems-** These types of embedded systems are related to a network to access the resources. The connected network can be LAN, WAN or the internet. The connection can be any wired or wireless. This type of embedded system is the fastest growing area in embedded system applications. The embedded web server is a type of system wherein all embedded devices are connected to a web server and accessed and controlled by a web browser. Example for the LAN networked embedded system is a home security system wherein all sensors are connected and run on the protocol TCP/IP.

- **Mobile embedded systems-** Mobile embedded systems are used in portable embedded devices like cell phones, mobiles, digital cameras, mp3 players and personal digital assistants, etc. The basic limitation of these devices is the other resources and limitation of memory.

Embedded Systems are classified into three types based on the performance of the microcontroller such as:

- **Small scale embedded systems-** These types of embedded systems are designed with a single 8 or 16-bit microcontroller, that may even be activated by a battery. For developing embedded software for small scale embedded systems, the main programming tools are an editor, assembler, cross assembler and integrated development environment (IDE).

- **Medium scale embedded systems-** These types of embedded systems design with a single or 16 or 32 bit microcontroller, RISCs or DSPs. These types of embedded systems have both hardware and software complexities. For developing embedded software for medium scale embedded systems, the main programming tools are C, C++, JAVA, Visual C++, RTOS, debugger, source code engineering tool, simulator and IDE.

- ***Sophisticated embedded systems-*** These types of embedded systems have enormous hardware and software complexities, that may need ASIPs, IPs, PLAs, scalable or configurable processors. They are used for cutting-edge applications that need hardware and software Co-design and components which have to assemble in the final system.

1.4 OBJECTIVE

- To design a Braille pattern using vibration motors
- Convert text message into Braille pattern
- To design a Braille patterned keypad
- System will reach the person through wireless
- Deaf-blind person can able to communicate with each other

CHAPTER 2

LITERATURE SURVEY

2.1 LITERATURE SURVEY

Louis Braille (4 January 1809 – 6 January 1852) was a French educator and an inventor of a system of reading and writing for use by the visually impaired, his system remains known worldwide simply as Braille. Braille consists of a system of six or eight possible dot combinations that are arranged in a fixed matrix, called a cell. Every dot can be set or cleared, giving 61 combinations in six-dot & 256 combinations in eight-dot Braille. All dots of a Braille page should fall on the intersections of an orthogonal grid. When texts are printed double-side (recto-verso), the grid of the verso text is shifted so that its dots fall in between the recto dots. Braille has a low information density. An average page of 25x 29 cm can have 32 characters on a line & 27 lines in a page. A typical dot has a diameter of 1.8 mm. This project presents a solution to such a problem, making learning process for an unsighted person easy. As all textbooks will not be available in Braille script as well as Audio recordings of all textbooks are not available. We will take the image of content in the textbook and it will be reproduced as Braille script for persons who are blind.

2.2 RELATED PAPERS & DESCRIPTIONS

Ramirez-Garibay. F, et al., proposed a model which uses USB keyboard to enter the message which is in turn processed by a Raspberry Pi controller. A 16 cell refreshable Braille display is used to display the text given by the user in the form of Braille language, so that the disabled person can sense the message.

A speaker is also attached with this system, so that the person who is only blind can know the message by hearing it.

A vibration motor is used as an alert system for the deaf blind people to indicate that a message has been received.

Shylaja. R, et al., in their model, has used a bluetooth module (HC-05) which is interfaced with an Arduino Mega microcontroller. Whenever a message is sent via bluetooth, present in the mobile phone to the communication device, the processor will convert the message to braille and will send the braille pattern to the vibration motor which is arranged in braille cell format. Thus the corresponding motors will be raised up according to the received text. A 16x2 LCD display is also used to display the message and a piezo buzzer acts as an indicator whenever a message is received.

Sibila. R, et al., designed a software system for the conversion of English words, numbers and special characters into braille format. The inputs which are opened in a folder is read and it's corresponding braille format representation is assigned by MATLAB simulator by comparing the input characters with a look up table which contains the braille pattern for all 26 English alphabets, 10 digits and some special characters. The device stores the output text as a file, which can be printed as a Braille dots.

Saraswathi. Y, et al., in their paper designed a device which contains a GSM module which is interfaced with an Arduino UNO microcontroller. When the message is received in the GSM module from the mobile phone corresponding braille characters will be assigned by the controller and the vibration motors which is arranged in 3x2 matrix will raised up accordingly.

Anuradha .P.G, et al., proposed an efficient communication device for deaf- blind people which contains a QWERTY keyboard to enter the text. The keyboard is interfaced with a raspberry pi processor. Six servo motors are used which acts as braille display unit and performs raising of the braille dots. In this manner the disabled person can sense the message by touching the dots.

Sarkar. R, et al., in his paper discusses about an approach of converting the text to the braille format through a computer application. Six stepper motors are arranged in braille cell format and it is connected to the computer system. An application program loaded in the computer, takes the English text as input and performs different language processing, parsing, interpreting and controlling operations to meet the desired output of the system.

Swati Malik P. J., et al., proposes a device of E- Braille reader where the WI-FI module (ESP8266) is used for receiving the e-books and to communicate with other android devices. The received material or text is sent to STM32f407 ARM cortex microcontroller for processing and conversion. Servo motors are used for displaying the Braille characters. An audio playback has also been used as output device to hear the text for the person who is visually impaired.

Kaustubh Bawdekar, et al., discusses about a model that functions by collecting the raw text with the help of a camera. The camera sends the collected data to the microcontroller (Raspberry Pi), which in turn converts it into Braille text. This model uses a look up table for conversion of Standard English text to Braille text

CHAPTER 3

EXISTING AND PROPOSED SYSTEM

3.1 EXISING SYSTEM

Existing system uses RF as medium to control the vehicle speed. That process has certain limitation including communication range. Zigbee and ESP8266 Networks may cover the maximum communication range at the same time communication speed is gradually decreased. That existing model based on HC05 BT Module which is limited in communication range as well as less security comparing with the proposed system. The proposed design consists of two parts namely Text to Braille converter unit and a Vibration Band. The Text to Braille converter unit converts the input alphanumeric text received through the GSM module to its corresponding Braille format and sends the output signals to the vibration motors to form the pattern. This pattern can be sensed by the Deaf-Blind person and can thus interpret the message received.

3.2 PROBLEM DEFINITION

The existing system does not wait for user presence. The system indicates the incoming message and activates the braille pattern. There are more or less possibility that user can miss the pattern. The system does not implement the braille to text. So, user cannot send replay.

3.3 SOLUTION ADAPTED

We cannot implement entire alphabet keypad to convert braille to text. But some predefined messages capable to replay the sender. Whenever incoming message received, the controller module will activate the vibration band. If user interrupt his presence by pressing any key from given keypad the vibrator stops and braille start to display. User need to press button a after every character he read. A simple matrix keypad resolves the all issues we faced in existing system.

3.4 PROPOSED SYSTEM

In this project, a way to develop a low cost, portable communication device which converts English text and numbers to its corresponding Braille format is discussed. The proposed design consists of three parts namely Text to Braille converter unit, Braille to text converter and a Vibration Band. The Text to Braille converter unit converts the input alphanumeric text received through the GSM module to its corresponding Braille format and sends the output signals to the vibration motors to form the pattern. The Braille to text converter has limited key buttons with predefined commands. User can communicate with each other by pressing particular key which contain predefined messages. This pattern can be sensed by the Deaf-Blind person and can thus interpret the message received.

3.5 ADVANTAGES

- Now user can send messages through braille to text converter
- User no need to hurry to read all characters received in GSM
- Text to braille converter generates received mobile number before message.
- Additional display will help deaf person to read received message

3.6 BLOCK DIAGRAM OF MICROCONTROLLER

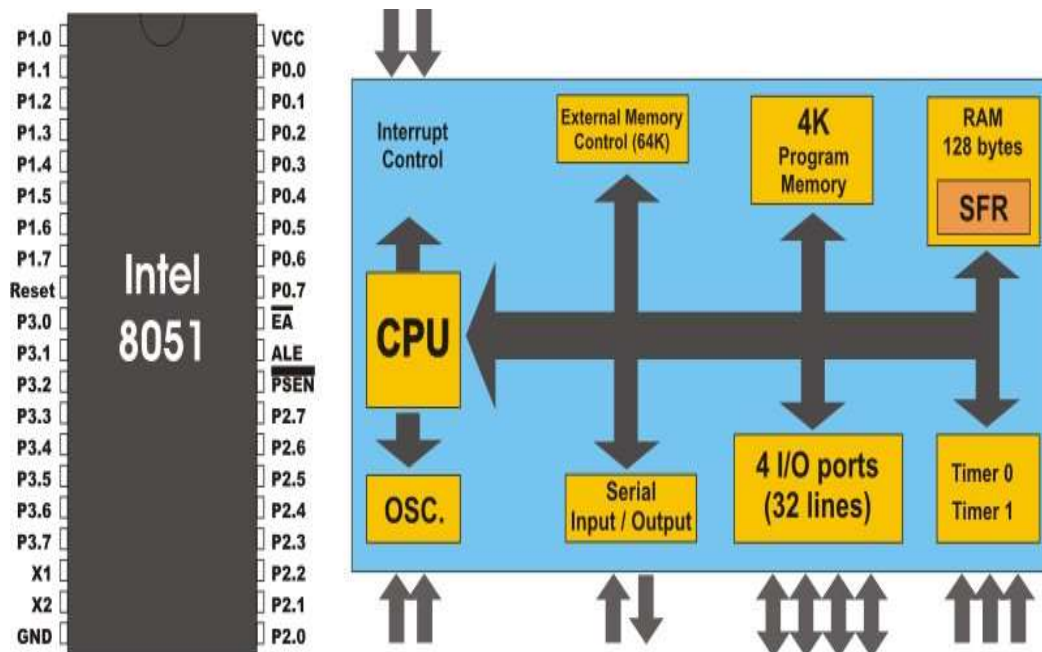


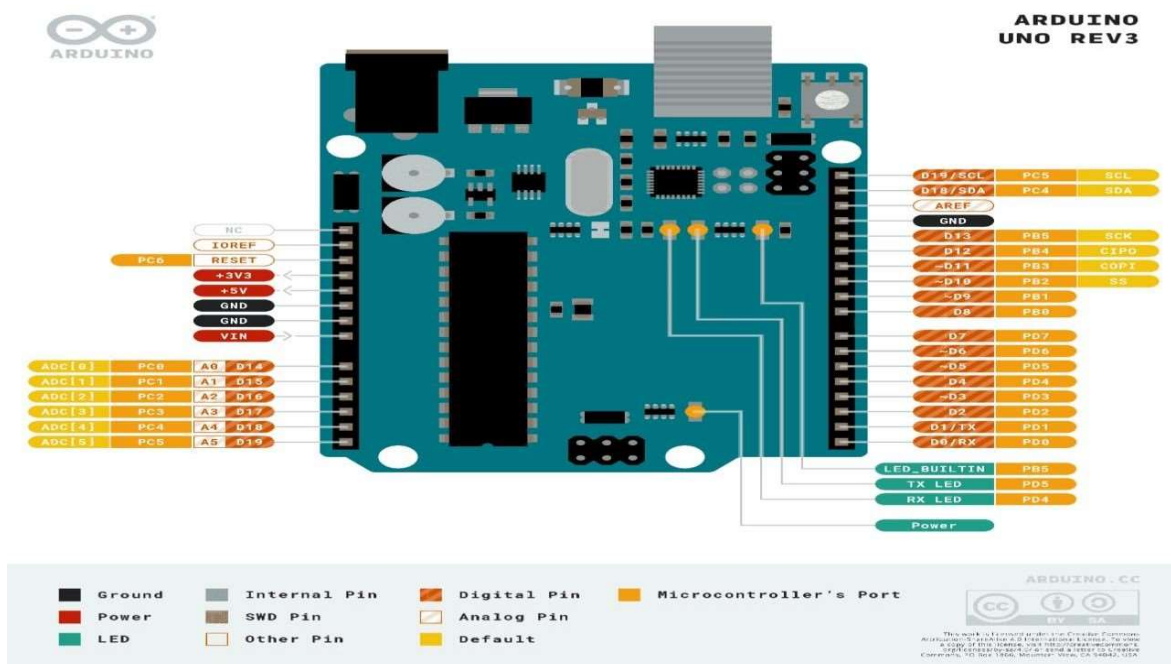
Fig: 3.1 Basic Block Diagram of Microcontroller

3.7 ARDUINO UNO

The ATmega328 microcontroller is the MCU used in Arduino UNO R3 as a main controller. ATmega328 is an MCU from the AVR family; it is an 8-bit device, which means that its data-bus architecture and internal registers are designed to handle 8 parallel data signals.

ATmega328 has three types of memory:

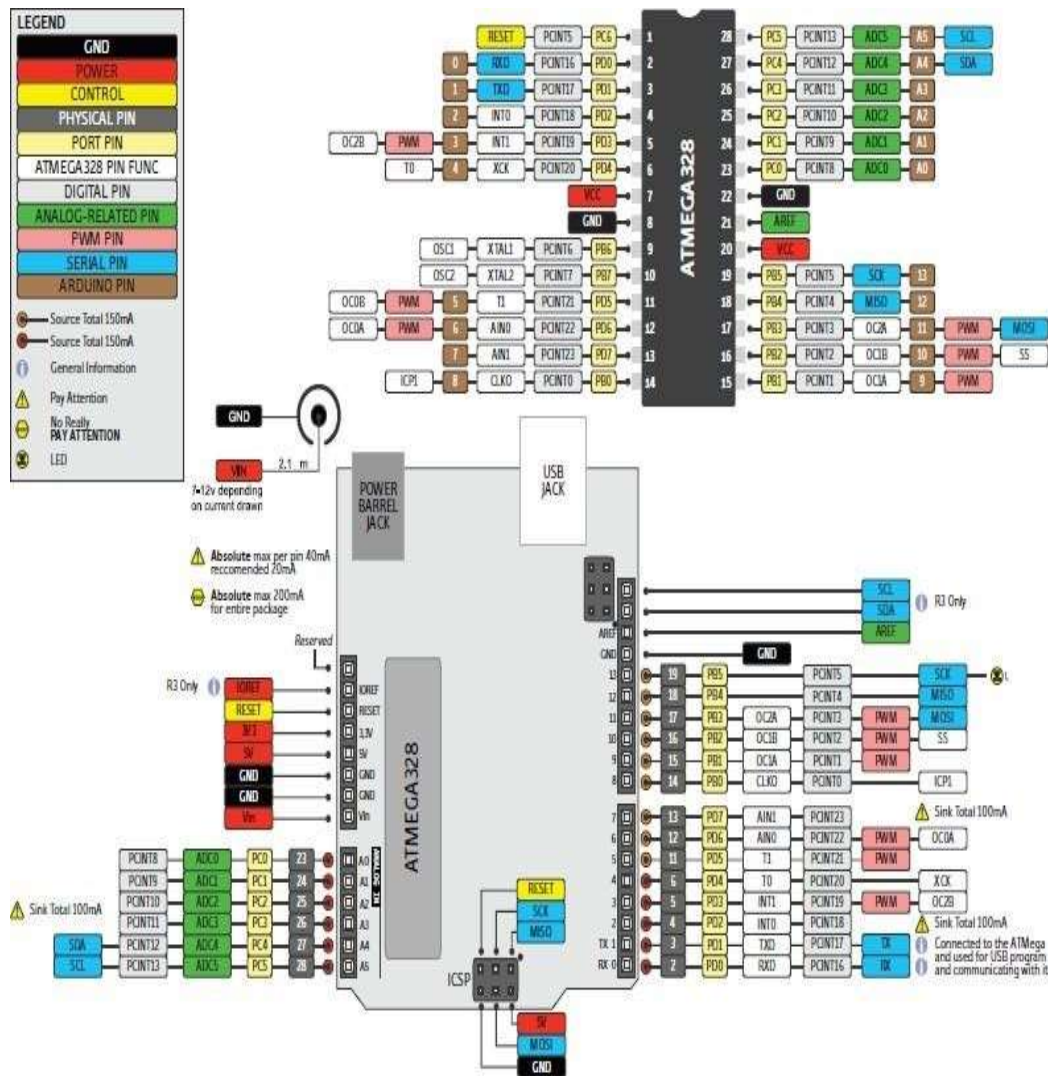
- **Flash memory:** 32KB nonvolatile memory. This is used for storing application, which explains why you don't need to upload your application every time you unplug arduino from its power source.
- **SRAM memory:** 2KB volatile memory. This is used for storing variables used by the application while it's running.
- **EEPROM memory:** 1KB nonvolatile memory. This can be used to store data that must be available even after the board is powered down and then powered up again.



3.8 POWER CONSUMPTION

The MCU accepts supply voltages from 1.8 to 5.5 V. However, there are restrictions on the operating frequency; for example, if you want to use the maximum clock frequency (20 MHz), you need a supply voltage of at least 4.5 V.

3.9 PCB DESIGN



3.9.1 KEYPAD

A numeric keypad, or numpad for short, is the small, palm-sized, seventeen key section of a computer keyboard, usually on the very far right. The numeric keypad features digits 0 to 9, addition (+), subtraction (-), multiplication (*) and division (/) symbols, a decimal point (.) and Num Lock and Enter keys. Laptop keyboards often do not have a numpad, but may provide numpad input by holding a modifier key (typically labelled "Fn") and operating keys on the standard keyboard.

Particularly large laptops (typically those with a 17 inch screen or larger) may have space for a real numpad, and many companies sell separate numpads which connect to the host laptop by a USB connection.

Numeric keypads usually operate in two modes: when Num Lock is off, keys 8, 6, 2, 4 act like an arrow keys and 7, 9, 3, 1 act like Home, PgUp, PgDn and End; when Num Lock is on, digits keys produce corresponding digits. These, however, differ from the numeric keys at the top of the keyboard in that, when combined with the Alt key on a PC, they are used to enter characters which may not be otherwise available: for example, Alt-0169 produces the copyright symbol. These are referred to as Alt codes.

On Apple Computer Macintosh computers, which lack a Num Lock key, the numeric keypad always produces only numbers. The num lock key is replaced by the clear key.

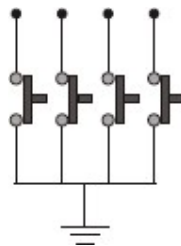


Fig: 3.4 KEYPAD

Numeric keypads usually operate in two modes: when Num Lock is off, keys 8, 6, 2, 4 act like an arrow keys and 7, 9, 3, 1 act like Home, PgUp, PgDn and End; when Num Lock is on, digits keys produce corresponding digits. These, however, differ from the numeric keys at the top of the keyboard in that, when combined with the Alt key on a PC, they are used to enter characters which may not be otherwise available: for example, Alt-0169 produces the copyright symbol. These are referred to as Alt codes.

3.9.2 SIM800L

This chapter describes SIM800L hardware interfacing detail. This chapter can help user to quickly understand SIM800L interface specifications, electrical and mechanical details. With the help of this document and other SIM800L application notes, user guide, users can use SIM800L to design various applications quickly.

SIM800L is designed with power saving technique so that the current consumption is as low as 1.2mA in sleep mode. SIM800L integrates TCP/IP protocol and extended TCP/IP at commands which are very useful for data transfer applications.



Fig: 3.5 SIM800L MODULE

Power supply

The power supply range of SIM800L is from 3.4V to 4.4V. Recommended voltage is 4.0V. The transmitting burst will cause voltage drop and the power supply

must be able to provide sufficient current up to 2A. For the VBAT input a bypass capacitor (low ESR) such as a 100 μ F is strongly recommended.

For the VBAT input, a 100uF Tantalum capacitor (CA low ESR) and a 1uF~10uF Ceramics capacitor CB are strongly recommended. The 33pF and 10pF capacitors can effectively eliminate the high frequency interference. A 5.1V/500mW Zener diode is strongly recommended, the diode can prevent chip from damaging by the voltage surge. These capacitors and Zener diode should be placed as close to SIM800 VBAT pins as possible.

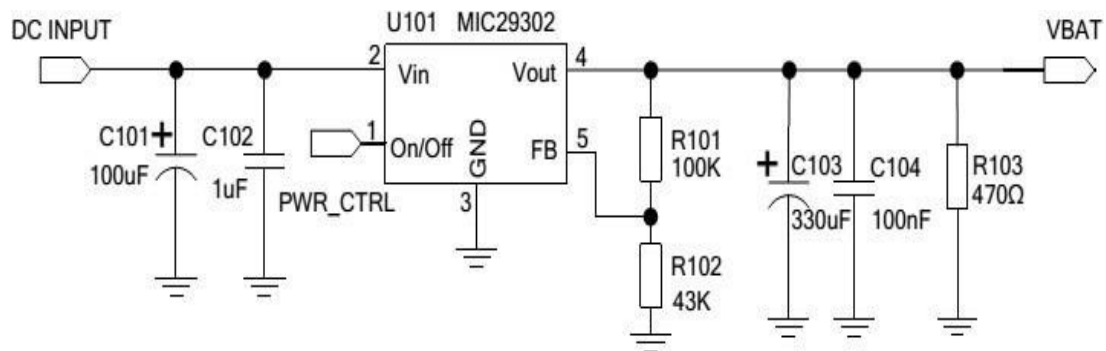


Fig: 3.6 Power Supply for SIM800L Module

Reset function

SIM800L also have a RESET pin used to reset the module. This function is used as an emergency reset only when AT command “AT+CPOWD=1” and the PWRKEY pin have no effect. User can pull the RESET pin to ground, and then the module will restart. This pin is already isolated in the module, so the external isolation is not necessary. Following figure is internal circuit of the RESET pin.

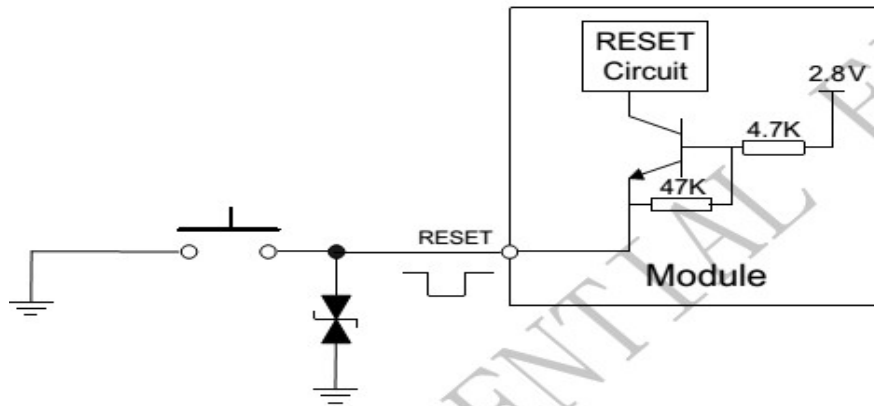


Fig: 3.7 Reset Module Using Button

SIM card interfacing

The SIM interface complies with the GSM Phase 1 specification and the new GSM Phase 2+ specification for FAST 64 kbps SIM card. Both 1.8V and 3.0V SIM card.

Keypad interfacing

SIM800L consists of 5 keypad column outputs and 5 keypad row inputs, and it can support two kinds of connections, the traditional 5*5 keypad matrix and the extended 5*5*2 keypad matrix.

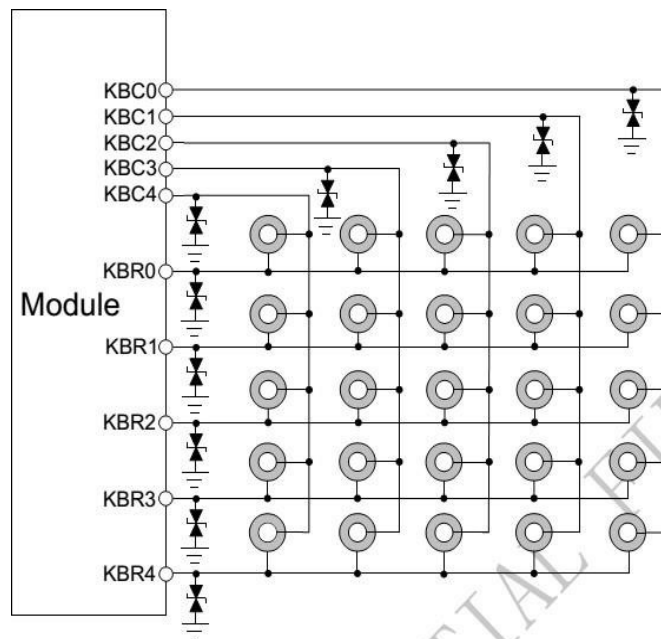


Fig: 3.8 Traditional Keypad Interfacing

Decoders

The 212 decoders are a series of CMOS LSIs for remote control system applications. They are paired with Holtek's 212 series of encoders (refer to the encoder/decoder cross reference table). For proper operation, a pair of encoder/decoder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a Programmed 212 series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. The 212 series of decoders are capable of decoding information's that consist of N bits of address and 12_N bits of data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bits of address information.

Encoder

In this circuit HT 640 is used as encoder. The 3¹⁸ encoders are a series of CMOS LSIs for remote control system application. They are capable of encoding 18 bits of information which consists of N address bit and 18-N data bits. Each address/data input is externally trinary programmable if bonded out. It is otherwise set floating internally. Various packages of the 3¹⁸ encoders offer flexible combination of programmable address/data is transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The capability to select a TE trigger type further enhances the application flexibility of the 3¹⁸ series of encoders.

In this circuit the input signal to be encoded is given to AD7-AD0 input pins of encoder. The encoder output address pins are shorted so the output encoded signal is the combination of (A0-A9) address signal and (D0-D7) data signal. The output encoded signal is taken from 8th which is connected to RF transmitter section.

RF Transmitter

Whenever the high output pulse is given to base of the transistor BF 494, the transistor is conducting so tank circuit is oscillated. The tank circuit consists of L2 and C4 generating 433 MHz carrier signal. Then the modulated signal is given LC filter section. After the filtration the RF modulated signal is transmitted through antenna.

RF Receiver

The RF receiver is used to receive the encoded data which is transmitted by the RF transmitter. Then the received data is given to transistor which acts as amplifier. Then the amplified signal is given to carrier demodulator section in which transistor Q1 is turn on and turn off conducting depends on the signal. Due to this the capacitor C14 is charged and discharged so carrier signal is removed and saw tooth signal is appears across the capacitor. Then this saw tooth signal is given to comparator. The comparator circuit is constructed by LM558. The comparator is used to convert the saw tooth signal to exact square pulse. Then the encoded signal is given to decoder in order to get the decoded original signal.

Antenna interfacing

There is a GSM antenna pad named GSM_ANT to connect a GSM antenna, the connection of the antenna must be decoupled from DC voltage. This is necessary because the antenna connector is DC coupled to ground via an inductor for ESD protection. The GSM antenna must be matched properly to achieve the best performance, so the matching circuit is necessary. For the purpose of static electricity, we recommend to add D101, which is a TVS, the recommendation ESD component.

3.9.3 LCD DISPLAY



Fig: 3.9 Liquid Crystal Display

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal.

An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

On each polarizer is pasted outside the two glass panels. These polarizers would rotate the light rays passing through them to a definite angle, in a particular direction.

When the LCD is in the off state, light rays are rotated by the two polarizers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent.

When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarizers, which would result in activating / highlighting the desired characters.

3.9.4 DISPLAY DATA RAM (DD RAM)

The characters to be displayed are written into the display data RAM (DD RAM), in the form of 8 bit character codes present in the character font table. The extended capacity of the DD RAM is 80 x 8 bits i.e. 80 characters.

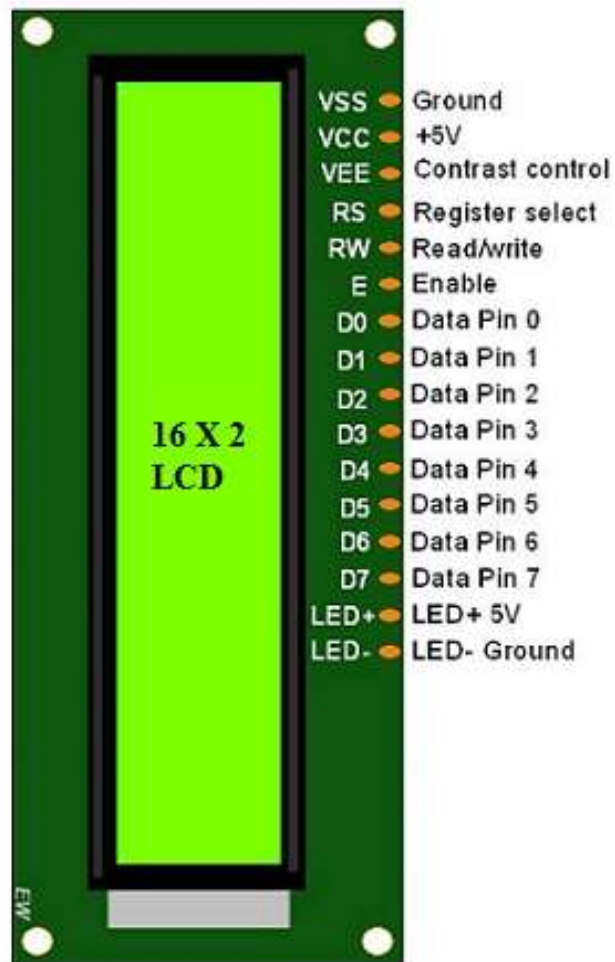


Fig: 3.10 Pin Diagram of LCD

CHAPTER 4

SOFTWARE DESCRIPTION

4.1 SOFTWARE DESCRIPTION

- Arduino IDE
- GCC

4.1.1 ARDUINO IDE

The Arduino integrated development environment (IDE) is a cross- platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User- written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

The current official meaning is “GNU Compiler Collection”, which refers generically to the complete suite of tools. The name historically stood for “GNU C Compiler”, and this usage is still common when the emphasis is on compiling C programs. Finally, the name is also used when speaking of the language-independent component of GCC: code shared among the compilers for all supported languages. The language- independent component of GCC includes the majority of the optimizers, as well as the “back ends” that generate machine code for various processors. The part of a compiler that is specific to a particular language is called the “front end”.

4.1.2 GCC

GCC stands for “GNU Compiler Collection”. GCC is an integrated distribution of compilers for several major programming languages. These languages currently include C, C++, Objective-C, Objective-C++, Fortran, Ada, D, Go, and BRIG (HSAIL). The abbreviation GCC has multiple meanings in common use. The current official meaning is “GNU Compiler Collection”, which refers generically to the complete suite of tools. The name historically stood for “GNU C Compiler”, and this usage is still common when the emphasis is on compiling C programs. Finally, the name is also used when speaking of the language-independent component of GCC: code shared among the compilers for all supported languages. The language-independent component of GCC includes the majority of the optimizers, as well as the “back ends” that generate machine code for various processors. The part of a compiler that is specific to a particular language is called the “front end”. In addition to the front ends that are integrated components of GCC, there are several other front ends that are maintained separately. These support languages such as Mercury, and COBOL. To use these, they must be built together with GCC proper. Most of the compilers for languages other than C have their own names. The C++ compiler is G++, the Ada compiler is GNAT, and so on. When we talk about compiling one of those languages, we might refer to that compiler by its own name, or as GCC. Either is correct. Historically, compilers for many languages, including C++ and Fortran, have been implemented as “preprocessors” which emit another high level language such as C. None of the compilers included in GCC are implemented this way; they all generate machine code directly.

CHAPTER 5

EXPERIMENTAL OR MATERIALS AND METHODS

5.1 ARDUINO

The Arduino integrated development environment (IDE) is a cross- platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User- written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

5.2 ARDUINO CONFIGURATION

- Download Arduino IDE from official webpage.
- Right click to run on administrator mode.
- Click tools select communication port.
- If port not visible unplugs the usb cable and replug it.
- Click new file.
- Select and save destination folder.
- Type some code.
- Click right symbol button on top left corner to verify your program.
- Click the nearest one of right symbol to upload your code into board.

5.3 ELECTRICAL BLOCK

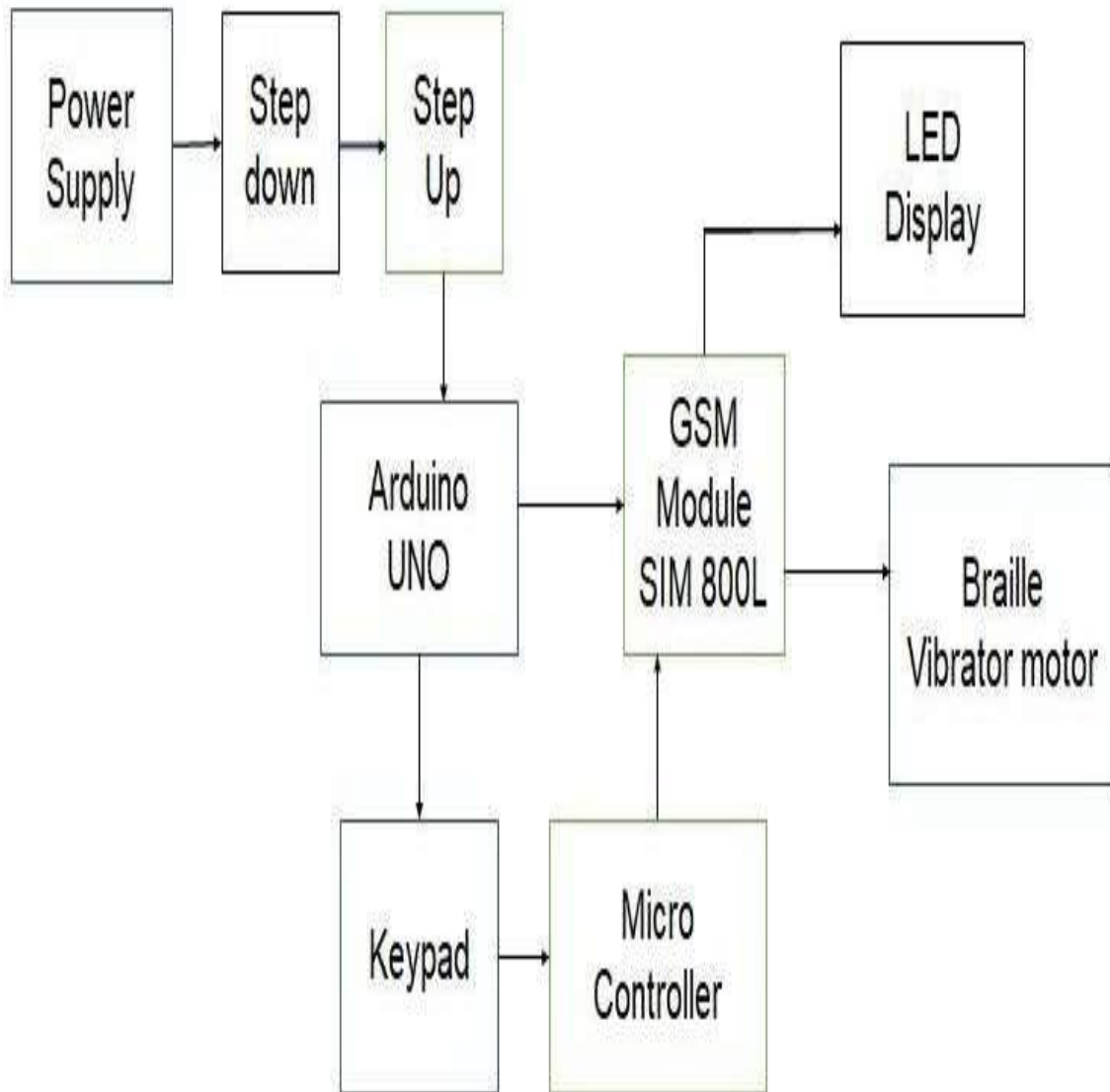


Fig: 5.1 Electrical Block Diagram

5.4 FLOW DIAGRAM

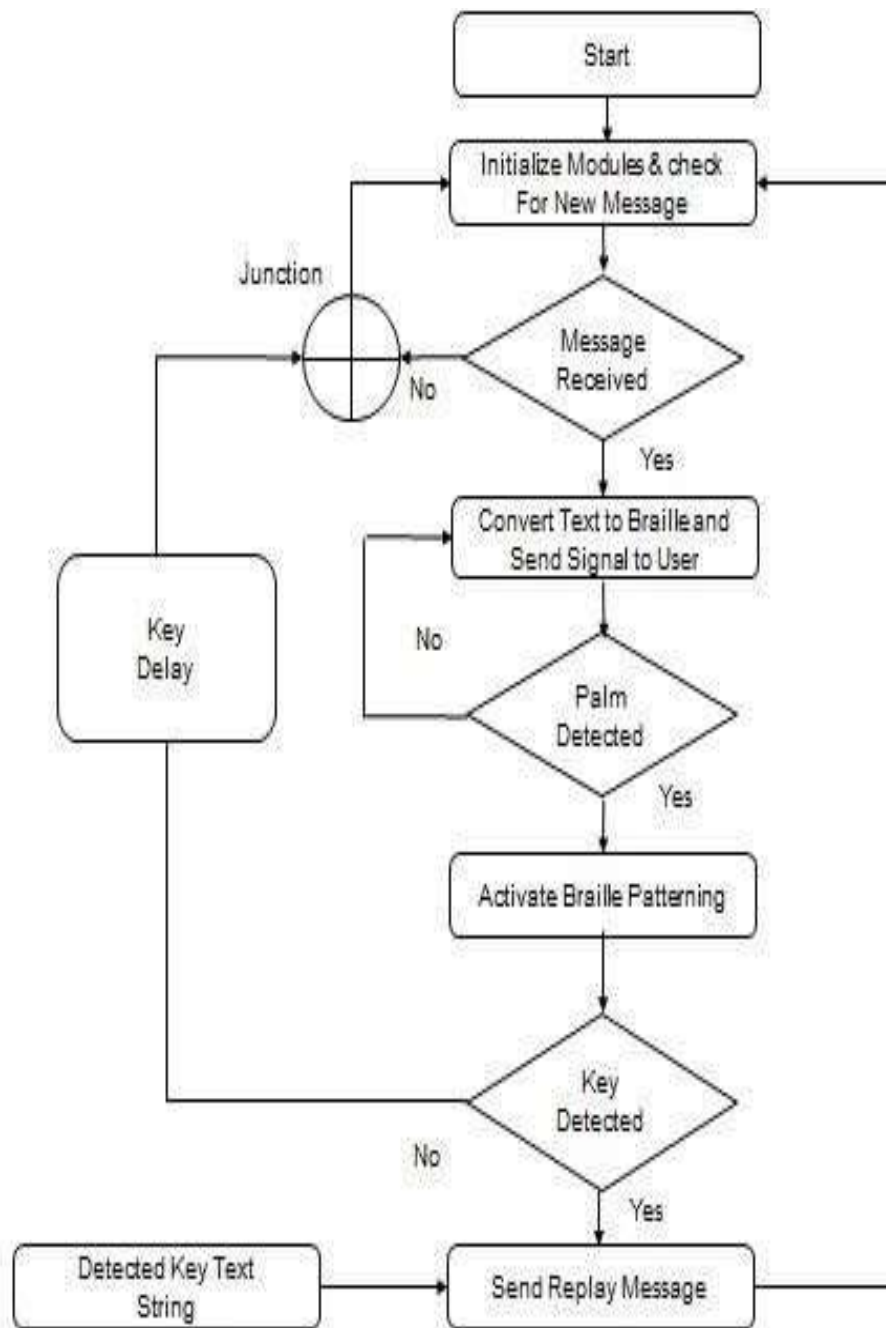


Fig: 5.2 Flow Diagram of Smart Braille Communication

5.5 CIRCUIT DIAGRAM

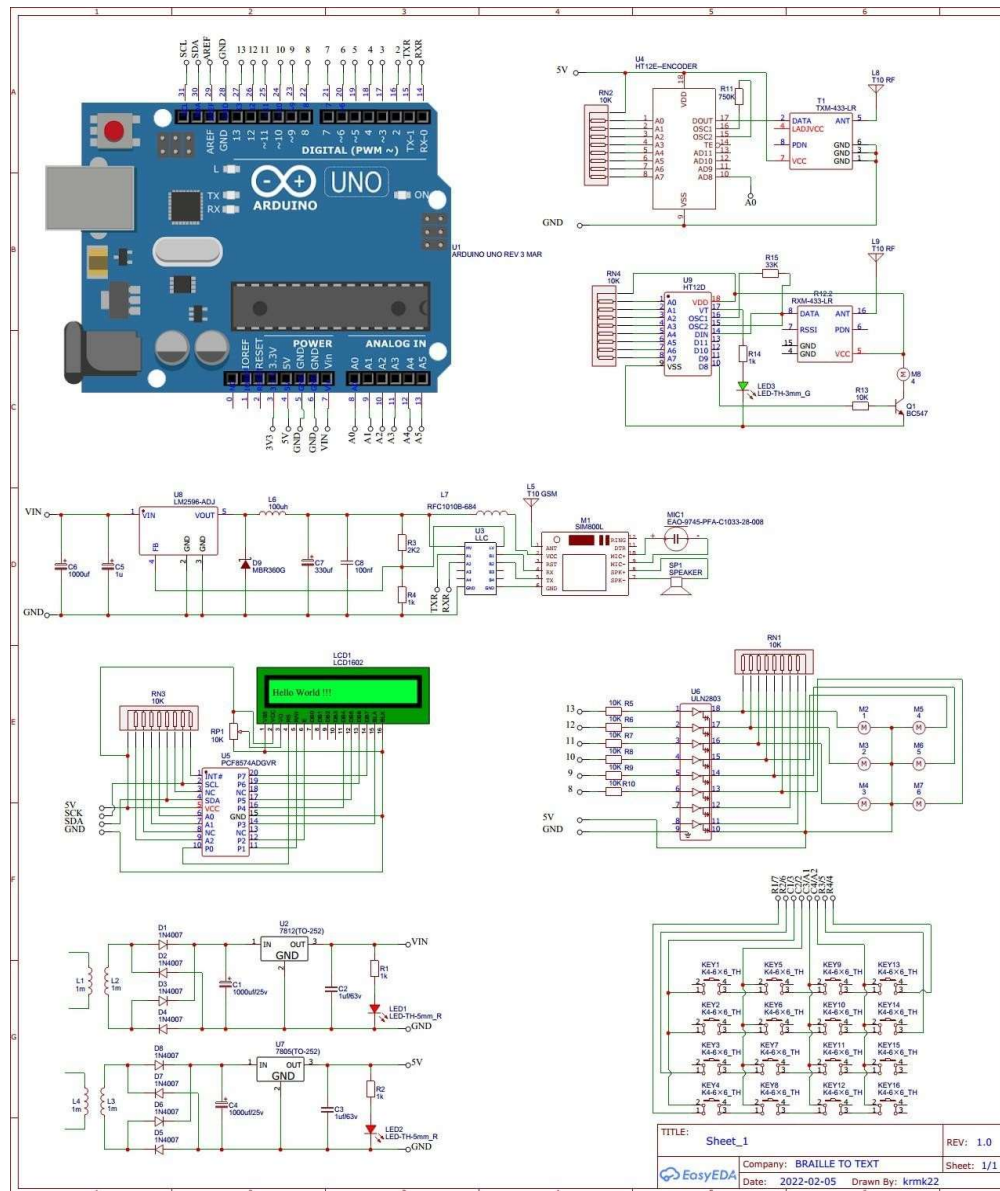


Fig: 5.3 Circuit Diagram of Smart Braille Communication

5.6 DESCRIPTION

The system described in this proposed project contains three section follows,

- Text to Braille converter: The section activated whenever new message received from GSM module and infrared proximity sensor detects palm in Braille patterned vibration motor. The system will separate text from message and start vibrating the motors according to the Braille key pattern.
- Notifier: The section activated whenever new message received from GSM module and the microcontroller will inform the new message arriving through radio frequency communication module. On receiver side, described as band in this project will start receive message and vibrate the motor till detection of key press.
- Braille to text converter: The section activated at end of the text to Braille section. This system will wait for the user replay for certain times, if user presses the button an acknowledge message will send to the last received number. Otherwise, it will keep checking the button for certain amount of delay or else new message arrival.

CHAPTER 6

RESULTS & DISCUSSION

6.1 RESULTS



Fig: 6.1 Power On

When power on it'll take few seconds to power up microcontroller unit and then controller initialize the liquid crystal display module and then print the project title on the display the data visible for few seconds after that controller initialize GSM Module.



Fig: 6.2 GSM Initialization

After clearing the display data's controller initialize GSM module by using respective AT commands. The command consists with module found or not, echo cleared, GPRS connection and server connection the result will print on the display. After particular time interval controller clear the display and execute next command.

Routine Execution

After initializing all sensor modules, controller will keep checks the gsm module for incoming message. If any message received and that message contains secret code which assures the message for deaf/blind people. Controller activates the vibrator module and waits for the user response.



Fig: 6.3 Failed Response

In case user not in home or near the proposed system. He/she not receive the radio frequency signal. The band will not vibrate so, we cannot process the message. But, that process has a limited time interval. If user fails to reach the transmitter kit within given timer controller will discard that message and wait for the new one.



Fig: 6.4 Generating Braille Pattern

After user informs his/her presence by pressing the keypad button, controller will activate the Braille pattern according received number and message. User need to press the button to move to next character. The button presses records until end of string. Once the string end detected, controller execute next routine.



Fig: 6.5 Final Result

At the end of the message controller check the response from the user end. If user pressed the keypad button, predefined message strings are forward to the received number otherwise controller wait until the timer expired and restarts the loop again.

6.2 FUTURE SCOPE

We look forward to add the facial recognition feature as part of the device. Likewise for additional improvement, a multi-language-Braille interpreter will be considered. Look-into tables for changed dialects could be put away in streak memory with the goal that when interpretation of content in a specific language is required, the microcontroller loads the relating look-into table. The vibration system may feel difficult to understand in future, we add braille punching system which will show exact braille pattern. Hereafter, we hope that the future hi-tech improvement will enlighten the life of the blind or deaf population.

6.3 ADVANTAGES

- Less weight and flexibility
- User friendly
- Low power consumption
- Portable
- Low cost

6.4 LIMITATIONS

- Chances of manual errors
- Lack of privacy

6.5 PHOTOGRAPHY

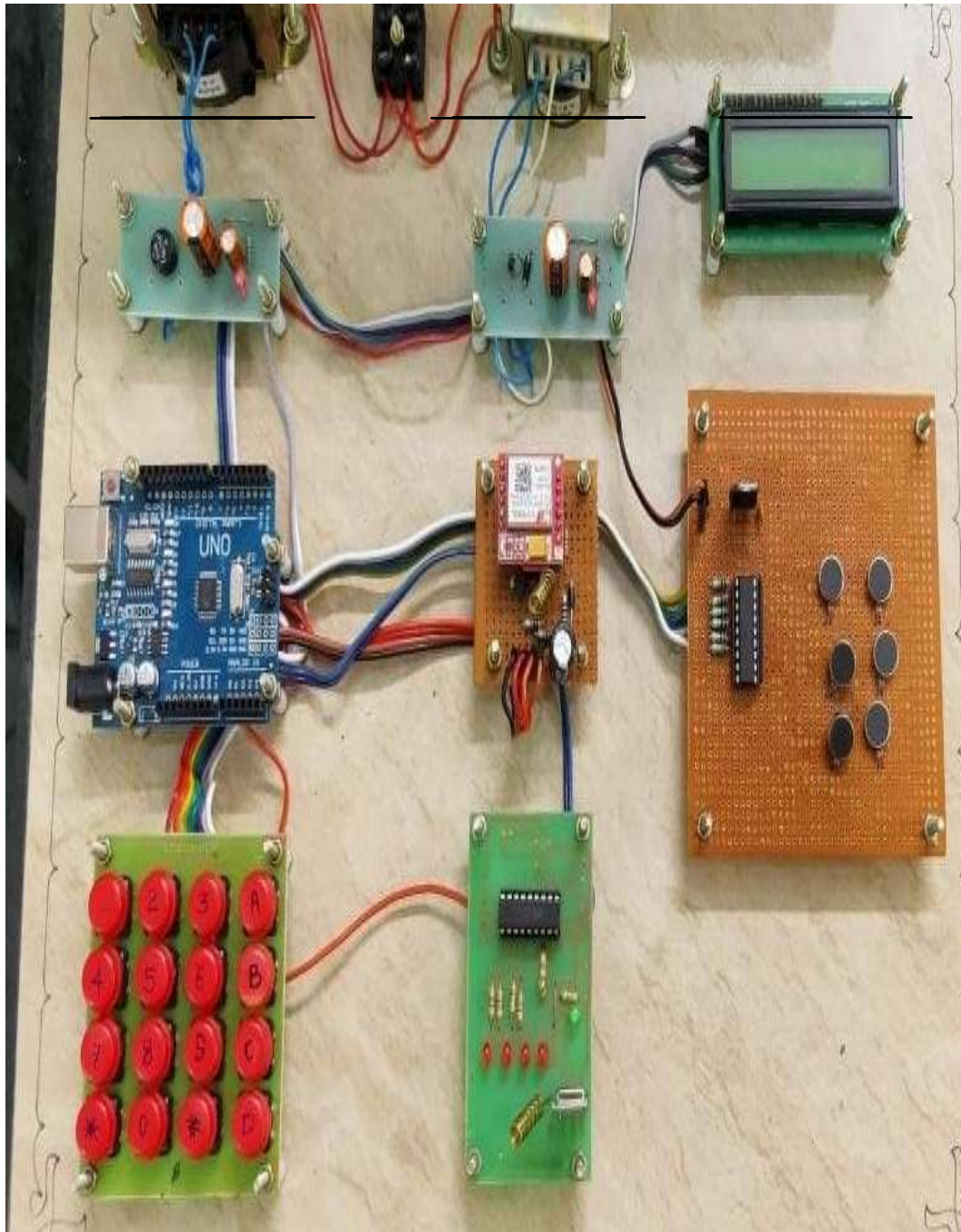


Fig: 6.6 The Assembled View of Proposed System

6.6 BRAILLE CHART

A	B	C	D	E	F	G	H	I	J	K	L	M	(accent)	(letter)	(capital)	(emph.)			
N	O	P	Q	R	S	T	U	V	W	X	Y	Z	(stop)	(termination)	(non-Latin)				
1	2	3	4	5	6	7	8	9	0	(number)	(decimal)		* † ‡ ¶	// (ditto)					
.	,	!	?	;	:	-	'	"	”	()	/	(space)	...	—					
and	for	of	the	with	ch	gh	sh	th	wh	ed	er	ou	[	]					
ow	en	in	st	ar	-ing	-ble	-ea-	-bb-	-cc-	-dd-	-ff-	-gg-	'	,					
but	can	do	every	from, -self	go	have	just	knowledge	like	more	not	people	quite	rather	so	that	still	us	very
it	you	as	child	shall	this	which	out	will	be, be-	con-	dis-	enough	to	were	his	by, was	com-	into	

Fig: 6.7 BRAILLE CHART

CHAPTER 7

SUMMARY AND CONCLUSION

7.1 CONCLUSION

The present project proposes a flexible and real-time text to Braille and display conversion system. In its present form, the framework can be utilized in a project, archive, book and so forth. For reading and easy understanding for the impaired audience. We've additionally added another usefulness of Text to Braille to help the outwardly hindered in understanding books, or tuning in to them straightforwardly as book recordings/content. In any case, there are a few upgrades which will be consolidated in future adaptations of the equipment interpreter. For instance, the present framework is an independent segment. Our device allows social, communicational and educational barriers to be removed for people with disabilities. Thus, with some modifications in previous conventional communicating devices, we can accommodate large number of visually impaired people in an updated communication system.

7.2 SUMMARY

The "Smart Braille Based Communication Device for Visually Impaired Persons" project aims to develop a communication device that utilizes Braille, a system of raised dots used by visually impaired individuals to read through touch. The device is designed to be "smart" by incorporating modern technology to enhance its functionality and usability for visually impaired users.

The key features of the Smart Braille Based Communication Device include:

Braille Input and Output: The device allows visually impaired users to input text in Braille through a tactile interface, and also provides output in Braille for reading messages or documents.

Text-to-Speech and Speech-to-Text: The device includes text-to-speech and speech-to-text capabilities, allowing visually impaired users to communicate with sighted individuals through speech-based interactions.

Wireless Connectivity: The device is equipped with wireless connectivity, such as Wi-Fi or Bluetooth, for communication with other devices, such as smartphones or computers, to send and receive messages or access online content.

Navigation and Orientation: The device includes built-in features for navigation and orientation, such as GPS and compass, to help visually impaired users navigate their surroundings independently.

User-Friendly Interface: The device is designed with a user-friendly interface, including tactile buttons and audio cues, to make it easy for visually impaired users to operate and interact with the device.

Customizable Settings: The device allows users to customize settings, such as font size, speech rate, and Braille display settings, to suit their individual preferences and needs.

Portable and Durable: The device is designed to be portable and durable, making it convenient for visually impaired users to carry it with them wherever they go.

The Smart Braille Based Communication Device for Visually Impaired Persons project aims to provide a modern and innovative solution to facilitate communication and enhance the independence of visually impaired individuals by leveraging Braille

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