

SELF-LEARNING BRAILLE APPLICATIONS FOR VISUALLY IMPAIRED PEOPLE

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Electronics and Instrumentation Engineering

By

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SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC
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CHENNAI 600 119**

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **LEKHA (Reg No: 37180002)** and **SUPRIYA SINGH (Reg No: 37180019)** who carried out the project entitled "**Self-Learning Braille Application for Visually Impaired People**" under my supervision from January 2021 to April 2021

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DECLARATION

We, **LEKHA (Reg.No:37180012)** and **SUPRIYA SINGH (Reg.No:37180019)** hereby declare that the Project Report entitled “**Self-Learning Braille Application for Visually Impaired People**” done by us under the guidance of **Ms. D. JAMUNA RANI, M.E., (Ph.D.,)** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in **ELECTRONICS AND INSTRUMENTATION ENGINEERING**

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ABSTRACT

Braille system is the main method for the blind and visually impaired people for acquiring the read and writing skills. Considering their disability, efforts were dedicated to facilitating the learning with Braille. Studying Braille system at the specialized centers and schools is not easy for all involved blind and visually impaired people. Moreover, making the learning process independent of others is very useful. This project presents the design and implementation of an Self-learning Braille application for the blind and visually impaired people on the smart devices.

This project describes Arduino based Hardware Implementation of the Braille teaching device, where the problem of existing method can be abridged. This project implements a Braille Script Teaching Aid in which the presence of combination of six vibration motors is operated using the input got from the Arduino. All these vibration motors is controlled using Relay. This method provides an easy way of teaching Braille Script. Some self-learning programs are developed to make students to learn without the help of a teacher. It is well suited for first time learners. We can teach different languages with the same setup by selecting the language based on the requirements.

CONTENT

CHAPTER	TITLE	PAGE No
	ABSTRACT	v
	LIST OF ABBREVIATIONS	viii
	LIST OF FIGURES	xi
1	INTRODUCTION	
	1.1About Braille	2
	1.2Braille Structure	2
	1.3Importance of Braille	2
	1.4Braille in Day to Day life	3
	1.5Braille Symbols	4
	1.6 The Braille Numbers	4
	1.7The Braille Punctuation	4
	1.8 Embedded System	4
	1.9 Classification of Embedded Systems	6
	1.10 Block graph of an implanted framework	7
	1.11 Embedded Systems Applications	8
2	LITERATURE SURVEY	
	2.1Character Recognition on Neural Networks	9
	2.2 Approach to text entry on Smart phones	9
	2.3 Image Recognition for Beginners	10

	2.4 Customized Transportation Intervention	10
3	AIM & SCOPE	
	3.1Block Diagram	12
	3.2Existing System	13
	3.3Proposed System	14
4	METHODS, ALGORITHM AND MATERIALS	
	4.1Flow Chart	15
	4.2Hardware Requirements	15
	4.2.1Arduino	16
	4.2.2Power Supply	17
	4.2.3Memory Unit	18
	4.2.4Relay	20
	4.2.5Bluetooth Module	23
	4.2.6Applications	26
	4.2.7Vibration Motor	26
	4.3Software Requirements	28
	4.3.1Arduino IDE	28
	4.3.2Embedded C	29
5	CONCLUSION	33
	REFERENCE	34

LISTS OF ABBREVIATION

RTOS	-	Real-Time Operating System
IDE	-	Integrated Development Environment
TX	-	Transmitter
RX	-	Receiver
MOSI	-	Master Out Slave In
MISO	-	Master In Slave Out
SCL	-	Serial Clock
UART	-	Universal Asynchronous Receiver Transmitter
TIL	-	Transistor-Transistor Logic
ERM	-	Eccentric Rotating Mass
LRA	-	Linear Resonant Actuator
DTR	-	Data Terminal Ready Computing
LED	-	Light Emitting Diode
JTAG	-	Joint Test Action Group
SWD	-	Serial Wire Debug

LISTS OF FIGURES

FIGURE NO	DESCRIPTION	PAGE NO
1.1	Embedded System	5
1.2	Types of Embedded Systems	6
1.3	Block Diagram of Embedded system	7
3.1	Proposed Block diagram	12
4.1	Flow Chart	15
4.2	Arduino UNO	17
4.3	Arduino Pin Configuration	19
4.4	Relay	21
4.5	Block Diagram of Power Supply	22
4..6.a	Bluetooth Module	24
4.6.b	Bluetooth Pin Configuration	25
4.7	Vibration Motor	26
4.8.a	Embedded C	30
4.8.b	Embedded C Program	32

CHAPTER 1

INTRODUCTION

Human correspondence today is primarily through talk and text. To get to information in content, an individual necessity to have vision. Apparently blocked people report different issues with getting to printed text using existing development, fusing issues with plan, focus, accuracy, convenience and capability. Machine replication of human limits like scrutinizing is an outdated dream. Regardless, throughout the latest fifty years, machine scrutinizing has created from a dream to this present reality.

Today, there are two or three structures that have some assurance for advantageous use, like smaller normalized recognizable proof per clients expected to help astonish people with recognizing different things in a wide thing informational index can enable customers who are neglectful concerning get to information about these things through talk and Braille. Braille is a system for scrutinizing and feeling text through touch, rather than find. It is transcendently used by those with crippled vision; regardless, found people can scrutinize Braille moreover. There are various purposes behind this, especially for those with an outwardly hindered or apparently obstructed individual in their family.

There are various kinds of Braille, including melodic, mathematical, and different sorts of imaginative Braille. Examining speed is essentially more slow than for print scrutinizing or recorded materials. Consistently and current brailled information isn't instantly available. Braille materials are expensive to convey. In any case, a significant limitation is that it is hard for shock customers to find the circumstance of the normalized tag and to successfully point the scanner tag per client at the scanner tag. It consumes critical room and presents comfort and limit issues. Spelling capacities require interesting thought considering the turns of events. Express segments of Braille present significant issues to some of different weakened individuals.

1.1 ABOUT BRAILLE

Braille is named after its maker, Frenchman Louis Braille, who lost his vision because of a youthful episode. Braille was made in 1824, the fundamental spot structure is at this point considered by various people as the best examining system for amaze people. It is an impressive mechanical assembly for granting and checking out the public field. Braille is a material creating system used by people who are outwardly disabled or apparently ruined. It is generally with project.

Braille is a plan of raised spots that can be examined with the fingers by people who are outwardly impeded or who have low vision. Braille isn't a language. It is a code by which all that tongues can be made and examined. Utilizing Braille, people who are outwardly disabled can review and study the made other word. It gives a visa to schooling and empowers an individual to get settled with spelling, emphasis, paragraphing and arranging examinations.

1.2 BRAILLE STRUCTURE

Braille images are framed inside units of room known as Braille cells. A full Braille cell comprises of six brought specks orchestrated up in two equal vertical segments of three dabs (like the number 6 on a dice). The dab positions are recognized by numbers one through to six. 63 blends are conceivable utilizing at least one of these six dots. Cells can be utilized to address a letter of the letters in order, number, and accentuation, part of a word or even an entire word.

1.3 IMPORTANCE OF BRAILLE

The suppositions for understudies to sort out some way to examine and to form is something similar for a found or outwardly disabled individual; it is key capacity that everyone should make to rule in their life. There is certifiably not a reasonable swap for the ability to examine. For surprise people, Braille is an essential gadget that helps during the time spent getting capable. Recording gadgets and mixed talk are useful mechanical assemblies, yet they are deficient with regards to

substitutes for examining and making. Braille accepts huge part in preparing of outwardly disabled and ostensibly thwarted people.

A couple of examinations show that Braille schooling is directly related with insightful achievement and work among the outwardly disabled and apparently debilitated. There are various organization turn out open for astonish and apparently upset people. They ought to be told to land position from the public power affiliation. For that they ought to learn Braille which is a basic thing. Exactly when shock young people learn Braille, they learn punctuation, spelling, highlight and sentence structure capacities that they don't dominate using text-to-talk advancement.

Braille moreover permits astonish people to get blueprints and outlines that are for all intents and purposes hard to pass on using text-to-talk. Whether or not they moreover use low-vision helps or text-to-talk advancement, Braille permits them to name things clearly, read public signs at air terminals or washrooms.

1.4 BRAILLE IN DAY TO DAY LIFE

A person who examines Braille can wander independently among the neighborhood Braille dynamically is appearing everywhere. With the Convention on the Rights of Persons with Disabilities completed in 2008, from here on out in excess of 150 countries have denoted the endorsement. The attestation has given the affirmation of individuals inadequacies on an identical reason with others all throughout the planet. Besides, society is beginning to see the need to present reasonableness for all occupants inside its organizations. Consequently, public spaces continue presenting devices and helps for all inadequacies.

Braille is used in customary correspondence and as a capable outwardly disabled or apparently obstructed particular, opportunity is given. Shock individuals merit this chance at equilibrium, and this is something that Braille gives. Talk analysis or other electronic contraptions are no compensation for Braille. Just Listening isn't adequate. To examine without Braille, a person who is outwardly disabled is absolutely dependent on PCs with voice synthesizers or sound record, neither of

which is useful in each condition. Braille conveys sight to the apparently debilitated and astonish.

1.5 BRAILLE SYMBOLS

The central Braille letter set, Braille numbers, Braille emphasis and remarkable pictures characters are created from six spots. These Braille spots are arranged like the figure six on a kick the pail, in an organization of two equivalent vertical lines of three bits each. From the six spots that make up the essential lattice, 64 one of a kind plans can be made.

1.6 THE BRAILLE NUMBERS

Braille numbers are outlined by putting a Braille number sign before Braille letters. They are all around recognized Braille system. Braille numbers are like letters however have an exceptional number sign character in front to tell per users that the characters that follow are expected to be numbers.

1.7 THE BRAILLE PUNCTUATION

These are the normal accentuation utilized in our everyday life. These braille mixes for accentuations are acknowledged universally. It contains the same punctuation marks as is found in print. These marks, with their braille equivalents.

1.8 EMBEDDED SYSTEM

An embedded system is a controller changed and compelled by a progressing working structure (RTOS) with a dedicated limit inside a greater mechanical or electrical system, consistently with nonstop use of introduced systems figuring constraints.

It is inserted as a segment of a total gadget consistently including equipment and mechanical parts. Introduced structures control various devices in like way use today. 98% of all central processor are created to fill in as embedded system section.

Occasions of properties of conventional embedded PCs when differentiated and comprehensively valuable accomplices are low power usage, little size, harsh working scopes, and low per-unit cost. This comes at the expense of limited taking care of resources, which make them inside and out more enthusiastically to program and to connect with.

In any case, by building understanding parts on top of the hardware, misusing possible existing sensors and the presence of an association of introduced units, one can both in a perfect world direct available resources at the unit and association levels similarly as give broadened limits, beyond those open. For example, cunning techniques can be planned to supervise power.

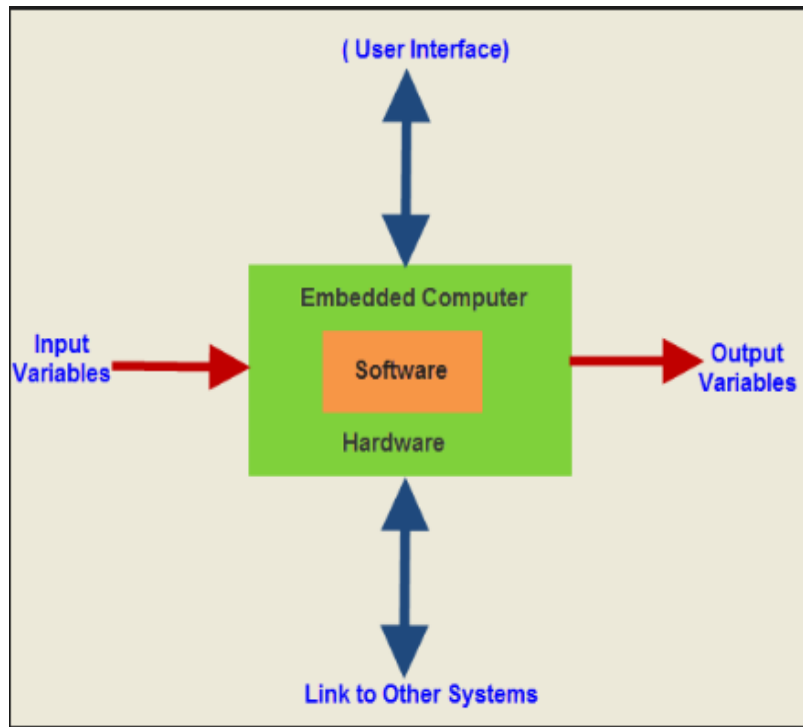


Fig. 1.1: Embedded Systems

Embedded Computer Sub-Assembly for Electronic Voting Machine. Inserted systems are usually found in buyer, mechanical, auto, clinical, business and military applications.

Broadcast correspondences systems use different embedded structures from telephone switches for the association to PDAs close to the end customer. PC arranging uses submitted switches and association augmentations to course data. Customer equipment fuses MP3 players, phones, PC game consoles, automated cameras, GPS authorities, and printers. Home gadgets, for instance, microwaves, garments washers and dishwashers, consolidate embedded structures to give flexibility, viability and features

1.9 CLASSIFICATIONS OF EMBEDDED SYSTEMS

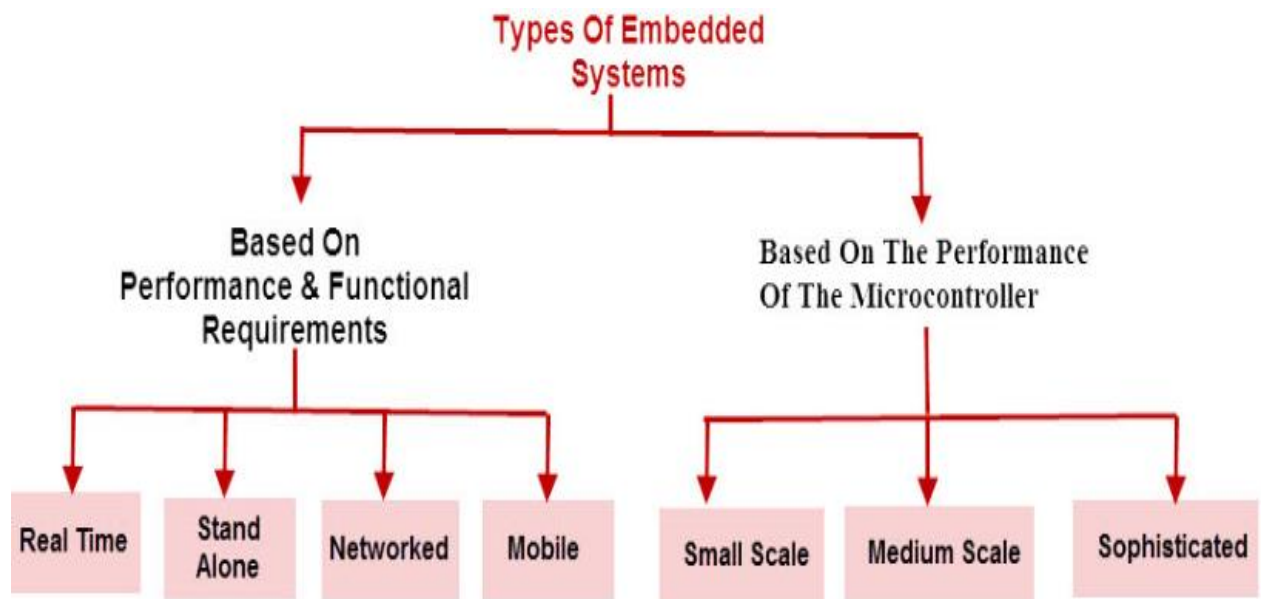


Fig. 1.2: Types of Embedded Systems

Advanced HVAC structures use coordinated indoor controllers to even more absolutely and successfully control temperature that can change via period of day and season. Home robotization uses wired-and far off frameworks organization that can be used to control lights, climate, security, general media, surveillance, etc, all of which use embedded devices for identifying and controlling like traffic lights, plant controllers, and by and large complex systems like cream vehicles, MRI, and flight Embedded structures range from reduced devices like progressed watches and MP3 players, to huge fixed foundations. Complexity changes from low, with a single microcontroller

1.10 Block graph of an implanted framework

An introduced structure when in doubt contains an embedded processor. Various devices that have a high level interface microwaves, VCRs, vehicles utilize introduced systems. Some embedded structures fuse a functioning system. Others are extraordinarily specific achieving the entire reasoning being completed as a single program. These structures are embedded into some contraption for some

specific explanation other than to give comprehensively valuable enlisting.

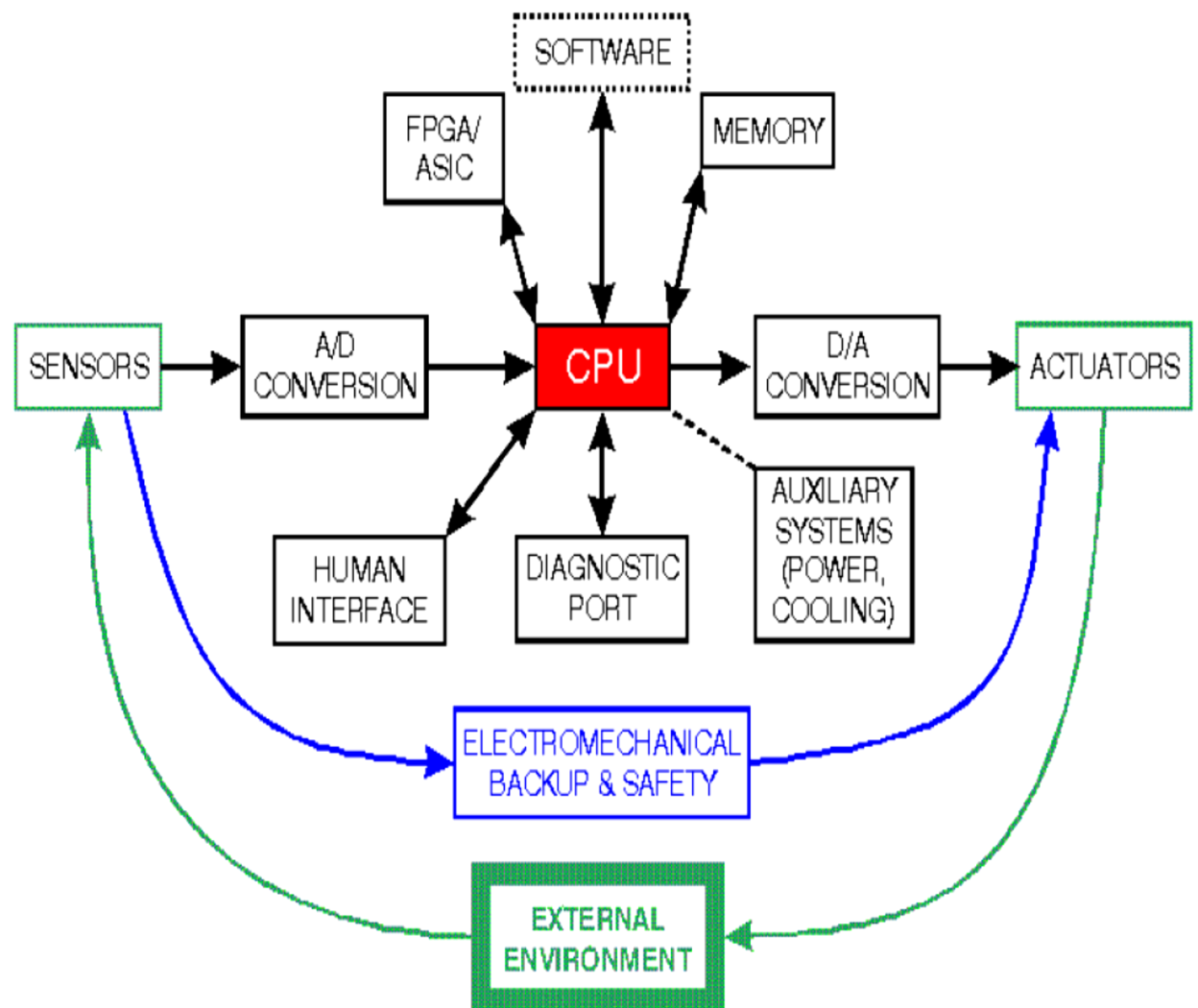


Fig. 1.3: Block Diagram of a Typical Embedded System

1.11 EMBEDDED SYSTEMS APPLICATIONS

Introduced structures in cars consolidate motor control, venture control, and body prosperity, engine security, progressed mechanics in a successive development framework, vehicle media, vehicle entertainment, E-com access, mobiles, etc

- Embedded structures in media correspondences consolidate frameworks organization, flexible handling, and distant exchanges.
- Embedded systems in smart cards consolidate banking, telephone and security structures.
- Embedded Systems in satellites and rockets consolidate protect, correspondence, and avionics
- Embedded structures in PC arranging and peripherals join picture planning, coordinating systems, printers, network cards, screens and shows
- Embedded Systems in mechanized buyer devices fuse set-top boxes, DVDs, prevalent quality TVs and progressed cameras

CHAPTER 2

LITERATURE SURVEY

2.1 Character Recognition on Neural Networks

Sandeep et.al (2018) The spot of this undertaking is to make a refreshable electronic braille show utilizing Raspberry Pi 2 and Arduino Mega2560 board. This target making a refreshable braille show that is useful for changing over Normal substance report also as printed picture records to braille. To accomplish the benefit of changing over picture records to message we have utilized tesseract-ocr motor of Google which the best open OCR motor open at the present time and is fundamentally cautious. The Raspberry pi does the picture dealing with and the Arduino drives the display. The display is made of 6 servo engines, which can be constrained by the PWM. The servo engine goes likely as an actuator in this undertaking.

2.2 Approach to text entry on Smart phones

Prachi Rajarapoll, et.al (2017) individuals are a critical piece of the general populace. Regardless, their deficiencies have made them to have less acceptance to PCs, the Internet, and inconceivable instructive programming than individuals with clear vision. Thusly, they have not had the decision to develop their own insight, and impact the cash related, business, and illuminating endeavors in the general populace.

One approach as far as possible this expanding opening and see an inversion of this model is to build up a construction, inside their cash related reach, and which will engage them to pass on wholeheartedly and broadly utilizing the Internet or some other data foundation. Over the long haul, the Braille structure has been utilized by the clearly debilitated for correspondence and contact with the rest of the world. This undertaking presents the execution of Braille to Text/Speech Converter on FPGA Spartan3 pack. The genuine Braille language is changed over into English language in like manner space.

The data is given through braille keypad which contains various mixes of cells. This information goes to the FPGA Spartan3 Kit. As shown by the mixes given, FPGA changes over the obligation to taking a gander at English substance through the deciphering thinking in VHDL language. Coming about to disentangling, the relating letter set is changed over to talk through figuring. In like way it is showed up on the LCD by interfacing the LCD to the Spartan3 pack

2.3 Image Recognition for Beginners

Aisha Mousa, HazemHiary, et.al (2018) Firsthand Experiences with a Balanced Approach to Literacy , new from the American Foundation for the Blind, begins with a conversation of the entire language and standard ways to deal with oversee showing investigating and framing. Creator Anna M. Swenson is a Braille instructor who favors the entire language speculation, in any case who has educated in different settings, and joins thoughts and strategies that will work with the standard framework besides. The books rotate is around making an environment that advances tutoring, paying little psyche to what the preparation approach.

As per Swenson, Braille educators, who are the book key target gathering, are engaging the Braille code, but then are showing examining and making. Swenson urges Braille instructors to keep alert with the latest with current ways to deal with oversee showing language explanations, to get preliminary of discovered understudies work to get a handle fair and square of homeroom assumption, and to speak with the plan arranged capable or learning incompetencies ace in the school if the ostensibly thwarted understudy is obviously experiencing issues figuring out some approach to peruse.

Swenson makes isolated considerations concerning working out the particular bits of preparing Braille to an understudy in the standard, particularly in an entire language study entryway. In the segment A Morning in the Mainstream, the scrutinize can get a specific perspective on how the Braille instructor can function close by the homeroom teacher to guarantee a strong establishment for the apparently ruined understudy.

2.4 Customized Transportation Intervention

VineethKarth; Dheeraj et.al (2017) Braille is a material report which is most standard methods for investigating for apparently attempted individuals. There is an immense need to safeguard old Braille reports and creative works. Printed copy Braille is profound, huge, which takes basic space to store and keep up. The materials that are open essentially in printed copy bear a risk of losing them.

The Automation of Braille examining and digitization cycle will help in getting, appropriating Braille over organization and replicating printed copy basically on requests. The essential for digitizing Braille has lead different analysts in advancement libbing and execution of optical Braille confirmation frameworks. A layout and near evaluation on different calculations and strategies proposed and introduced by specialists in ad libbing Optical Braille Recognition framework to attainably/proficiently make an interpretation of Braille to message has been introduced in this venture.

CHAPTER 3

AIM & SCOPE

Point of the current work is to execution of a Self-learning Braille application for the visually impaired and outwardly weakened individuals on the keen gadgets

3.1 BLOCK DIAGRAM

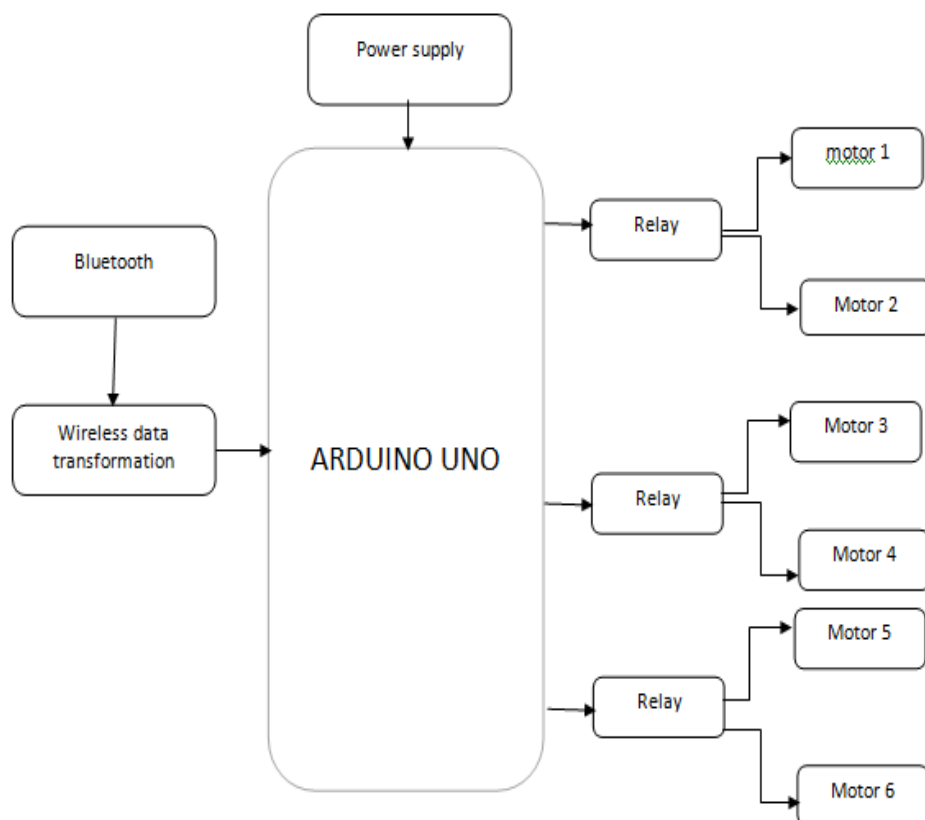


Fig. 3.1: Block Diagram

Bluetooth module interface with Arduino Uno.

- We develop an endeavor in Arduino IDE. First we do this endeavor in programming using Embedded C language.
- Then we interface the Bluetooth module with Arduino Uno using UART correspondence.
- Connect the Bluetooth module 5v to Arduino UNO 5v, GND to GND, TX to RX. By then interface the Bluetooth module with our versatile using android application.
- Then we send the data to compact through Bluetooth module. The data recently moved to Bluetooth module by then moved to Arduino through TX pin in the Bluetooth module.
- In the accompanying overview we interface the Arduino Uno with vibration motors, by then reliant on the Bluetooth module data (letters all together) the vibration motors will work.

3.2 EXISTING SYSTEM

Preparing is the best approach to accomplishment for the duration of regular day to day existence, normal young people acquire from instructors in schools seeing and talking with each other. For Visually tried understudies sorting out some way to examine and form is generously more irksome because of visual weakness. The preparation assists required with empowering such outwardly hindered understudy are unprecedented and require part of teacher's thought.

For a first time learning blind understudy, character set a number are told with a help of marbles and opened record. Different blueprint instances of marbles on opened record address different characters. For each character depiction, teacher needs to show up at each understudy and shift the direction of activity of marbles. This is harder and monotonous exercise.

3.3 PROPOSED SYSTEM

The proposed system offers understanding to apparently weakened people to examine English characters. The system uses the characters for vibrating the vibration motors for the ostensibly incapacitated people as braille language which is passed on to the customers through downsized vibration motors tending to each braille glyph. Fitting gear is picked for executing the system. The system contains, a single braille cell and adaptable for voice affirmation to get the characters as the information. Arduino is used as the dealing with device in this errand.

CHAPTER 4

METHODS, ALGORITHMS AND MATERIALS

4.1 FLOW CHART

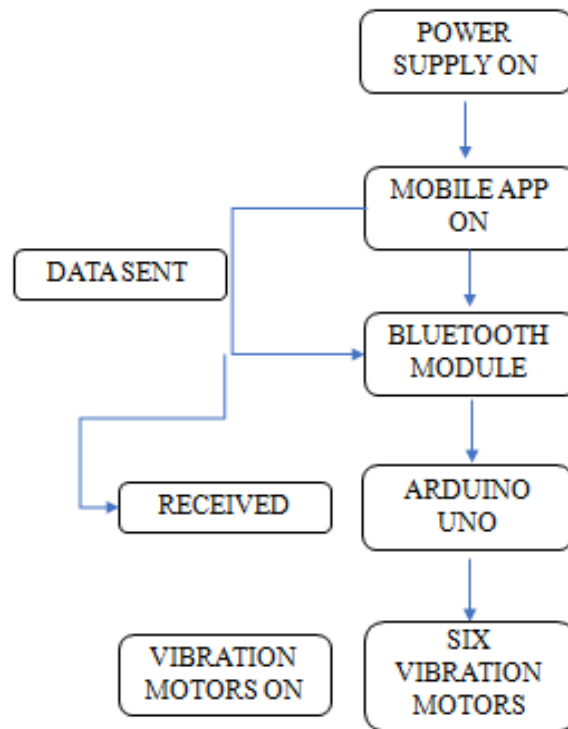


Fig. 4.1: Flow Chart

4.2 HARDWARE REQUIREMENT

- ARDUINO UNO
- BLUETOOTH MODULE
- VIBRATION MOTOR RELAY

4.2.1 ARDUINO UNO (ATmega328)

The Arduino Uno is a microcontroller board reliant on the ATmega328 (datasheet). It has 14 computerized input/output pins (of which 6 can be utilized as PWM outputs), 6 simple sources of info, a 16 MHz fixed resonator, a USB association, a power jack, an ICSP header, and a reset button. It contains all that normal to help the microcontroller; simply partner it to a PC with a USB connection or power it with an AC-to-DC connector or battery to start.

The Uno contrasts from all former sheets in that it doesn't utilize the FTDI USB-to-serial driver chip. All things considered, it includes the ATmega16U2 (ATmega8U2 up to adaptation R2) modified as a USB-to-serial converter. Update 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, simplifying it to put into DFU mode.

Correction 3 of the board has the accompanying new highlights:

- Pin out: added SDA and SCL pins that are close to the AREF pin and two other new pins put close to the RESET pin, the IOREF that permit the safeguards to adjust to the voltage gave from the board. In future, safeguards will be viable both with the board that utilization the AVR, which work with 5V and with the Arduino Due that work with 3.3V. The subsequent one is a not associated pin that is held for future purposes.
- ATmega 16U2 supplants the 8U2. "Uno" implies one in Italian and is named to stamp the impending appearance of Arduino 1.0. The Uno and form 1.0 will be the reference variants of Arduino, pushing ahead. The Uno is the most recent in a progression of USB Arduino sheets, and the reference model for the Arduino stage; for a correlation with past variants, see the list of Arduino sheets.

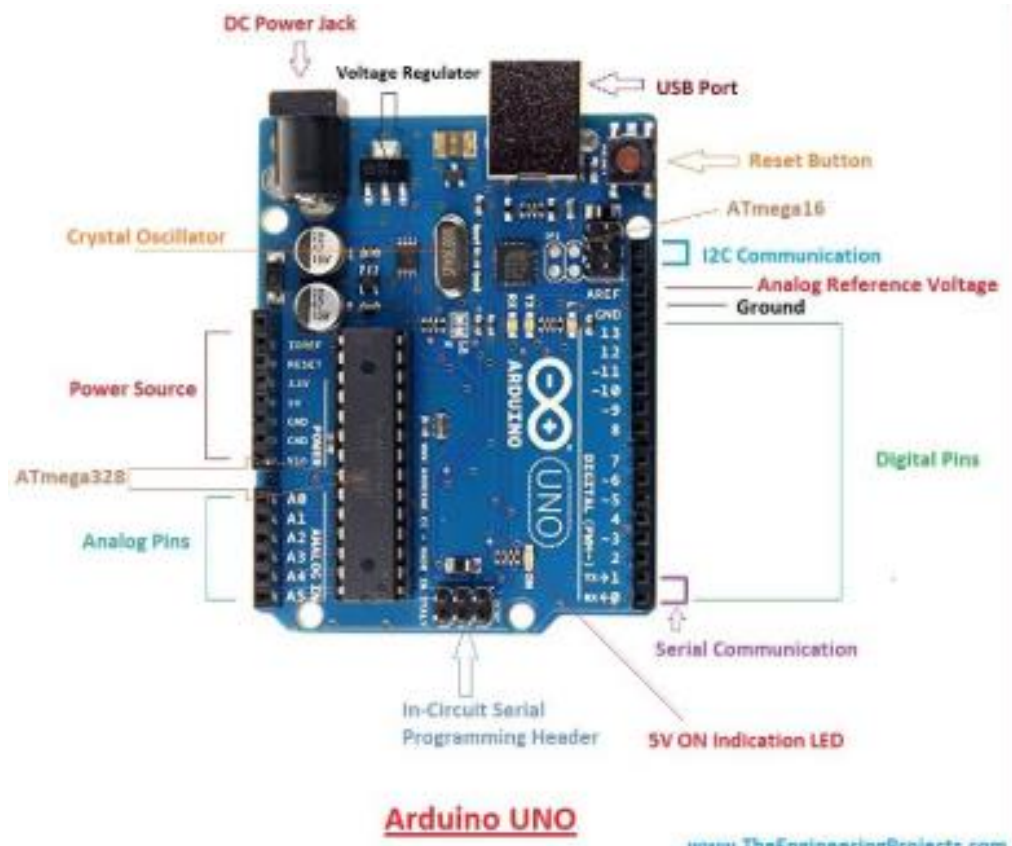


Fig.4.2: Arduino UNO

4.2.2 POWER SUPPLY

VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). It can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

- 5V. This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.
- 3V 3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins

4.2.3 MEMORY UNIT

The ATmega328 has 32 KB (with 0.5 KB used for the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library). Input and Output Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode (), digital Write (), and digital Read () functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50k Ohms.

In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt () function for details.
- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write () function.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference () function. Additionally, some pins have specialized functionality.
- TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library. There are a couple of other pins on the board:
- AREF. Reference voltage for the analog inputs. Used with analog Reference ().

- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board. See also the mapping between Arduino pins and ATmega328 ports. The mapping for the Atmega8, 168, and 328 is identical. Communication The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers.

The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed.

However, on Windows, an .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

PIN CONFIGURATION

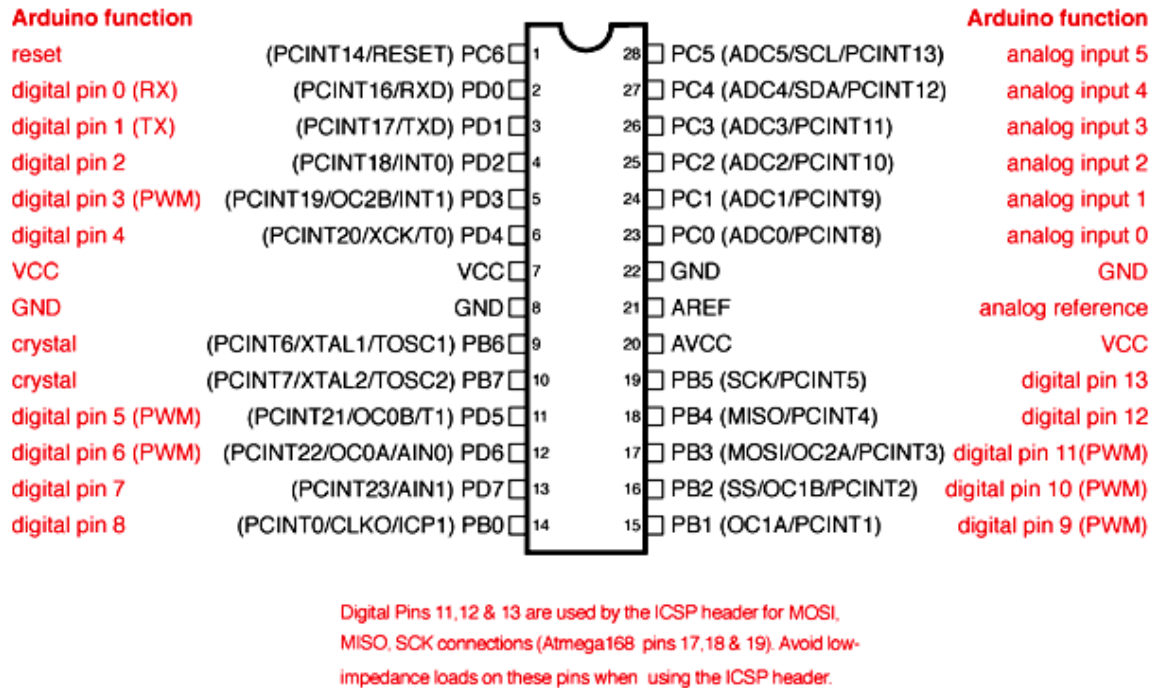


Fig. 4.3: Pin Configuration

4.2.4 USB Overcurrent Protection

The Arduino Uno has a resettable poly fuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

4.2.5 Physical Characteristics

The maximum length and width of the Uno PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Four screw holes allow the board to be attached to a surface or case.

Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100-mil spacing of the other pins.

4.2.6 RELAY

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification

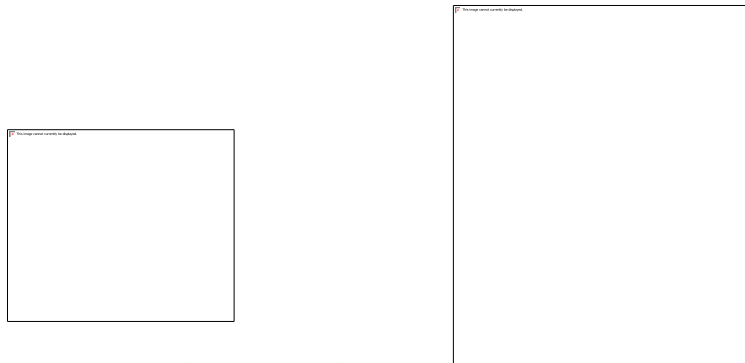
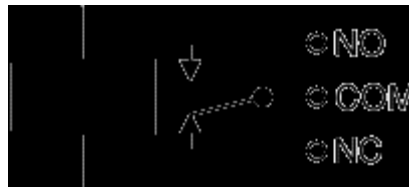


Fig. 4.4: Relay

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but it can solder wires directly to the pins providing it take care to avoid melting the plastic case of the relay. The animated picture shows a working relay with its coil and switch contacts. It can see a lever on the left being attracted by magnetism when the coil is

switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.



The relay's switch connections are usually labeled COM, NC and NO:

- **COM** = Common, always connect to this, it is the moving part of the switch.
- **NC** = Normally Closed, COM is connected to this when the relay coil is **off**.
- **NO** = Normally Open, COM is connected to this when the relay coil is **on**.

Power supply unit

A power supply (sometimes known as a power supply unit or PSU) is a device or system that supplies electrical or other types of energy to an output load or group of loads. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

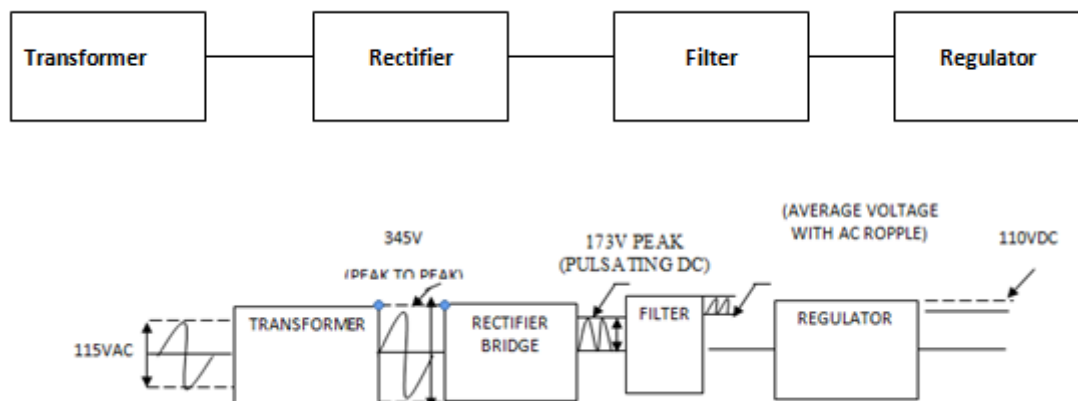


Fig.4.5: Block Diagram of Power Supply

The transformer steps up or steps down the input line voltage and isolates the power supply from the power line. The RECTIFIER section converts the alternating current input signal to a pulsating direct current. However, as it proceed in this chapter it will learn that pulsating dc is not desirable. For this reason a

FILTER section is used to convert pulsating dc to a purer, more desirable form of dc voltage.

The final section, the REGULATOR, does just what the name implies. It maintains the output of the power supply at a constant level in spite of large changes in load current or input line voltages. Now that it know what each section does, let's trace an ac signal through the power supply. At this point you need to see how this signal is altered within each section of the power supply. Later on in the chapter it will see how these changes take place. An input signal of 115 volts ac is applied to the primary of the transformer.

The transformer is a step-up transformer with a turn's ratio of 1:3. It can calculate the output for this transformer by multiplying the input voltage by the ratio of turns in the primary to the ratio of turns in the secondary; therefore, $115 \text{ volts ac} \times 3 = 345 \text{ volts ac}$ (peak-to-peak) at the output. Because each diode in the rectifier section conducts for 180 degrees of the 360-degree input, the output of the rectifier will be one-half, or approximately 173 volts of pulsating dc. The filter section, a network of resistors, capacitors, or inductors, controls the rise and fall time of the varying signal; consequently, the signal remains at a more constant dc level. It will see the filter process more clearly in the discussion of the actual filter circuits. The output of the filter is a signal of 110 volts dc, with ac ripple riding on the dc. The reason for the lower voltage (average voltage) will be explained later in this chapter. The regulator maintains its output at a constant 110-volt dc level, which is used by the electronic equipment (more commonly called the load).

Simple 5V power supply for digital circuits

- Brief description of operation: Gives out well-regulated +5V output, output current capability of 100 m A
- Circuit protection: Built-in overheating protection shuts down output when regulator IC gets too hot
- Circuit complexity: Very simple and easy to build
- Circuit performance: Very stable +5V output voltage, reliable operation
- Availability of components: Easy to get, uses only very common basic components

- Design testing: Based on data sheet example circuit, I have used this circuit successfully as part of many electronics projects
- Applications: Part of electronics devices, small laboratory power supply
- Power supply voltage: Unregulated DC 8-18V power supply
- Power supply current: Needed output current + 5 mA
- Component costs: Few dollars for the electronics components + the input transformer cost

4.2.5 BLUETOOTH MODULE (HC – 05 / 06)

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

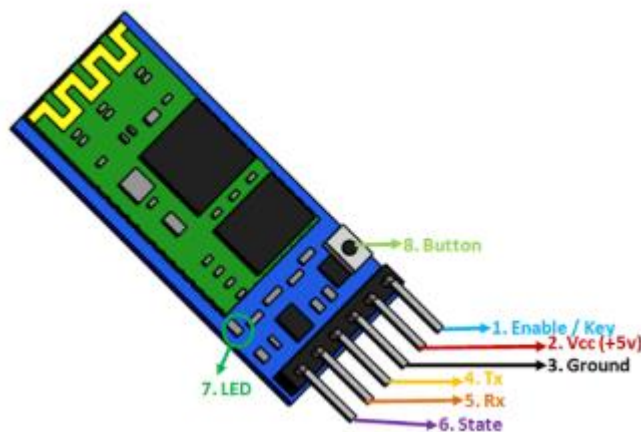


Fig. 4.6.a: Bluetooth Module (HC – 05 / 06)

4.2.6 Hardware Features

- Typical -80dBm sensitivity
- Up to +4dBm RF transmit power
- Low Power 1.8V Operation ,1.8 to 3.6V I/O
- PIO control

- UART interface with programmable baud rate
- Integrated antenna
- Edge connector

4.2.7 Software Features

- Default Baud rate: 38400, Data bits:8, Stop bit:1,Parity:No parity, Data control
- Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.
- Given a rising pulse in PIO0, device will be disconnected.
- Status instruction port PIO1: low-disconnected, high-connected;
- PIO10 and PIO11 can be connected to red and blue led separately. When master and slave are paired, red and blue led blinks 1time/2s in interval, while disconnected only blue led blinks 2times/s.

PIN CONFIGUARTION

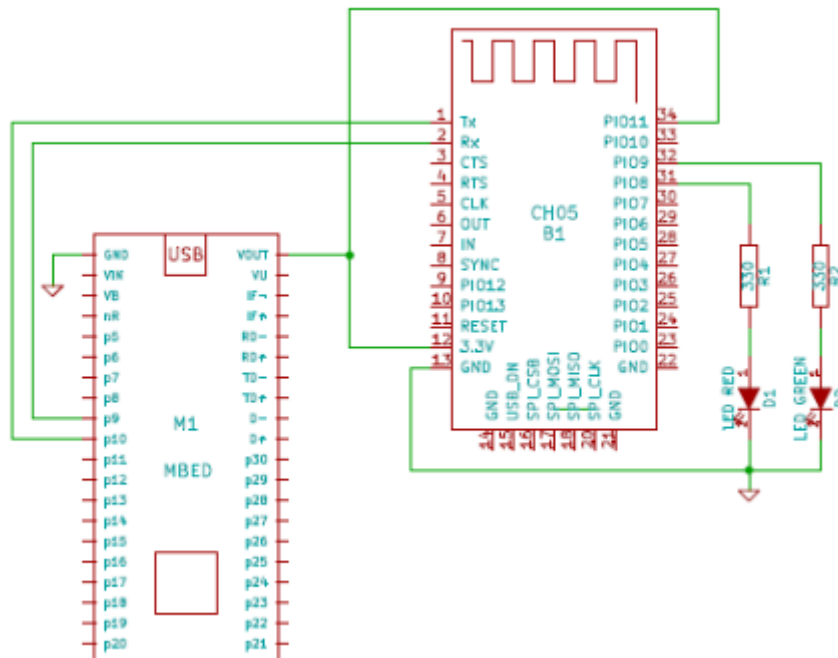


Fig. 4.6.b: Pin Configuration

- Auto-connect to the last device on power as default.

- Permit pairing device to connect as default.
- Auto-pairing PINCODE: "0000" as default
- Auto-reconnect in 30 min when disconnected as a result of beyond the range of connection.

The **HC-05** has two operating modes, one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin as explained in the pin description.

It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). Simply power the module with +5V and connect the Rx pin of the module to the Tx of MCU and Tx pin of module to Rx of MCU

During power up the key pin can be grounded to enter into Command mode, if left free it will by default enter into the data mode. As soon as the module is powered it should be able to discover the Bluetooth device as "HC-05" then connect with it using the default password 1234 and start communicating with it. The name password and other default parameters can be changed by entering into the

4.2.6 Applications

1. Wireless communication between two microcontrollers
2. Communicate with Laptop, Desktops and mobile phones
3. Data Logging application
4. Consumer applications
5. Wireless Robots
6. Home Automation

4.2.7 VIBRATION MOTOR

There are two basic types of vibration motor. An **eccentric rotating mass vibration motor (ERM)** uses a small unbalanced mass on a DC motor when it rotates it creates a force that translates to vibrations. A **linear resonant actuator (LRA)** contains a small internal mass attached to a spring, which creates a force when driven.



Fig.4.7: Vibration Motor

As specialists in the supply and design of vibration motors, it can find our stocked motors in our product catalogue. If it can't find exactly what it need or would like to discuss a project, please do not hesitate to contact our engineers here. If it prefer to read online, it will find lots of additional information and guides to help it understand how vibration motors work.

Different Vibration Motor Form Factors

Whilst the end goal of vibration motors is to produce a force, there are many ways of achieving it. There is a wide range of physical forms, both internal and external, to help it achieve this. To guide you, the articles below help describe the main characteristics of each type. It will notice that some motors may belong to multiple categories, for example, our encapsulated motors are based on ERMs, and so it may want to look at several different types for additional information.

Our most popular form factor is the ERM or 'pager' motor. This is because there are lots of DC motors available in this cylindrical form, where the eccentric mass helps create an unbalanced force.

They are also the most versatile - they can be mounted on PCBs, encapsulated, use a variety of power connections, and even be based on brushless motors. However, coin or 'pancake' motors use the same operating principle - but their eccentric mass is kept in their small circular body (which is where they get their names from). They are restricted in amplitude because of their size but have extremely low profiles (only a few mm!) which make them popular in applications which space is restricted Linear Resonant Actuators (LRA) are the most unique devices in our collection of vibration motors.

Although they sometimes look like coin motors, they do not use an eccentric mass to create force. Instead, they have a magnetic mass attached to a spring and driven by a voice coil - a similar design to loudspeakers. This means they are very

efficient, have excellent response, and need different drivers compared to a DC vibration motor. Similarly, brushless vibration motors also have different driving requirements. Without wearing the brushes of the commutator, they last for a very long time but (unless the vibration motor has an internal driver IC) are slightly more complicated to operate.

Common Vibration Motor Applications and Examples

Our customers are always coming up with ever more inventive uses for vibration motors, so it is difficult for us to list them all here! To help, we have discussed some of our most popular categories over the years below. Haptic Feedback and Vibration Alerting is not necessarily applications themselves, but they are different methods of implementing vibrations within applications. Haptic Feedback uses advanced vibration patterns and effects to convey complicated information to users. Vibration Alerting tends to be a simple on/off alert, perhaps with a ramp effect.

A good example is a mobile phone, which in the early days would simply vibrate to notify the user of a call/text. Later, they would play SMS in Morse code, now they have a range of effects for games and applications. Over time, they have progressed from Vibration Alerting to Haptic Feedback.

4.3 SOFTWARE REQUIREMENTS

4.3.1 ARDUINO IDE

Programming The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno" from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials. The ATmega328 on the Arduino Uno comes preburned with a boot loader that allows it to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. It can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

- On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.
- On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode. It can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or it can use the ISP header with an external programmer (overwriting the DFU boot loader). See this user-contributed tutorial for more information.

Automatic (Software) Reset Rather than requiring a physical press of the reset button before an upload, the Arduino Uno is designed in a way that allows it to be reset by software running on a connected computer.

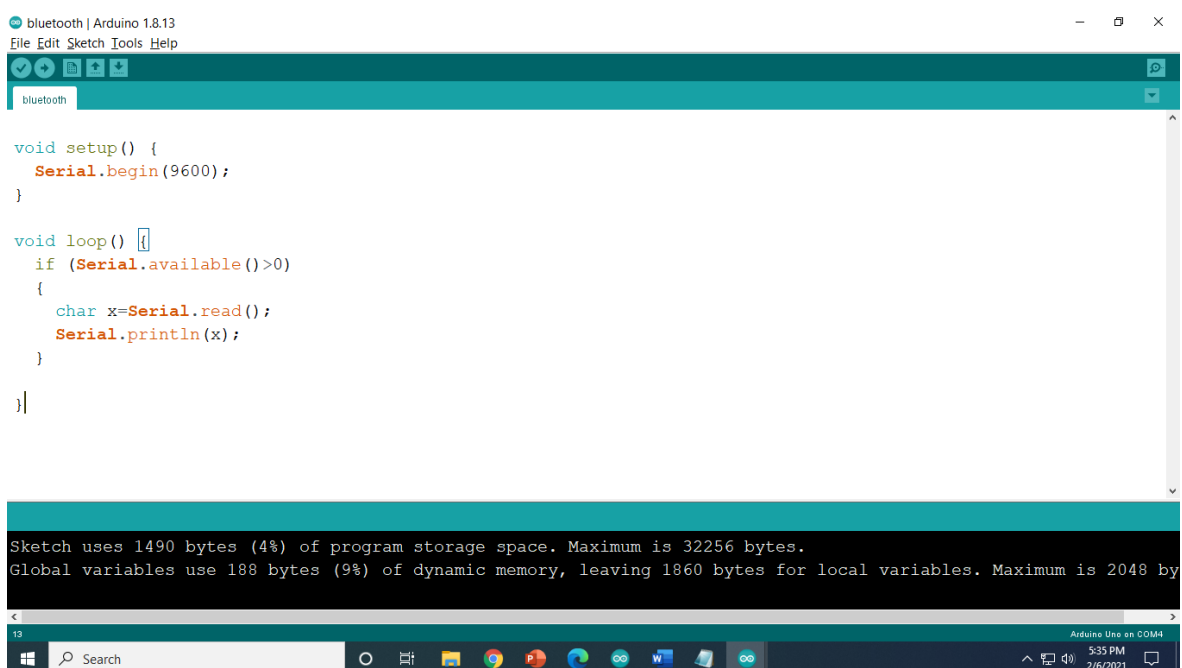
One of the hardware flow control lines (DTR) of the ATmega8U2/16U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow it to upload code by simply pressing the upload button in the Arduino environment. This means that the boot loader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the Uno is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half second or so, the boot loader is running on the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened.

If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data. The Uno contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". It may also be able to disable the auto-reset by connecting a

4.3.2 EMBEDDED C

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software. Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.



The screenshot shows the Arduino IDE interface with a sketch named 'bluetooth'. The code is as follows:

```
void setup() {  
  Serial.begin(9600);  
}  
  
void loop() {  
  if (Serial.available() > 0)  
  {  
    char x = Serial.read();  
    Serial.println(x);  
  }  
}
```

Below the code editor, the status bar indicates: "Sketch uses 1490 bytes (4%) of program storage space. Maximum is 32256 bytes. Global variables use 188 bytes (9%) of dynamic memory, leaving 1860 bytes for local variables. Maximum is 2048 bytes." The bottom of the window shows the Windows taskbar with the system clock at 5:35 PM on 2/6/2021.

Fig. 4.8.a: Embedded C

The Embedded C code written in above block diagram is used for blinking the LED connected with Port0 of microcontroller.

In embedded system programming C code is preferred over other language. Due to the following reasons:

- Easy to understand
- High Reliability
- Portability
- Scalability

Function is a collection of statements that is used for performing a specific task and a collection of one or more functions is called a programming language.

Most consumers are familiar with application software that provide functionality on a computer. Embedded software however is often less visible, but no less complicated. Unlike application software, embedded software has fixed hardware requirements and capabilities, and addition of third-party hardware or software is strictly controlled.

Embedded software needs to include all needed device drivers at manufacturing time, and the device drivers are written for the specific hardware. The software is highly dependent on the CPU and specific chips chosen. Most embedded software engineers have at least a passing knowledge of reading schematics, and reading data sheets for components to determine usage of registers and communication system. Conversion between decimal, hexadecimal and binary is useful as well as using bit manipulation.

Web applications are rarely used, although XML files and other output may be passed to a computer for display. File systems with folders are typically absent as are SQL databases.

Software development requires use of a cross compiler, which runs on a computer but produces executable code for the target device. Debugging requires use of an in-circuit emulator, JTAG or SWD. Software developers often have access to the complete kernel (OS) source code. Size of the storage memory and RAM can vary significantly. Some systems run in 16 KB of Flash and 4 KB of RAM with a CPU operating at 8 MHz, other systems can rival contemporary computers.

These space requirements lead to more work being done in C or embedded C++, instead of C++. Interpreted languages like BASIC (while e.g. Parallax Propeller can use compiled BASIC) and Java (Java ME Embedded 8.3[9] is available for e.g. ARM Cortex-M4, Cortex-M7 microcontrollers and older ARM11 used in Raspberry Pi and Intel Galileo Gen. are not commonly used; while an implementation of the interpreted Python 3 language – Micro Python – is however available expressly for microcontroller use, e.g. 32-bit ARM-based (such as BBC micro: bit) and 16-bit PIC microcontrollers.

Communications between processors and between one processor and other components are essential. Besides direct memory addressing, common protocols

include I²C, SPI, serial ports, and USB. Communications protocols designed for use in embedded systems are available as closed source from companies including Inter Niche Technologies and CMX Systems. Open-source protocols stem from uIP, lwip, and others.

This program explains how to use structure within structure in C using normal variable. “student_college_detail” structure is declared inside “student detail” structure in this program. Both structure variables Please note that members of “student_college_detail” structure are accessed by 2 dot(.) operator and members of “student are normal structure variables.

- _detail” structures are accessed by single dot (.) operator.

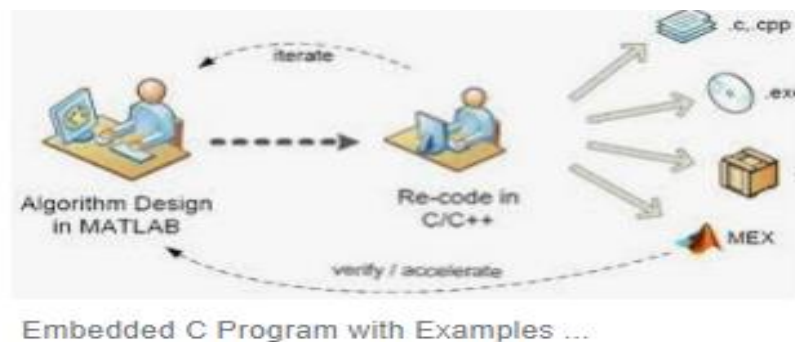


Fig. 4.8.b Embedded C Program

A Keyword is a special word with a special meaning to the compiler (a C Compiler for example, is software that is used to convert program written in C to Machine Code). For example, if we take the Kiel’s Cx51 Compiler (a popular C Compiler for 8051 based Microcontrollers) the following are some of the keywords:

- Bit
- Sbit
- Sfr
- Small
- Large

These are few of the many keywords associated with the Cx51 C Compiler along with the standard C Keywords. 110-ohm resistor from 5V to the reset line; see this forum thread for detail.

CHAPTER 5

CONCLUSION

In our undertaking, we have planned the model for dazzle, to peruse the English characters in a solitary reduced gadget. This framework gives interpretation to outwardly debilitated individuals to peruse English characters. This framework utilized for the outwardly impeded individuals as Braille language which is imparted to the clients through six vibration engines addressing each braille glyph. Reasonable equipment is picked for carrying out the framework. The significant key factor of this venture to encourage these individuals and to fix the more sure to deal with their locales without help from anyone else. The essential benefit is that the gadget can be removed effectively and is of about less weight.

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Self-learning Braille application for visually impaired people

by Ashwin Sharma

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

PAGE 15

PAGE 16

PAGE 17

PAGE 18

PAGE 19

PAGE 20

PAGE 21

PAGE 22

PAGE 23
