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# Voice to Braille Converter Using Arduino Mega

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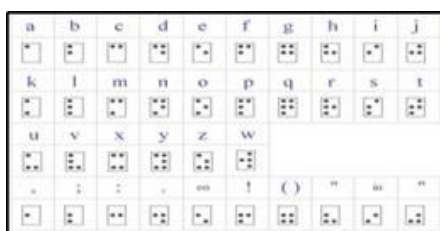
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**ABSTRACT:**In ancient times, the Braille system was developed to eradicate the darkness of visual impaired people and make them gain knowledge for proper interaction with the world. Learning Braille script involves sensing of Braille dots. The size of the dots is too small. Therefore, sensing the dots and recognizing the letters is a difficult task. Visually Impaired students have to memorize/remember various patterns of keys of Braille matrix assigned for different letters / symbols in Braille script to read and write effectively. Different types of Braille devices are available in the market such as a refreshable Braille display, rotatable Braille display and panda Braille display. The cost of them is too high. In a developing country like India, people can't afford. From the literature it is known that, in India it is true that computers have not reached even normal schools in the rural and remote areas. Therefore, providing computers for visually handicapped children to learn and use them seems certainly farfetched. Therefore, an idea to design and develop user-friendly, cost-effective learning aid for visually handicapped children was brought up. The project aims to design a learning aid for the visually impaired in English language which infuses a sense of playing while learning. The proposed idea is implemented on an Arduino Microcontroller interfaced with LCD, Mobile device and Solenoid Actuators as output devices.

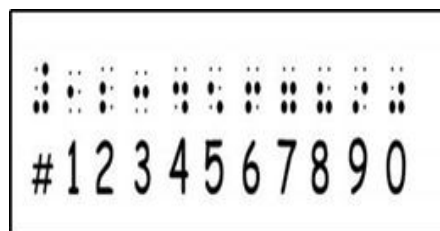
**KEYWORDS:** Braille script, Visually Impaired.

## I. INTRODUCTION

In an information-oriented society, all members of the Society have the right to obtain and use the information. Therefore, it is necessary to develop various devices, which can provide information to anyone easily. Physically challenged people like visually impaired or deaf-blind people are facing lots of problems while communicating or interacting with other people. To provide a helping hand towards the visually impaired, recent technological growth has been developing different skilled methods to enhance their communication procedures. Illiteracy among this group is very high, much of which is attributed due to the lack of reading material in accessible format. For reading and writing visually impaired people always use Braille representation of different alphabets, symbols as shown in Fig.(a) and digits as shown in Fig.(b). Braille is the language used by the blind to read and write. It is vital for communication and educational purposes.



(a)



(b)

The Braille is a tactile writing system used by the blind and the visually impaired. It is traditionally written with embossed paper. They can write Braille with the original slate and stylus or type it on a Braille writer, such as a portable Braille note- taker, or on a computer that prints with a Braille embosser. Braille is named after its creator, Frenchman Louis Braille, as shown in fig.(c) who lost his eyesight due to an accident in childhood. In 1824, at the age of 15, Braille developed his code for the French alphabet as an improvement on night writing.



(c)

## II. PROPOSED SYSTEM

We are planning to build a device that is not only affordable to everyone but also is accurate for reading for people who are visually impaired by using Solenoid actuators. To make this device economical and compact we are using ATMEGA 2560. Our Device is aiming to offer a two-way communication between the users. Since the braille language is already known to the people who are visually impaired, using this device will make it easier for them to communicate as no learning curve is required. This will indirectly reduce the need for braille trained professional teachers in school moreover people can be independent in the true sense.

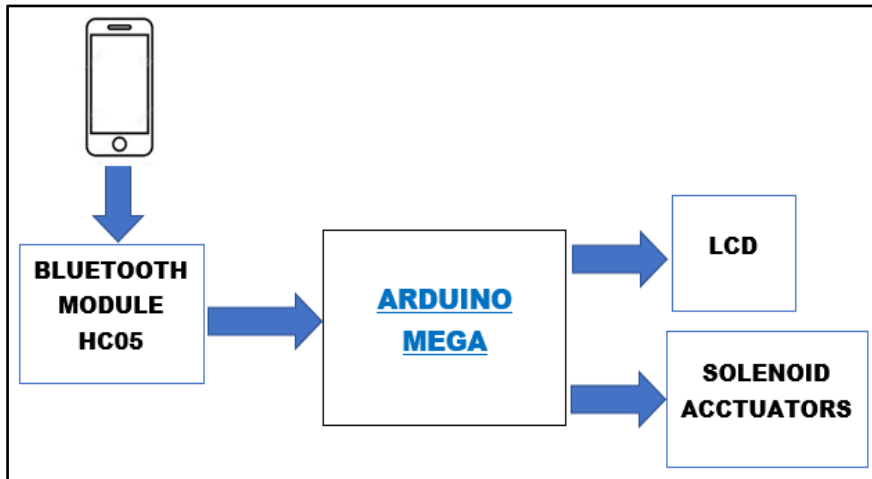
### Steps involved:

This project is divided into three parts: 1. Voice to Braille converter, 2. Braille to Voice converter and third one which is an advanced feature for the visually impaired people that is the Braille-to-Braille converter. This project ensures best possible communication between people with different disabilities.

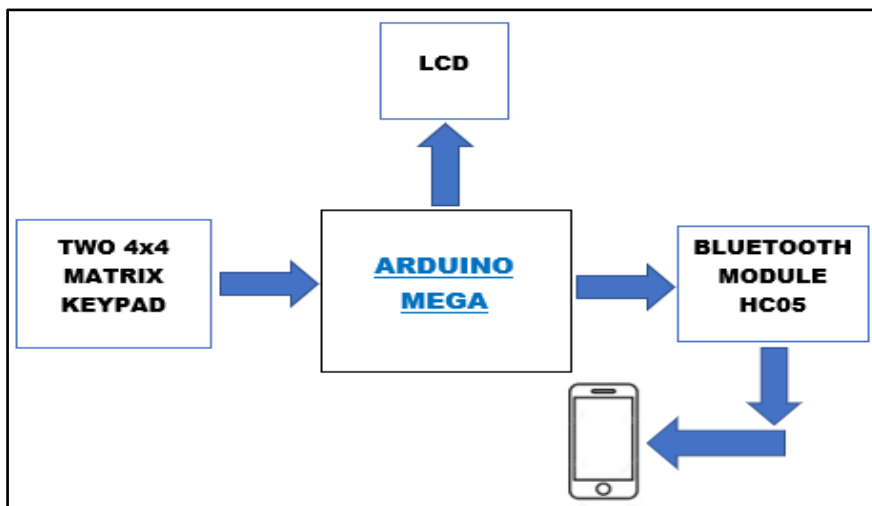
- In the Voice to Braille converter, the input device is a Mobile device, which will act as a voice recognition system. By using the mobile device, the data will be transmitted onto the lcd screen by speaking or by typing in the text. The data on the lcd screen needs to be acquired on the Braille keypad, the data is then stored into the Arduino Mega 2560, the Arduino will compare the data onto the lcd screen with the Braille pattern and will make the corresponding Solenoid pins high. This is how the Voice to Braille conversion works.
- In the Braille to Voice converter, the data will be sent by the disabled people with the help of Braille keypad i.e Switches corresponding to the Braille script and two switches for Enter and Clear operations for example if the data is 'I am a boy' so for the letter 'I' they need to press the switch that has the second and the fourth pins high which is it's corresponding Braille pattern, then for space they need to press the switch which has all the pins low, this is how the entire sentence can be transmitted to Arduino Mega 2560. This data is then stored into the Arduino, now to display the data on the lcd screen, enter switch is to be pressed, and the Clear switch will clear the lcd display. Now with the help of HC05 Bluetooth module, the sentence on the lcd screen will get transferred to the Mobile device where one can see and hear the data. This is how the Braille to Voice conversion works.
- In the Braille-to-Braille converter, there are Braille keypads on the receiver's end as well as the sender's, so the people who can't see, hear or speak can even communicate with each other. To communicate they will

place their hands on the Braille keypad, and if the data is transmitted from one end it will get acquired on the other end by making the corresponding Braille pins high. This is how the Braille-to-Braille conversion works.

### III. BLOCK DIAGRAM



- i. In the Voice to Braille converter, through the mobile device one can send a voice note or type in the required text which will then be given to the Arduino with the help of the Bluetooth Module HC05.
- ii. The Arduino will process the text and then display it on the LCD screen as well as on the Solenoid actuators according to the original Braille script.



- i. In the Braille to Voice converter, the input is to be given through the Keypad matrix which is designed in a way that it resembles the original Braille script which will be an ease to use, for the visually impaired people.
- ii. The data is then sent to the Arduino and then displayed on the LCD screen and also on the mobile device through which it can be heard or seen.



#### IV. METHODOLOGY

##### A. Hardware used:

###### a. Arduino Mega 2560:

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila. The Mega 2560 is an update to the Arduino Mega, which it replaces.

###### b. HC-05 Bluetooth Module:

HC-05 module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. This serial port bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4 GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). The Bluetooth module HC-05 is a MASTER/SLAVE module. By default, the factory setting is SLAVE. The Role of the module (Master or Slave) can be configured only by AT COMMANDS. The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections. Master module can initiate a connection to other devices.

###### c. Solenoid Actuators:

Solenoid is the generic term for a coil of wire used as an electromagnet. It also refers to any device that converts electrical energy to mechanical energy using a solenoid. The device creates a magnetic field from electric current and uses the magnetic field to create linear motion.

##### Working of Solenoid:

The braille chip cell uses 42-gauge coil, this project uses this gauge coil as it is more responsive to the 5V 35 mA Arduino output from the other range of 37-44 gauge. This gauge is more resistant to temperature fluctuations and also flexible to the current fluctuations that take place in the Arduino. Moreover, the cost of this gauge is more economical as compared to other gauges. Output of Arduino is the input to this coil (535 turns which equals to 175 ohms). When current is supplied to the coil the coil experiences electromagnetic induction which in turn leads to the acceleration in the inner plunger which is a semi magnetic shaft consisting of neodymium magnet as the base and iron nail as a head. This acceleration is used for detecting the state of the pins which in turn detects the braille alphabet.

###### d. 4x4 Matrix Keypad:

The 4x4 Matrix Keypad usually is used as input in a project. It has 16 keys in total, which means the same input values. The 4x4 Matrix Keypad Module is a non-encoded matrix keypad consisting of 16 keys in parallel. The keys of each row and column are connected through the pins outside – pin R1-R4 as labelled beside control the rows, when L1-L4, the columns. A 4x4 Keypad will have eight terminals. In them four are rows of matrix and four are columns of matrix. These 8 pins are driven out from 16 buttons present in the module. Those 16 alphanumeric digits on the module surface are the 16 buttons arranged in matrix formation.



**B. Software used:**

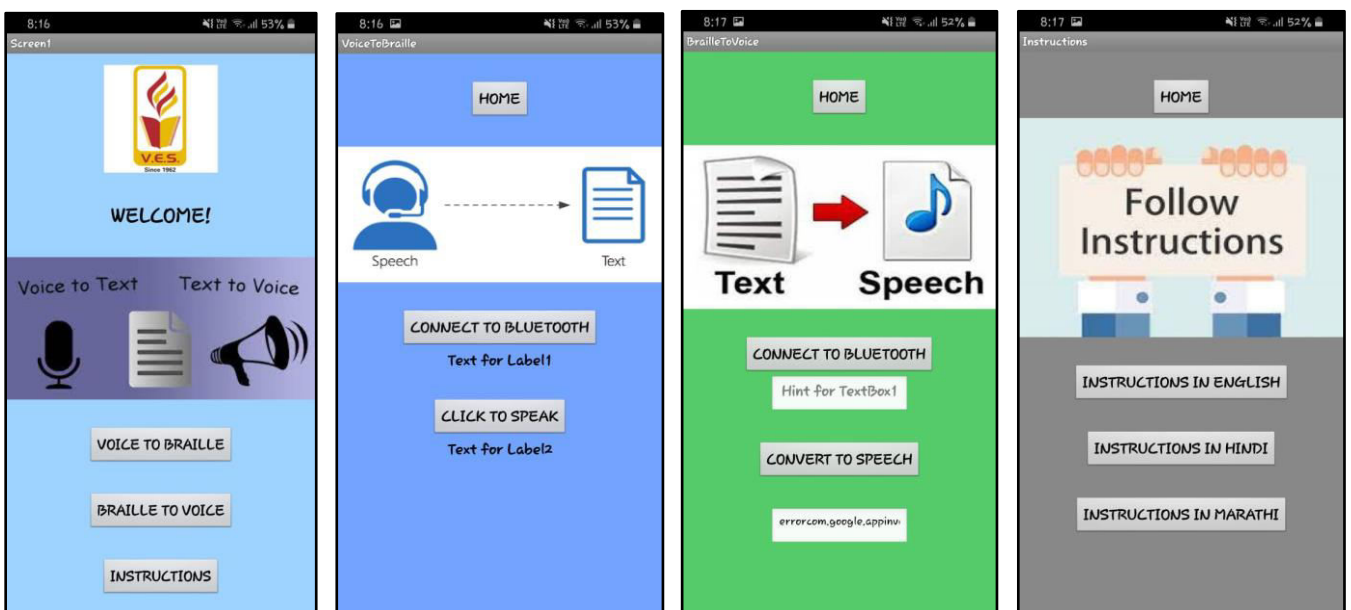
a. Arduino IDE:

The Arduino Integrated Development Environment(IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. 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 toolchain, 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. By default, avrdude is used as the uploading tool to flash the user code onto official Arduino boards.

b. MIT App Inventor:

In recent years the internet has reached a large number of people across the world. And this has motivated all the people who own some businesses or people who want to connect to a large number of people to use and make mobile/laptop applications. These applications provide the customer with a way of easily exploring the content of the provider and it helps the provider with an ample opportunity to present their content more efficiently than they could when they were using websites. But not all people can make the applications. They require some medium to get their business on an application or an app. One way is to hire app developers. It can prove to be costly for some new business setters or the businessmen can be living in some remote part of the country where app developers are not present. Hence, to make app development easier MIT provides us with the MIT app inventor. This is a platform that makes app development easy for anyone who knows to code or not.

**Application Created using MIT App Inventor:**



(a)

(b)

(c)

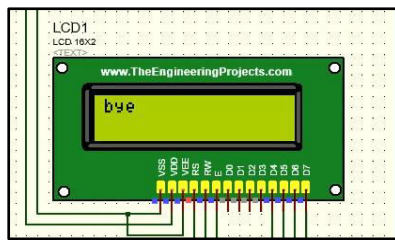
(d)

The important feature of this application is the fourth screen which is in fig.(d). This feature allows the user to get the instruction set on how to use the application and the system in three different native languages. On clicking the ‘Instructions in English’ button the working of the whole device will be explained through a voice note in English.

## V. RESULTS

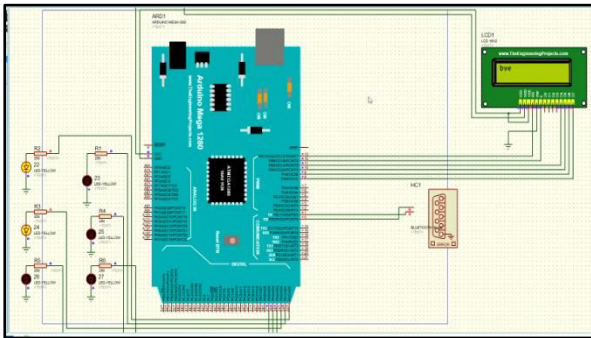
### i. Voice to Braille Converter

With the help of mobile the application, send the voice message which will appear on the LCD screen as in Fig.(a).

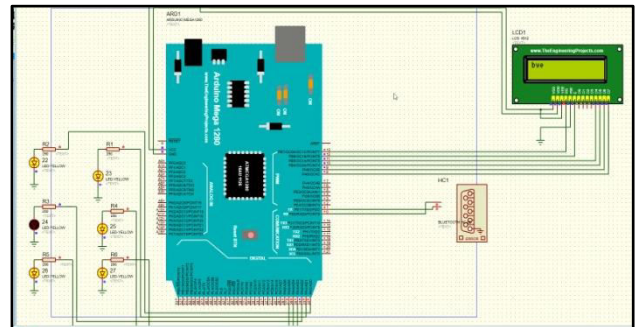


(a)

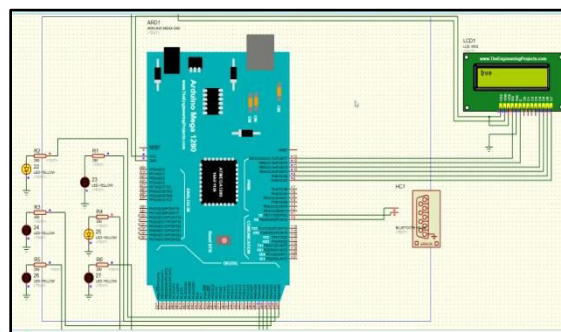
The message that is displayed on the LCD screen will be stored into the Arduino Mega 2560, and it’s corresponding Braille output will be obtained on the Push-Pull Solenoid. The corresponding Braille output for letter B, Y and E is shown through the blinking of the led’s in Fig.(b), Fig.(c) and Fig.(d) respectively.



(b)



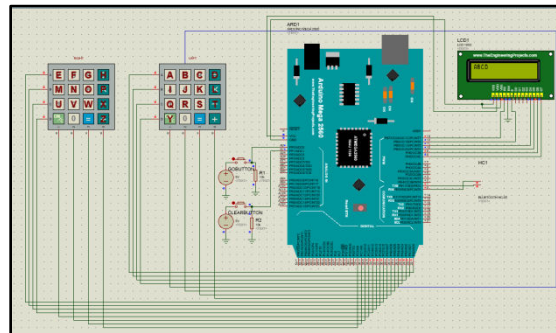
(c)



(d)

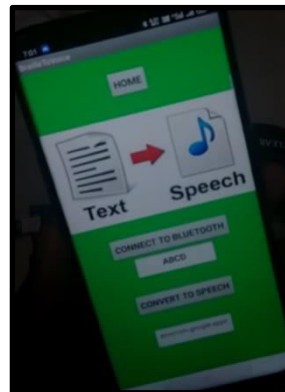
ii. Braille to Voice Converter

With the help of the two 4x4 keypads, input will be given in the form of words or sentences for example the word is 'ABCD', by pressing the keypad key corresponding to 'A' which will have a bump having the code as the original Braille. This is how the entire word can be formed and with the help of the Enter button it will be displayed on the LCD screen as shown in Fig.(e).



(e)

The word displayed on the LCD screen will also be stored into the mobile application and by pressing the 'Convert to Speech' button in the application it can be heard and seen as shown in Fig.(f).



(f)

## VI. CONCLUSION

The main purpose of this research paper was to implement and demonstrate the use of a communication device used for and by the visually and hearing-impaired persons. Due to dual sensory deprivation, visually and hearing-impaired people face many difficulties on interaction with normal people in the world, without an assistant they can't communicate with others. The benefits of this prototype allow them to interact with others without any assistant.

The problem that was stated has finally been resolved by implementation of Voice to Braille converter, Braille to Voice converter and Braille to Braille converter. There was success in getting the output on the Solenoid Braille keypad and the Mobile device respectively. The solution was also simulated on Proteus software with the use of MIT App Inventor. Also, the Mobile application was created and is fully-fledged. This project is ready to be implemented on a large scale and be helpful for the society to endure in the benefit of human mankind.





#### REFERENCES

- [1] E-Braille: A Study Aid for Visual Impaired International Journal of Research in Engineering, Science and Management Volume-2, Issue-2, February-2019.
- [2] Maham Naddeem, Nida Aziz, Umar Sajjad, Faizan Aziz, Hammad Shaikh, "A Comparative analysis of Braille generation technologies", International conference on advanced robotics and mechatronics, (ICARM), 2016, P.No:294-299.
- [3] Prachi Rajarapolu, Stavan Kodoliker, Dhananjay Laghate, AmarsinhKhavale, "FPGA Based Braille to Text & Speech For Blind Persons ", International Journal of Scientific & Engineering Research, Volume 4, Issue 4, April-2013 348 ISSN 2229-5518.
- [4] Ghose, R.; Dasgupta, T.; Basu, A.; , "Architecture of a web browser for visually handicapped people," Students' Technology Symposium (TechSym), 2010 IEEE , vol., no., pp.325- 329, 3-4 April 2010.
- [5] Dasgupta, T.; Basu, A.; , "A speech enabled Indian language text to Braille transliteration system," Information and Communication Technologies and Development (ICTD), 2009 International Conference on , vol., no., pp.201-211, 17-19 April 2009.
- [6] 2016 4th International Conference on User Science and Engineering (i-USER) Voice4Blind: The Talking Braille Keyboard to Assist the Visual Impaired Users in Text Messaging Robiah Hamzah1 and Mohammad Izzat Mohamad Fadzil2 University Kuala Lumpur 1016 Jalan Sultan Ismail 50250 Kuala Lumpur, Malaysia.
- [7] Proceedings of the IEEE 2017 International Conference on Computing Methodologies and Communication (ICCM) BRAILLE SCRIPT TO VOICE CONVERSION K.Krishna Kishore Asst Professor Department of ECE GMR Institute of Technology Rajam, India.



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