International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 03 | Mar 2022 www.irjet.net p-ISSN: 2395-0072

Design of Text-to-Braille Digitized Device based on Android and Arduino Uno with Remote Module

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Abstract - *The objective is to utilize Arduino to make a Text to Braille Converter. The current adaptation considers Braille for the English language. There are two sorts of Braille frameworks: static and dynamic. A set plan for addressing the English 26 letters requires static braille spots of 3x2 lattice measurement. The characters are punched as dabs on paper or metal blocks. To understand reports, a static Braille system needs a large number of archives to be transmitted. This weight is reduced by using a strong braille structure. Braille is a physical system for addressing text. A Braille book is made up of a few braille cells, each of which addresses a letter in order or photograph. A single cell is made up of six distinct spots. A mixture of these pins lifted high and low frames a letter in the sequence. Many languages have a standard braille code for each letter in the alphabet. Writings are typically emblazoned on material, and visually impaired people brush their fingertips over the dabs to read the content. Because of mechanical advancements in various fields of study, Braille engineering is advancing at a rapid pace. Several languages, including English, French, and Spanish, can be written and read using Braille code. The idea is for the client's fingertips to be placed on the cell, causing cell pins to reproduce, rubbing a finger over cells.*

***Key Words*: Braille, Text-to-Braille, Arduino Uno, Solenoids, Android, Bluetooth**

1. INTRODUCTION

Interaction is the exchange of facts. Composing is one of the primary skills that people use to express their thoughts and emotions. For different dialects, various writing frameworks, orthography, and punctuation are used. People who are dazzled learn by touch, while people who are placed read outwardly. Bishop Berkeley, a logician, accepted in the mid-eighteenth century that touch was the establishment of perception, with the hand acting as a unitary receptor like the eye (Katz, 1925). Charles Barbier produced the primary speck for content detection. Raised spots were created with the intention of being read by touch in obscurity. Following that, Louis Braille discovered and updated the technique to make it more accessible to those who are visually impaired. His style was more practical and financially savvy (Sakula, 1998). Individuals with visual impairments also use Braille's version for reading and writing. Braille characters were originally made up of six dots, but the encoding has since been expanded to include eight dots. The Braille language for Blind Youth was formally accepted by the Royal Institution in 1854. The whole first coding was reported in the United States at the Missouri School for the Blind. The World Health Organization (WHO) has shown that over 161 million individuals were outwardly disabled with 124 million unimpaired vision and 37 million visually impaired, the current observational assessment of the severity of visual impairment and visual impairment. They all use Braille as a means of communication and schooling. Although Braille dabs do not imitate print letters, Braille has been adapted to almost every language on the globe and is the primary form of education for blind people worldwide. Since Louis Braille distributed his first emblazoned Braille book in a long time, a large number of Braille books for people with visual impairments have been distributed. Recently, the use of Braille has declined as alternative solutions, such as discourse union, have been implemented. Braille, as a reading tool, continues to play an important role in instructing people with visual impairments. Reading directly from the text, on the other hand, can avoid possible blunders or inconveniences caused by discourse unions, such as garbled translations or incorrect spelling. As a result, Braille can be an essential part of visually disabled education and culture.

The mainstream use of Braille has declined dramatically over the past decade (Frieman, 2006). In Ireland, approximately 2.8 percent of the almost 14,000 clients of the National Council for the Blind's projects are authorized, Braille clients. This figure is comparable to that registered for the United Kingdom. (Keil and Keil, 2003). Every year, almost 75,000 people in the U.s. lose any of so of their vision. Despite this, almost 90% of visually impaired American children are not instructed Braille (National Federation for the Blind, 2009). Innovative progressions and a scarcity of expert braille educators are major causes for powerless braille proficiency. Non-industrial nations are home to 89 percent of the world's outwardly disabled people. The majority of people survive on the public standard of living, which has the least amount of compensation. The majority of available contraptions are prohibitively expensive and poorly built to be used. There is no free Braille conspiracy available in non-industrialized nations where braille reading and writing can be taught without the assistance of a Braille instructor (Sojib and Iqbal, 2018; Kulkarni and Bhurchandi, 2015). A number of researchers sought cost-effective wearable real-time screens for people with vision

impairment conditions. Different actuators have been used in the development of Braille display systems, such as solenoids, piezoelectric material and electrical polymers. However, refreshing braille displays were very promising to meet low-cost, portable and real-time specifications. In Draffan et al., (Draffan et al., 2007), the report outlined a number of research initiatives on the translation into Braille of various types of texts. In 1997, P. Blenkhorn (Blenkhorn, 1997) addressed the problem of converting Word-Processed Documents into designed Braille records. The concern has been raised by buyers of word processors who want to create Braille documents. The interpreter will be integrated into the word processing program. It is simple to use since MSWord menu artifacts allow for clarification. To convert text to Braille, they used a DLL written in C. The Braille Out technique generates consistent contracted Braille from a vast range of documents. The style is good, and the pace is adequate. The essential concept is to create a software program for converting text to Braille. This is usually based on NLP - Natural language processing - and the representation of English to each Braille. It is the software framework that is used to decode the content using Arduino. The analysis is

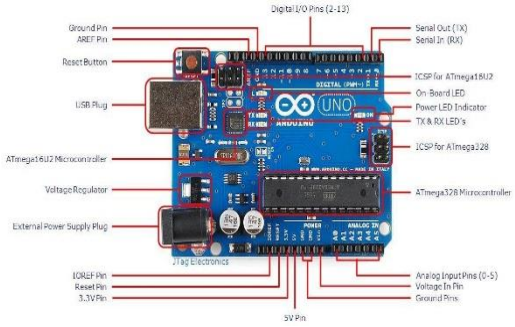

Fig - 1: Arduino Uno Board

available as text (Slaby, 1990).

It is offered a behavioural device that was meant to help outwardly people with disabilities read more easily. The yield of the structure is compared and broken down in comparison to the present framework. The work can also be extended to devices that use remote technologies. When constructing a braille cell to satisfy the requirements, aspect ratio, power usage, and material viability are extremely important variables to consider. This manipulates the cell pins such that as clients place their fingertips on the cell, it looks as if they are pivoting their fingers on the cell. This also highlights the design and development of a minimal, low-effort Braille book unit with one Braille cell.

These devices are being proposed to alleviate the sufferings of people who are deaf or blind. We may also use these ideas to build equations for device effectiveness and other boundaries, such as time interpretation, data transmission rate, long-distance correspondence, and other features as required. This gradually demonstrates that teamwork is fundamental indefinitely, regardless of impedances. Many of the suggested models took into account all possible touch yields, such as material, Braille code yield, and sound yield, with no regard for separation.

2. HARDWARE AND SOFTWARE TOOLS

The proposed framework has been developed using an Arduino Uno and its interconnection devices (Fig.1 (Badamasi, 2014; Hughes, 2016)). The panels, which are frequently used to stack programs from PCs, are linked to the subsequent interchange interfaces, which have Universal Serial Bus (USB) on some renditions. The C and C++ programming languages can be used to program the Atmega. The Arduino, in contrast to regular compiler tool chains, provides an integrated development environment (IDE) based on the Computing implementing quality. The Arduino Uno's specifications are mentioned below (Table 1) (Badamasi, 2014; Hughes, 2016).

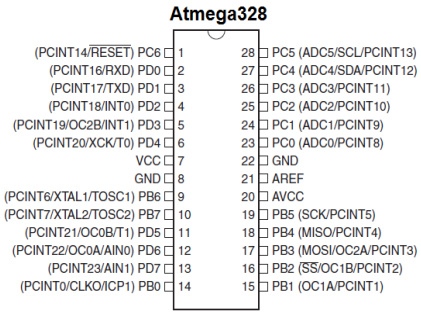

Fig - 2: Atmega238 pin out configuration

Fig. 2 describes the pinout specifications of the Atmega238. A solenoid (Fig. 3a) is a structure made up of a wire twist, a housing, and a moveable unclogger (armature). When an electrical current is applied to a curl, an enticing field forms around it, drawing the unclogged. A solenoid is essentially a device that converts electrical energy into mechanical action. Solenoids are an excellent way to generate direct movement for moving, hauling, or regulating switches.

Table -1: Technical Specifications for the Arduino Uno

Parameter	Specifications
Operating Voltage	5 Volts
Input Voltage	7 to 20 Volts
Digital I/O Pins	14
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm

Weight	25 g

The IRFZ44N (Fig. 3b) is a 49A N-channel MOSFET with a 17.5 m Rds worth. It also has a low limit voltage of 4V, at which the MOSFET begins to lead. The IRFZ44N stands out due to its high current and fast exchange speed. The HC-05 Bluetooth Module (Fig. 3c) is a simple Bluetooth SPP (Serial Port Protocol) module designed to provide a remote sequential connection. It communicates using serial communication, making it easier to connect with a regulator or a PC.

a. b. c.

Fig - 3a: Push Pull Solenoids, b: IRFZ44n MOSFET, c: HC 05 Bluetooth Module

The Arduino Integrated Development (IDE) environment is an inter-system for Windows, Mac OS, and Linux, which can be used for developing software. It's in the Java language of programming. Sketches are programs created with the Arduino IDE. These representations are made in a content manager and put away as "*. ino" documents. Libraries highlight additional features in sketches, such as handling equipment or manipulating records. Android Studio (Developers, 2011) is the official IDE for Android OS. It is built on JetBrains' IntelliJ IDEA computing and is primarily designed for Android.

3. RESULTS AND DISCUSSION

The conversion method in this paper is handled by an Arduino Uno. The coding is built on the Braille language's semantic pattern. The circuitry would have seven pins and one ground pin, with the output pins attached to the solenoids. We will use a separate coding style for each different pattern. There will be a separate coding template for each different pattern. The Solenoids are represented in a 2x3 matrix, and the pins are bound to the cell in the following manner:

- Solenoid 0 – Pin 2
- Solenoid 1 – Pin 3
- Solenoid 2 – Pin 4
- Solenoid 3 – Pin 5
- Solenoid 4 – Pin 6
- Solenoid 5 – Pin 7

The proposed system's circuit connection is shown in the Fig. 4. According to the diagram (Fig. 4), the connection is made by connecting the Arduino's 5v power and ground rails to the breadboard's power and ground rails. The solenoids are then connected to separate lines on the breadboard, one to the 5v power from phase 2 and the other to the transistor's collector.

As the solenoid coil discharges, link the 1N4007 Diode

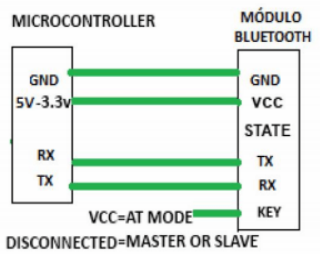

Fig - 6: HC-05 Bluetooth module interface with Arduino

betv
flowing back into the circuit. The power transistor is embedded on three distinct breadboard lines, with the smooth side facing out. The collector's leg is connected to the solenoid and diode lines. A 220-ohm resistor is then connected between the transistor's base leg and an alternate line, and the transistor's emitter leg to the

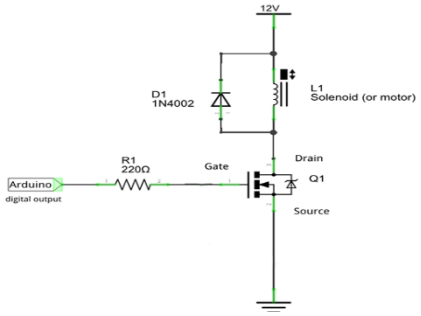

Fig - 5: Solenoids Circuit Connector

ground rail and I/O pin 9, which is our control pin (Fig. 5).

The Fig. 6 depicts the connection of the HC-05 Bluetooth module to the Arduino.

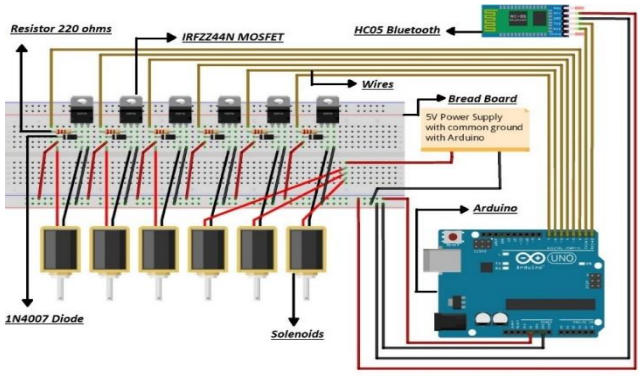

Fig - 4: Full circuit interaction of proposed systems

Bluetooth is the widely used world view of remote engineering with low power consumption attributes for information sharing over short distances through Bluetooth-controlled fixed and portable radio transmissions to form a personal area network (PAN) with a high degree of confidence. The transparency of Android allows for a fast increase in market share; however, this will be discussed later in the market review. Android can also run on many different screen resolutions and sizes on several smartphones. The application's coding would be focused on achieving the critical functionalities to be integrated with the software. The fig. 7 depicts the designed application's front end.

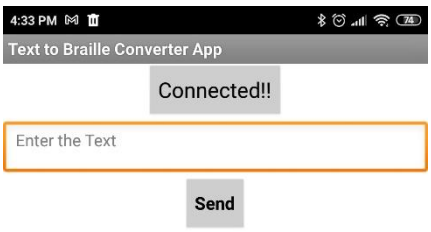

Fig - 7: Front end design of application for proposed system

The Arduino was programmed to recognize chronic characters and generate comparing braille text. Using the Arduino's Digital I/O pins, the display is gently flipped. The device receives input in the form of instructions (letters or words) from a PC or an Android program (Fig. 7). These instructions are sent to the microcontroller for preparation. The defined order is then interpreted by the microcontroller into the comparing Braille template. The yield of the microcontroller is obtained through the

Fig - 8: Braille result on Solenoids

advanced pins, which are linked to six Solenoids.

Any ASCII character is assigned a value, say 100, and then the 64 attributes to be expressed in Braille are assigned values. The pins' 6 bit paired representation is represented by these designated values. They are then submitted as HIGH or LOW results based on the ASCII value received as input from the application. The entire device is reliant on the content detects by the customer. The consumer must directly put their fingers on the device that has been set up in order to display the exhibition. The accuracy of the model was measured using a combination of English Alphabets (A-Z) and Arabic Numbers (0–9), and the data was analysed. If the information ASCII were not one of the 64 qualities, all solenoid pins would be set to a low value. The Fig. 8 depicts a solenoid output structure in 2x3 braille format. The Fig. 9 depicts the operating

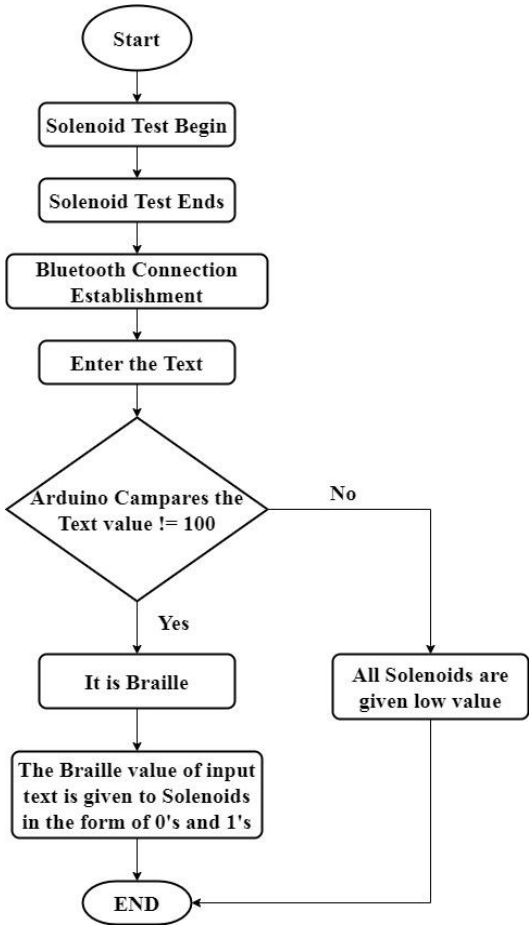

Fig - 9: Process flow diagram of proposed system

mechanism of the planned scheme using a flow chart.

The investigation showed that Braille could be perused from a braille cell by simply situating the fingers because of the examples activating instead of running the fingers over the all-around formed braille designs. The created advanced braille framework empowers outwardly impaired individuals to rapidly see any electronic content and read in a hurry. This driven model shows that it is feasible to build a computerized braille module at a reasonable expense and change the regular day to day existences of the outwardly crippled. The media braille framework helps outwardly crippled people in acquiring PC proficiency. The prizes got will change perusing for the visually impaired and move youngsters to devour sight and sound substance. The item gives the engineer sufficient breathing space to reconfigure it into a framework fit for catching content information self-rulingly without human intercession.

The principles for Braille interpretation are far higher than those for print interpretation. This degree of

exactness is needed by the setting since Braille utilizes a similar ASCII code for various purposes. Therefore, even minor mistakes will prompt limited challenges in the investigation. The interpreter's discoveries uncover that the machine can make message to-Braille interpretation with high exactness.

Braille isn't simply utilized for transcribing and composing books and magazines. It is likewise utilized on open signage, for example, lift keypads, entryway signs, and eatery menus, just as for naming everyday things like remedies. It is additionally used to make various records, for example, financial balances, more accessible. This permits dazzle and outwardly incapacitated people to handily find things, sort out where everything is the point at which they are making the rounds, stay sound, and ensure their autonomy. Ordinary individuals read braille code with their eyes, while outwardly debilitated individuals read it with their fingertips.

4. CONCLUSION

The crucial idea driving the creation and execution of the referenced plan is to help outwardly incapacitated individuals in accomplishing the essential objective of perusing by the utilization of digitized Braille cells. Because of technological advancements, it is now more affordable to read on a computer using screen pursuers or sound recordings rather than Braille. However, this does not eliminate the need for Braille, nor does it eliminate the need for us to learn how to write by hand. The voice, it is said, is for rhythm, while Braille is for precision. Braille is more effective than sound at transmitting format data. When learning Braille, it is much easier to see spelling errors than it is to hear errors in a large number of articulations. The introduction of small remote gadgets that read a text and translate it to fragile (refreshable) Braille will extend access to written content in a variety of new environments. Furthermore, the rise of convenient electronic books may make it easier to obtain data in Braille and other accessible organizations.

REFERENCES

[1] Badamasi, Y.A., "The working principle of an Arduino," in 2014 11th International Conference on Electronics, Computer and Computation (ICECCO), IEEE, 2014, pp.1-4.

[2] Blenkhorn, Paul, “System for Converting Print into Braille”, IEEE Transactions on Rehabilitation Engineering, Volume.5, No. 2, 1997, pg. 121-129.

[3] Developers, Android. "What is android." Dosegljivo: http://www.academia. edu/download/30551848/andoid--tech. pdf, 2011.

[4] Frieman B.B., “State braille standards for teachers of students who are blind or visually impaired: A national survey”, Braille Monitor, 2006.

[5] Hughes, J. M., “Arduino – a technical reference: a handbook for technicians, engineers, and makers.”, O'Reilly Media, Inc., 2016.

[6] Keil, S. & Keil, S., “Survey of educational provision for blind and partially sighted children in England, Scotland and Wales in 2002”, British Journal of Visual Impairment, 2003.

[7] Kulkarni, A., & Bhurchandi, K., “Low cost e-book reading device for blind people.”, in International Conference on Computing Communication Control and Automation, February 2015, pp. 516-520.

[8] National Federation for the Blind, “The Braille literacy crisis in America.” Available: https://www.nfb.org/braille-literacy-crisis-america, 2009.

[9] Sakula, A., “That the Blind May Read: The Legacy of Valentin Hauy, Charles Barbier, Louis Braille and William Moon.”, Journal of medical biography, 1998.

[10] Slaby, W. A., “Computerized Braille Translation” Journal of microcomputer applications, 1990.