ECE 1901
Technical Answers For Real World Problems (TARP)
Report

A project report titled

Braille Educational Toy

By

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Submitted to

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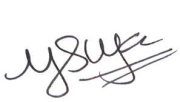
School of Electronics Engineering

DECLARATION BY THE CANDIDATE

I hereby declare that the Report entitled "**Braille Educational Toy**" submitted by me to VIT Chennai is a record of bonafide work undertaken by me under the supervision of **Dr. R. Menaka, Professor, SENSE, VIT Chennai.**

Signature of the Candidates

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We thank our parents, family, and friends for bearing with us throughout the course of our project and for the opportunity they provided us in undergoing this course in such a prestigious institution.

BONAFIDE CERTIFICATE

Certified that this project report entitled "Braille Educational Toy**"** is a bonafide work of **SENTHIL VEL K (19BEC1122)**, **S R SHIVARITHA (19BEC1130), SURYA Y (19BEC1176) and TARAN SRI ARANGESH V (19BEC1204) carried** out the "J"-Project work under my supervision and guidance for ECE 1901 Technical Answers For Real World Problems (TARP) Report.

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ABSTRACT

Braille literacy has fallen in recent years, and many blind children now grow up without learning Braille. However, learning Braille can increase employment chances and improve literacy skills. We introduce Braille keyboard, a system to help visually impaired children learn and practice Braille alongside a sighted parent. The Braille keyboard comprises a set of blocks and pegs, each block representing a Braille cell and push buttons to select the letter that the children want to learn and a speaker to play the sound of the required alphabet. The system is easy to use and parents can follow along even if they cannot read Braille. Braille is a very important mode of communication for blind people, and a braille toy is used to teach blind kids the language easily. The best way for any child to learn to read is through constant exposure to the written language when they are young to help develop a foundation for literacy, and blind children have the same opportunities with toys in braille. Here we are making an educational toy that every child can enjoy, whether they have sight or not.

CHAPTER – 1

INTRODUCTION

Braille literacy has fallen in recent years, and many blind children now grow up without learning Braille. Blind children like to play just as much as their sighted friends do. Commercially available Braille toys are limited in selection compared to the toys available for sighted children. Kids enjoy playing with toys. But a toy that helps them learn just adds to their benefit as it helps them play and study at the same time. Most toys are built for kids with sight, so we plan to create a toy that is useful for everyone.

The Braille system is used worldwide by people who are blind as a tool for writing and reading. It was invented in France by Louis Braille, who himself was blind. Its alphabet consists of six raised dots, arranged into two columns and three rows (a 3x2 matrix). Considering all available arrangements, it is possible to do sixty-four combinations without repetition. In 2007 it was recorded that the world has about 37 million blind people. This number has doubled over the years. The literacy rates for braille have always been declining year after year. In India the braille literacy rate is less than 1% this is less than the regular literacy rate which is 77.7%. This is an alarming statistic as India has about 15 million people who are visually impaired. One catalyst for the decline in Braille literacy appears to be the rise of audiobooks and accessible computing technology such as text-to-speech.

Our objective is to create a toy that helps kids learn the alphabets in a fun enthusiastic way. The toy is built on a board which displays the alphabets and the braille code. When a button is pressed, the sound of the alphabet is enunciated which can be heard from the speaker. The toy can be turned on and off thus the battery can be conserved as well. This toy will be made compact, thereby can be transported easily. The toy will have blunt edges making it kid friendly.

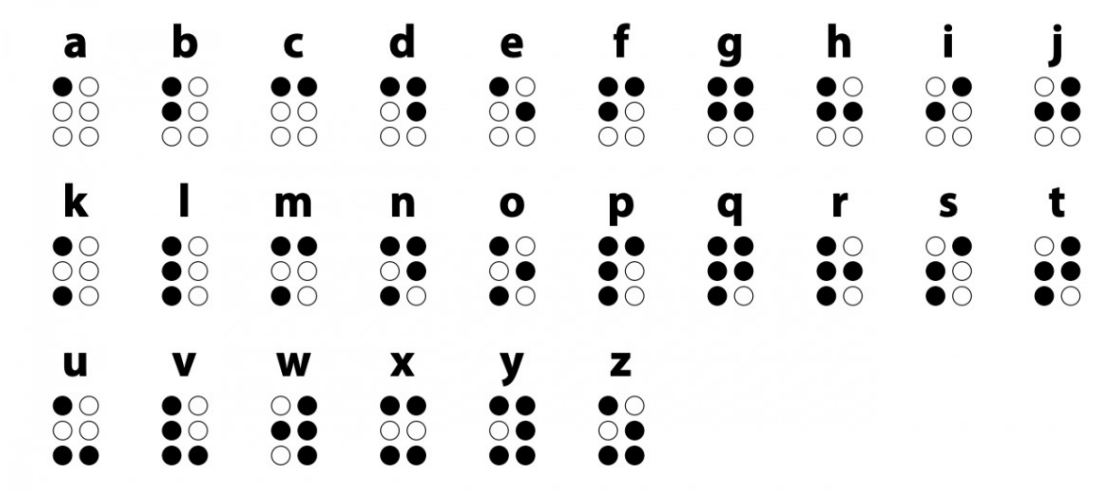
CHAPTER – 2

PROPOSED SYSTEM

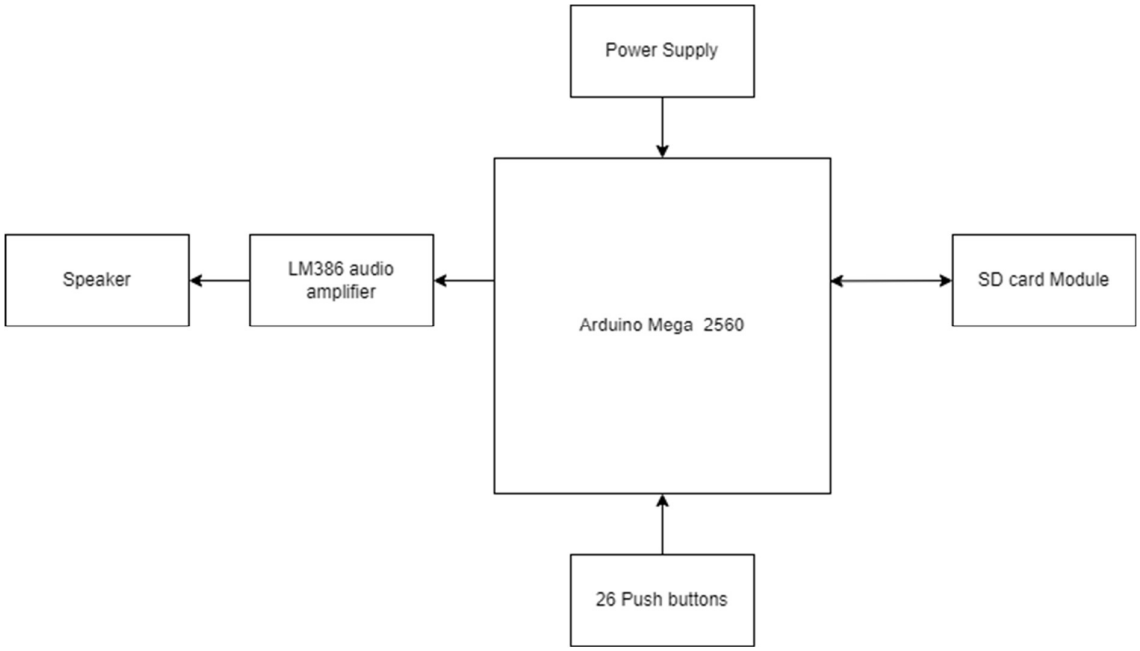
In our project, we are implementing a Braille Educational Toy where visually challenged kids can learn alphabets with their respective country names using a push-button for each alphabet attached next to the Braille alphabet on the device.

The dataset of audio files is stored in a microSD card. The microSD card is connected to the microSD card module which is connected to Arduino Mega 2560. 26 pushbuttons are connected to the digital pins in the Arduino Mega 2650 using jumper cables and a breadboard. The pushbuttons are placed in a box where Braille alphabets are printed on it. A speaker is connected to the Arduino Mega which is used for the output of the device.

When the push buttons are pressed on the box, the respective alphabet sound will be played by the speaker.



BLOCK DIAGRAM:



The pushbuttons will be placed under each Braille alphabet and will be connected to the breadboard using jumper cables which will be connected to Arduino Mega.

CHAPTER – 3

MODULE DESCRIPTION

Hardware:

- **Arduino Mega 2560** - Arduino mega was chosen as it has 54 I/O pins. It has a flash memory of 256kb which is useful for large codes.

- **LM386 Audio Amplifier -** It can amplify audio that is given to it. It is a low power circuit that can deliver a maximum power of 1 Watt (1W) and can be used in portable speakers.

- **Micro SD card Reader -** A memory card reader is a device for accessing the data on a memory card -Secure Digital (SD).

- **Speaker -** To present the output audio.

- **Jumper wires** - To connect the peripherals.

- **Bread Board -** To simplify the connections between the microcontroller and the keys.

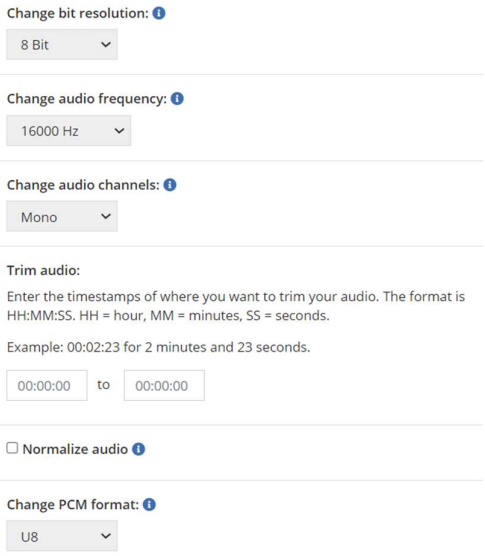
- **Push Buttons with Caps -** These are used to press the keys. Buttons with large caps were chosen for this project to give maximum sensational feel.

- **Gemstones -** The braille code was glued to the board with the use of gemstones. Big bright stones were chosen for maximum sensational feel and flair to the product.

- **Cardboard box -** Cardboard boxes have soft edges as compared to other materials. Hence it is kid friendly and light to carry.

Dataset:

- The audio files were recorded and volume was enhanced using volume changer.
- Then the audio files were converted into *wav* files with a set of given properties for the best quality of sound using audio-to-wav.



Code:

- The required header files are included,
  - ***SD.h*** **-** SD library.
  - ***TMRpcm.h*** - For audio wav files.
  - ***SPI.h*** - To communicate with SPI devices.

- The chipselect pin is defined to connect the I/O pins to the internal circuit.

```
#include <SD.h>                       // need to include the SD library
#define SD_ChipSelectPin 53  //using digital pin 4 on arduino nano 328
#include <TMRpcm.h>           //  also need to include this library...
#include <SPI.h>
TMRpcm tmrpcm;   // create an object for use in this sketch
```

- The variables used are declared. Since there are 26 keys, there are 26 variables. One variable for each key is denoted.

```
int SW1;
int SW2;
int SW3;
int SW4;
int SW5;
int SW6;
int SW7;
int SW8;
int SW9;
int SW10;
int SW11;
int SW12;
int SW13;
int SW14;
int SW15;
int SW16;
int SW17;
int SW18;
int SW19;
int SW20;
int SW21;
int SW22;
int SW23;
int SW24;
int SW25;
int SW26;
```

- The digital pins are configured. Pins 22 to 47 are set as input pins. Pin 11 is set up for the speaker.

```
void setup(){
  pinMode(22,INPUT);  //Define A0 as digital input.
  pinMode(23,INPUT);
  pinMode(24,INPUT);  //Define A1 as digital input.
  pinMode(25,INPUT);
  pinMode(26,INPUT);
  pinMode(27,INPUT);
  pinMode(28,INPUT);
  pinMode(29,INPUT);
  pinMode(30,INPUT);
  pinMode(31,INPUT);
  pinMode(32,INPUT);
  pinMode(33,INPUT);
  pinMode(34,INPUT);
  pinMode(35,INPUT);
  pinMode(36,INPUT);
  pinMode(37,INPUT);
  pinMode(38,INPUT);
  pinMode(39,INPUT);
  pinMode(40,INPUT);
  pinMode(41,INPUT);
  pinMode(42,INPUT);
  pinMode(43,INPUT);
  pinMode(44,INPUT);
  pinMode(45,INPUT);
  pinMode(46,INPUT);
  pinMode(47,INPUT);
  tmrpcm.speakerPin = 11; //11 on Mega, 9 on Uno, Nano, etc
```

- Checks whether the SD card is present and the dataset can be initialised into it. The volume is set to high.

```
 if (!SD.begin(SD_ChipSelectPin)) {  // see if the card is present and can be initialized:
 return;   // don't do anything more if not
 }
tmrpcm.volume(1);

}
```

- The digital pins are read and the values are stored into their respective variables.

```
void loop(){
SW1=digitalRead(22);
SW2=digitalRead(23);
SW3=digitalRead(24);
SW4=digitalRead(25);
SW5=digitalRead(26);
SW6=digitalRead(27);
SW7=digitalRead(28);
SW8=digitalRead(29);
SW9=digitalRead(30);
SW10=digitalRead(31);
SW11=digitalRead(32);
SW12=digitalRead(33);
SW13=digitalRead(34);
SW14=digitalRead(35);
SW15=digitalRead(36);
SW16=digitalRead(37);
SW17=digitalRead(38);
SW18=digitalRead(39);
SW19=digitalRead(40);
SW20=digitalRead(41);
SW21=digitalRead(42);
SW22=digitalRead(43);
SW23=digitalRead(44);
SW24=digitalRead(45);
SW25=digitalRead(46);
SW26=digitalRead(47);
```

- If any key is pressed, the key is high and hence the respective audio file is played. And the serial monitor prints the respective letter.

```
if (SW1 == HIGH) {
      tmrpcm.play("a.wav");
      Serial.print("a");
    }
else if(SW2 == HIGH){
    tmrpcm.play("b.wav");
    Serial.print("b");
   }
else if(SW3 == HIGH){
    tmrpcm.play("c.wav");
    Serial.print("c");
   }
```

CHAPTER – 4

RESULTS AND DISCUSSION

Learning Braille is beneficial to blind and visually impaired children, even when other forms of accessible media are available. Learning Braille provides access to a vast collection of reading materials and resources. Braille literacy has also been found to increase chances of employment and to improve literacy skills such as reading comprehension and reading proficiency. A braille educational toy that helps the visually impaired children and people who want to learn braille Alphabets is made using Arduino Mega, push buttons, sd card module and speaker.

The children can not only learn alphabets they will also be able to learn country names for each alphabet. This prototype system was made using a soft cardboard box so that the children can carry it around and not get hurt. The push buttons were large enough to differentiate from the braille code alphabets that the children would use to feel and learn the alphabets. Different voices were used for vowels and consonants so that it would be easy for them to differentiate. Hence after research and testing a braille education was created for visually impaired children to learn alphabets as shown in the above figure.

CHAPTER – 5

CONCLUSION AND FUTURE WORK

1. CONCLUSION:

Sighted children have an abundance of toys and activities to help them learn to read, but visually impaired children have far more limited options. While Braille can be a valuable tool for blind and visually impaired children, its adoption may be hindered by the quantity and quality of educational resources. We developed a Braille educational toy which will help them to learn Alphabets as well as countries along with it. Our Braille toy prototype shows that combining tangible braille blocks and interactive audio games can bring children and parents together to practice and play with Braille.

2. FUTURE WORK:

- This design can be made more compact, travel friendly and children friendly.
- Better modules to be used to get minimum power consumption and better sound quality.
- A PCB design to make it more compact, lighter and easy to carry.
- Kid friendly materials for board, braille block and keys (push buttons).

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