

# Dynamic Braille Script

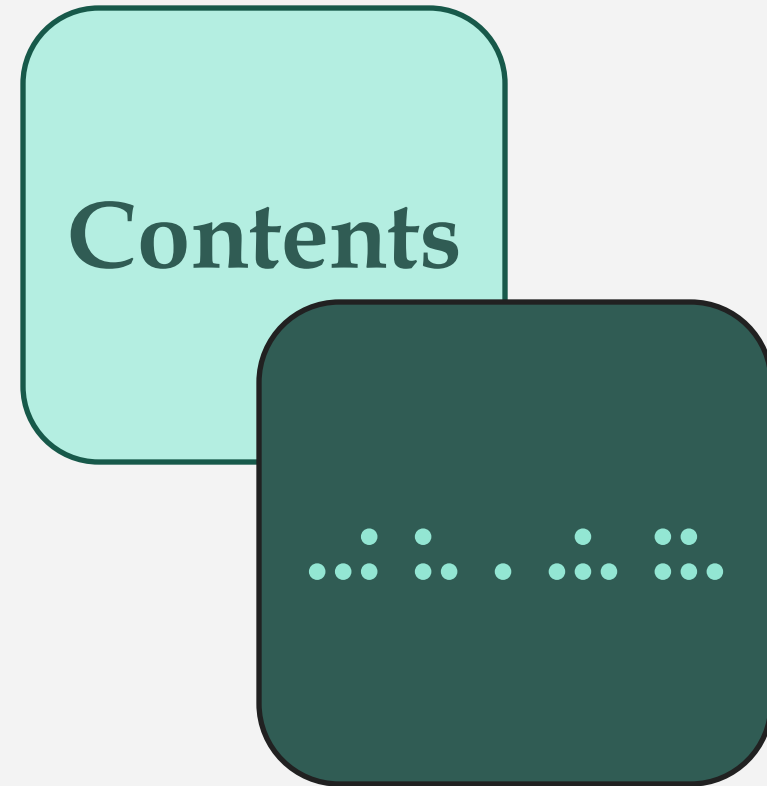
Dynamic Reuseable Electric Braille Script (DREBS)



Problem Code: 1500



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# Team Members

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# The Problem At hand

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- Nearly 40 million people in India are visually impaired, which is 20% of the world's visually impaired population.
- Braille is a form of reading and writing for visually impaired people that was developed in 1824 by Louis Braille.
- Visually impaired people rely on their sense of hearing and sense of touch to read and write.
- In this information age where everything is done with a click of a button, visually impaired people face many challenges.
- The internet has certainly made many aspects of our lives easier, but for those with a disability, digital exclusion is still a real problem.



- One of the major problems is the accessibility of specialized devices and resources.
- At present, companies mainly focus on the most active users who usually have stronger purchasing power and a higher level of digital literacy.
- Users with any type of disability are often overlooked in this market-driven and technology-oriented approach. Visually impaired people have a tough time finding good reading materials in accessible formats.
- Internet, the biggest repository of information and reading materials, is mostly inaccessible for visually impaired people.
- Even though a visually impaired person can use screen reading software, it does not make the surfing experience very smooth because the sites are not designed accordingly.

# Problem Approach

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- The plan of attack is to implement a dynamic braille device for the visually challenged users who want to have a better experience reading text.
- This is achieved with the help of micro sized solenoid with pins that move up or down based on the fed signals.
- 6 of these solenoids are arranged as sets. A single set is used to represent a single letter in braille.
- Then, sets of these 6 solenoid units are used to represent lines of text.
- The textual input to braille script conversion and the management of these solenoids is taken care of by a Raspberry Pi. It is a single board computer capable of heavy tasks like driving these solenoids

# Raspberry Pi As The Controller

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- Raspberry Pi is a single board computer with a lot of support for electronic devices.
- A pi can be used to drive all the necessary components to provide the desired braille combination for each letter.
- The output as braille letters is driven by a set of 6 motors arranged in a 2x3 matrix like pattern.
- These motors go up or down based on the required set of pins to represent the corresponding letter.
- And for blank spaces or endline characters, all the motors go down to represent them.



# Braille Script/Text

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Braille is a tactile writing and reading system that is used by people who are blind or visually impaired. Braille uses a series of raised dots arranged in cells to represent letters, numbers, and other symbols. Here's a brief overview of how Braille works:

- **Braille Cells:** Braille characters are composed of small rectangular blocks called "cells." Each cell contains a 2x3 grid of dots, which can be raised or lowered. The dots are numbered from top to bottom and left to right.
- **Alphabetic Characters:** Braille represents the letters of the alphabet by using combinations of dots within the cell. For example, the letter "a" is represented by a single dot in the upper-left corner of the cell, while the letter "b" is represented by dots in the upper-left and middle-left positions.
- **Numbers:** Numbers are also represented in Braille using combinations of dots. The number "1" is represented by a dot in the upper-left corner, just like the letter "a." The numbers "2" through "0" use different combinations of dots within the cell.



# Motor mechanism

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- To represent braille text, micro sized motors are arranged in sets of 6 motors each
- These motors if turned on, put up a shaft through and if reverse powered, the shaft lowers down
- The position of the shaft represents 0 or 1
- This varying position of 6 motors can be used to represent a braille letter
- Then subsequently, these sets of motors can be used to display the letters desired.
- However, there is a limitation to number of motor sets that can be used based on the number of IO pins on a microcontroller

- Punctuation and Special Symbols: Braille also includes symbols for punctuation, mathematical symbols, and other special characters. These are created using specific dot combinations.
- Capitalization: To indicate capital letters, a special capitalization indicator is placed before the letter or word that should be capitalized.
- Grade 2 Braille: In addition to Grade 1 Braille, which represents the basic alphabet and numbers, there is Grade 2 Braille, which includes contractions and short forms to make reading more efficient. For example, the word "and" can be represented by a single Braille character.
- Reading: People who are blind read Braille by running their fingers over the raised dots. They use their sense of touch to interpret the patterns of dots and recognize letters, numbers, and words.

# Multiplexers

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- This is a solution to the limitation faced by the lack of IO pins on a microcontroller to handle the motor sets
- This is where a 74HC595 IC is used to drive the motors up and down as needed
- The main feature is that, it utilized 3 pins from the main microcontroller and provides 8 pins as output that can be used in a serial order
- Also, 4 of these chips can be daisy chained together to provide 32 output pins from the 3 pin set that is initially connected
- So, this provides an extra amount of pins that can drive the motor as needed without taking up a lot of IO pins

# Impact On Society

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- Dynamic Braille system can enhance accessibility for people with visual impairments, providing them with quicker access to a wider range of information. This could apply to various settings including education, employment, leisure, and everyday tasks.
- In education, dynamic Braille could facilitate faster and more interactive learning experiences for students who use Braille as their primary reading and writing system. It could also make it easier to adapt materials to individual learning styles and needs.
- Being able to access information in real-time without relying on sighted assistance can increase the independence of individuals with visual impairments. They could have greater control over their environment, activities, and decisions.
- With dynamic Braille, it may be easier for visually impaired individuals to access and utilize modern workplace technologies, potentially increasing their participation in various industries.

**Thank you!**

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