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## “Economical Speech to Braille Printer”

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### Abstract

The objective of this paper is to propose “Economical Speech to Braille Printer” which will help people with visual impairment. Braille is used by visual impaired people for written communication, which is purely based on touch. Normal people can easily take written notes and memos to help them get by in their day-to-day tasks and academic. To enable the Visually Impaired people to have the same ability, we propose a Voice to Braille text printing semi-portable device. The device is built using Arduino. It uses internet to converts voice to text and prints the braille characters. Moreover, Braille printers’ cost from 50,000 to 100,000 INR which many people with visual impairment cannot afford. This project proposes cost-effective alternatives for expensive Braille printers, real-time and efficient. Using the Economical Speech to Braille Printer, Visually Impaired People can easily print notes in Braille just by speaking or playing a recording. This device shall serve as an affordable tool to take lecture notes for visually impaired graduates and also help the people with both visual and hearing impairments in real time communication.

**Keywords -** Voice to Braille, Internet and Web Technologies, Arduino, Braille Printer.

### I. Introduction

Nearly 18 to 19% of total population of India has visual impairment. This people face difficulty in communication and pursuing their goals. Due to visual impairments the usage of computer information is limited for them as they can only communicate through Braille. It is possible using Braille printer to take print of any computer data in Braille format. But it is difficult for visual impairments to write and print their own ideas and imaginations without anyone’s help. So, for convenience of this people many speech-oriented systems are develop by many researchers [1]. But this system have the most common issue with cost and compactness. There are many systems available with provisions which convert text document in Braille [2,3] but today’s requirement is combine solution for all problems which are faced by blind people while communicating. It is necessary to develop this idea in economical and convenient way so that every single person with visual impairment can communicate their ideas and get any type information from the computer or internet.

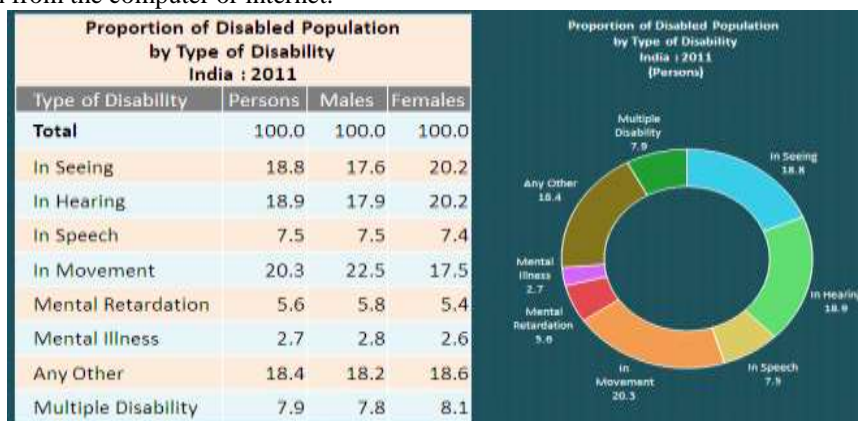


Fig.1 Survey of 2011 disabled population of India

The Economical Speech to Braille Printer has provision so that person’s speech is converted into text using internet and also it can convert text into Braille format. Project also proposes using existing voice to speech conversion so that project cost will

reduce and it can be easily available for user. Economical Speech to Braille Printer is develop such that it can convert text into Braille and provide simple printing mechanism [4,5] so it will become convenient. The proposed system design is economical, user friendly which will help blind people to explore their ideas and get more and more information without any help of other. The project is about fulfilling their demand of growth of knowledge.

## II. Relevant Theory

### Braille

	⠠	⠡	⠢	⠣	⠤	⠥	⠦	⠧	⠨	⠩	⠪	⠫	⠬	⠭	⠮
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⠠	⠡	⠢	⠣	⠤	⠥	⠦	⠧	⠨	⠩	⠪	⠫	⠬	⠭	⠮	⠯
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@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
⠠	⠡	⠢	⠣	⠤	⠥	⠦	⠧	⠨	⠩	⠪	⠫	⠬	⠭	⠮	⠯
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_

Fig.2 Braille Alphabets

Braille is a system of raised dots that can be read with the fingers by people who are blind or who have low vision. Teachers, parents, and others who are not visually impaired ordinarily read braille with their eyes. Braille is not a language. Rather, it is a code by which many languages such as English, Spanish, Arabic, Chinese, and dozens of others may be written and read. Braille is used by thousands of people all over the world in their native languages, and provides a means of literacy for all.

Braille symbols are formed within units of space known as braille cells. A full braille cell consists of six raised dots arranged in two parallel rows each having three dots. The dot positions are identified by numbers from one through six. Sixty-four combinations are possible using one or more of these six dots. A single cell can be used to represent an alphabet letter, number, punctuation mark, or even a whole word.

## III. EXISTING METHODOLOGY



Slates and Stylus

Perkins brailler

Braille embosser

Fig.3 Existing Braille Printing Techniques

### Slates and stylus

The slate and stylus are lightweight, inexpensive, do not need batteries or electricity to operate. A slate is made of two plastic or metal parts hinged together so that a piece of paper can be put between them. A stylus is a pointed tool used to punch raised dots in the paper.

### Perkins brailier

The Perkins Brailier is a "braille typewriter" with a key corresponding to each of the six dots of the braille code, a space key, a backspace key, and a line space key. Like a manual typewriter, it has two side knobs to advance paper through the machine and a carriage return lever above the keys

### Braille embosser

A braille embosser is an impact printer that renders text as tactile braille cells. Using braille translation software, a document can be embossed with relative ease, making braille production efficient. an embosser can cost roughly anywhere from 150000 INR to 1000000 INR.

## IV. PROPOSED METHODOLOGY

Proposed methodology will perform certain actions to print speech into Braille

Advantages of proposed system:

1. Effective use of existing technology  
Normally speech to text conversion is crucial process but in proposed system speech to text conversion is done by existing technology i.e., google assistant device, which is easily available and works on ASR (Automatic Speech Recognition) which is more reliable than any other system. Due to this the complexity of system is reduced and system become cost effective.
2. Wireless connection  
The proposed system provides wireless connectivity between google assistant device and actual Braille printer assembly using MQTT (Message Queuing Telemetry Transport) which act as the bridge between text format sentence and printing assembly.
3. Compact system  
Proposed system has lesser size as compare to other available braille printers and requires less time for embossing as compared to traditional tools for braille.
4. Cost effective  
Unit cost of proposed printer is less than available braille printing systems.
5. Reliability  
The whole system is designed in such a way that it can reduce human dependency of blind people.

## V. Block Diagram

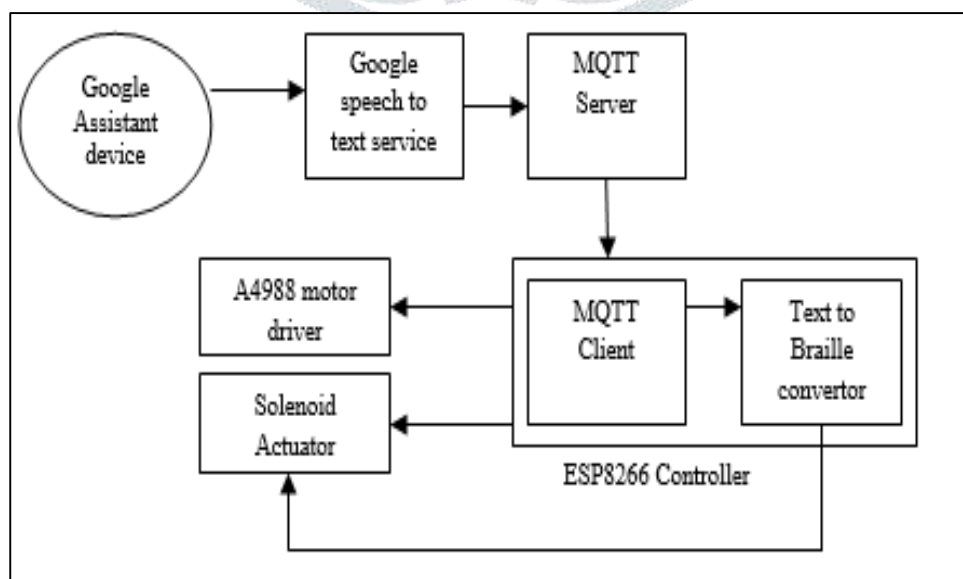


Fig.4 Block Diagram of proposed system

This project gives the effective solution for the visual impairment people who are unable to write their own thoughts like a normal human being. It converts speech into text and print it in the braille format. The key feature of this printer is it give



economical alternative for Braille printer. The above block diagram shows main blocks that can be used to develop Economical Speech to Braille Printer

As System print speech into braille google assistant device is used to capture and convert the speech into text. Google assistant device can be android phone, tablet or any equipment in which google assistant software is present. Google Assistant is an artificial intelligence-powered virtual assistant developed by Google that is primarily available on mobile and smart home devices. Users primarily interact with the Google Assistant through natural voice, though keyboard input is also supported. This software converts speech into written text format which can be used for further processing, which is an easy and cost-effective method for converting speech to text.

This converted text is transferred to Braille printer assembly through MQTT protocol. MQTT (Message Queuing Telemetry Transport) is an open OASIS and ISO standard (ISO/IEC PRF 20922) lightweight, publish-subscribe network protocol that transports messages between devices. The protocol usually runs over TCP/IP; however, any network protocol that provides ordered, lossless, bi-directional connections can support MQTT [6]. MQTT client and server pair act as the bridge between text format sentence and printing assembly.

To receive the text from MQTT server the client must be connected to internet through Wi-Fi. So microcontroller first ensure that the printer is connected to Wi-Fi then it will ready to receive text from MQTT server. After receiving converted text stream from MQTT server, it is recognized by the system and converted into Braille that is English alphabets is converted into braille characters consist of 3 rows and 2 columns. The created code will drive actual printing assembly. Printing assembly consist solenoid actuator, stepper motor driver. In braille the space between two dots as well as space between two character have standard value. So, stepper motors are used to move printing head as well as printing paper. A solenoid actuator is used as printing head, which emboss dots according to Braille code. Printing assembly only prints the required printer dots from 6 dots i.e. 3 rows and 2 columns.

## VI. Flowchart

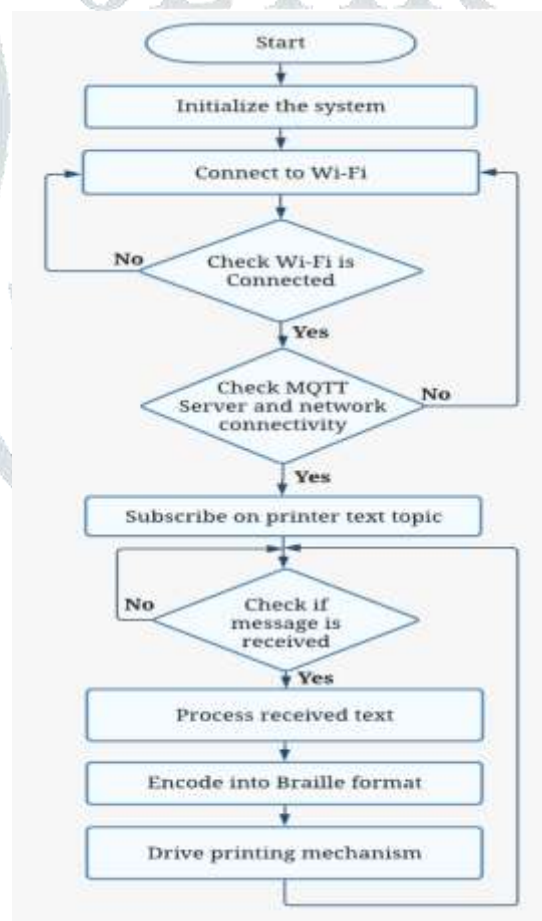


Fig.5 Flowchart of Braille Printer

Flow chart will describe step by step functionality of Braille printer. As shown in fig 5, when printer is turn on first it will initialize system. After initialization it will connect to the Wi-Fi, if connection is established it will proceed further otherwise it will wait for Wi-Fi connection. After establishing Wi-Fi connection system will check internet connectivity and check MQTT server. When printer is properly connected to internet it will subscribe to printer text topic directory to receive the text message

from google assistant device. Now printer will wait until it receives message. When message is received, the received text is processed and encoded into Braille format. According to encoded text printing mechanism print the text in Braille.

## VII. Conclusion

The proposed system provides economic printer for blind people so that everyone can afford this printer which will help visually impaired people to write their own thoughts and imagination without anyone's help. Using existing android app will make easy and cost effective and there is no restriction for input device and range between client and server. Thus this project is overall solution for visually impaired people.

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