Text to Braille converter with Audio Output for visually Impaired person

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Abstract: *The cosmos will soon be totally electrified. Everyone can utilize and profit from everything in the digital and virtual world, but what about the plight of those who are physically disabled? Can they use the knowledge at their disposal to the same advantage? Nevertheless, when it comes to applying such techniques in educational institutions. For this reason, no such regulation has been created. Thus, when the text to braille conversion application is the only option, instructional time becomes a major issue. The majority of tools that convert text to braille solely concentrate on copying and converting existing books to braille. This issue will be resolved by using the present initiative, which will also help to give pupils in the school immediate education. This technique uses a PC and Python as the language. The TESERRACT and PIC18f4550 board are employed in Python since the solenoid device will serve as a reflection for the blind pupils. The primary justification for utilizing the Python language is its extensive library of callable and usable functions. Python's productivity and speed are also quite high, and the data it uses is straightforward to utilize and, most importantly, simple to understand. Using a serial interface, data on the screen or letters input by a blind user will be converted from text to speech and synced with PIC-based Braille hardware to plot letters on a Braille board. For schools with blind students, this will be a simple method of instruction.*

Keywords: Braille, Solenoide valve, Text to speech, Image to speech, PIC,Python.

INTRODUCTION

Blind and visually impaired people use Braille, a tactile writing technique that uses pointed dots to represent letters, numbers, and symbols. It is essential to the success of the visually impaired in reading, school, and the job. In contrast to sign language, Braille uses a more intricate system with six-dot patterns that can be challenging to learn and retain. Braille promotes inclusion and equitable chances in many facets of life by empowering people to read and write on their own. For everyday tasks like reading books, interpreting signs, and even utilizing technology, it is a necessary tool. In reverse Braille, Braille may be read on embossed paper or on technological devices. It also provides access to textual resources, such as books and magazines, for people who are hard of hearing. There are three coding levels for English Braille: Level 1 employs straightforward, one-to-one letter representations; Level 2 makes better use of contractions and abbreviations to express words; and Level 3 uses fewer Braille characters and more than 300 symbols. A six-dot cell makes up each character, and various dot combinations stand for letters, words, numbers, and symbols. The starting four dots make the first ten letters, while the remaining dots form the remaining lettersWith tools like Braille computers and embossers, technological developments have simplified the process of converting text to Braille. While OCR software like Tesseract enhances image-to-text conversion, certain systems, such thePic18f4550, transform computer data to Braille, improving user accessibility.

METHDOLOGY

System is designed with python communication with PIC18F4550 to access Braille keypad. The system is specially designed for visually impaired students as learning gadget. Due to python multiple languages can be incorporated or supported for learning.

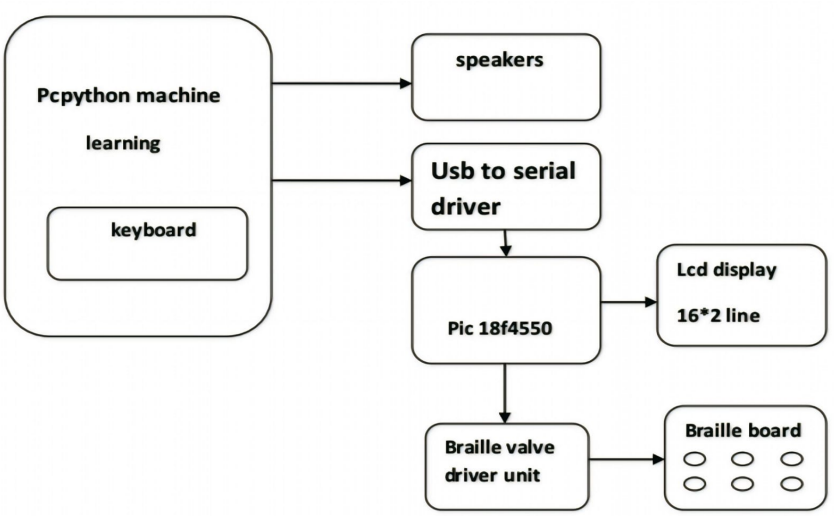

Fig 1. Block Diagram of Text to braille converter with audio output

System can be configured as language to language translator.Firstly students will have interactive voice response for python on data or any letter pressed on keyboard via win32com which is text to voice converter. Then python communicates serially to PIC18f4550 at 9600 baud rate to send key pressed. Pic microcontroller receives the letter compares it sends to display and as per letter it switches Braille keyboard to plot letters so that student ca sense it by touch. System has facility to display all letters, alphabets, numbers, words, etc. in English as well as Marathi language depends on selection or language choice. System also includes image to text conversion and text to voice as well as Braille using py-tesseract library means OCR optical character recognition. Below given table1-4 shows the condition of PORTB pins switching active low to plot letters dot of microcontroller after data sent by python. Figure 1. Shows the basic building blocks, figure 2 shows hardware circuit diagram which is implemented and tested. Figure3 shows actual implemented setup.

SYSTEM WORKING

Input and Interaction of Data: Learner can use the keyboard to communicate with the system or send in scanned photographs. First, the system uses the py-tesseract OCR module to turn any based on images data into text. The Python uses the win32com package to turn the text into speech after processing the input, which may be a word or letter entered on the keypad or text using an image.

Voice output: The technology causes the Python program to transmit an auditory response through speakers when a key is pushed on the keyboard. The voice output is produced by the win32com library, giving the learners instantaneous, interactive assistance on the letter or word typed on keyboard.

OCR for Converting Images to Text: The OCR module scans scanned pictures with written text and separates the text from the images using the py-tesseract library. Visually challenged pupils may read and comprehend printed materials more easily thanks to the system's conversion of the extracted text into speech and Braille output.

Serial communication: Once the voice feedback has been generated, the Python software uses serial connection to connect to the PIC18F4550 microcontroller. At the baud rate of 9600, the data—such as the key pushed or the text taken from an image—is transmitted via USB-to-serial connection. This enables the input data to be received and processed by the microcontroller.

The microcontroller Processing: The input is processed by the PIC18F4550 microcontroller after it receives the data. It checks the received letter or word against the patterns that have been

preprogrammed and stored in its memory. The Braille board is then controlled by the solenoid valves after the microcontroller switches the relevant PORT B pins that are from active high state to active low. In order to create the sensation of Braille characters that match to the input, these solenoid valves raise

Output in Braille: Learners who are blind or visually challenged can feel the raised dots produced by the Braille keyboard. The PIC18F4550 microprocessor controls the solenoid valves, which represent various Braille characters. Learners can learn how to read and identify Braille characters by sensing the dots that are produced.

Support for Multiple Languages: The system's multilingual support is one of its primary characteristics. Both Marathi and English voice outputs can be produced and displayed by the system.

SOFTWARE IMPLEMENTATION

The system's software is written in Python and offers the essential features for Braille output, image-to-text conversions (OCR), and text-to-speech (TTS). The system can convert text to speech or tactile Braille output thanks to Python's simple interface with other libraries include win32com for TTS and py-tesseract in OCR.

1.OCR image to text and text to voice and Braille

Character acknowledgment or optical character acknowledgment (OCR), is the method of changing over checked pictures of machine printed or transcribed content (numerals, letters, and images), into a computer arrange content. Discourse amalgamation is the fake blend of human discourse. The software utilized is python with set of libraries. The fundamental system could be a framework that captures and changes over that content to speech Python library utilized whereas executing the extend are:**1.Flask:** capable instrument utilized to make a user-friendly object-oriented interface. Fast and simple way to make GUIapplications.**2.Pytesseract:** It is an Optical character acknowledgment tool.It primarily performs the errand of perceiving the content implanted within the record, record, picture . It can peruse all sorts of pictures and record arrange like png, jpeg, jpg giff.**3.gTTs**: google content to discourse. It is utilized to form a mp3 record of extricated content. Boundless lengths are allowed.**4.PIL:** python picture library essentially to include additional capability to python interpreter.

2. keyboard keys pressed/ any file to voice to Braille conversion

Here input may be from keyboard or file python accesses the keyboard or open the file then reads input data form keyboard or file, file may word document or PDF which is accessed and converted to speech then after if translation requires it is done by goslate python google translator library and text is separated in to single letter and given serially to pic via usb to serial pic will receive data from python platform and convert to Braille plotted on Braille keypad made up of six solenoid valve. TTS motors are required for an sound yield of machine interpretation comes about. A text-to-speech framework (or "motor") is composed of two parts: a frontend and a back-end. The front-end has two major errands. To begin with, it changes over crude content containing images like numbers and truncations into the proportionate of written-out words. Here in this setup we used English and Marathi language. Marathi language is converted using goslate google translator.

HARDWARE IMPLEMENTATION

The PIC18F4550 microcontroller is used in hardware implementation, interacting with various components Based on instructions from the Python program, the microcontroller is essential in managing the hardware accessories. For visually challenged pupils, the solenoids provide a multi-modal interface by raising hands-on Braille code, with LCD offers visual confirmation and the speakers produce audio.following components are used in project. 1.PIC18F4550 2.LCD 16 x 2 3. IRF3205 MOSFET 4. Solenoide valve 5.PCB 6.LM7805 Regulator

RESULT AND OUTPUT

For accurate tactile sensations to be produced, the PIC18F4550 microcontroller and the Braille keyboard must interface. Tables 1- 4 show how the Port B active low pins are mapped to the English and Marathi alphabets, numbers, and symbols so that the solenoids may layout Braille letters for the user. With this setup, Braille output and text-to-speech capabilities are perfectly integrated, giving visually challenged persons a better educational experience.

Table 1. pic Braille Interfaced Port B Pins Active Low For Plotting English Alphabets

letter	Pic port B active low pins for braille	letter	Pic port B active low pins for braille	letter	Pic port B active low pins for braille
A	RB0,	J	RB1,RB3,RB4	S	RB1,RB2,RB3
B	RB0,RB01	K	RB0,RB2	T	RB1,RB2,RB3,RB4
C	RB0,RB3	L	RB0,RB1,RB2	U	RB0,RB2,RB5
D	RB0,RB3,RB4	M	RB0,RB2,RB3	V	RB0,RB1,RB2,RB5
E	RB0.RB4	N	RB0,RB2,RB3,RB4	W	RB3,RB4,RB5
F	RB0,RB1,RB3	O	RB0,RB2,RB4	X	RB0,RB2,RB3,RB5
G	RB0,RB1,RB3,RB4	P	RB0,RB1,RB2,RB3	Y	RB0,RB2,RB3,RB4,RB5
H	RB0,RB1,RB4	Q	RB0,RB1,RB2,RB3,RB4	Z	RB0,RB2,RB4,RB5
I	RB1,RB3	R	RB0,RB1,RB2,RB4		

Table 2. pic Braille Interfaced Port B Pins Active Low or Plotting Marathi Alphabets

letter	Pic port B active low pins for braille	letter	Pic port B active low pins for braille	letter	Pic port B active low pins for braille
अ	RB0	च	RB0,RB3	फ	RB1,RB2,RB4
आ	RB2,RB3,RB4	छ	RB1,RB5	ब	RB0,RB01
इ	RB1, RB3	ज	RB1,RB3,RB4	भ	RB3,RB4
उ	RB2, RB4	झ	RB2,RB4,RB5	म	RB0,RB2,RB3
ऊ	RB0, RB2,RB5	ट	RB1,RB2,RB3,RB4,RB5	य	RB0,RB2,RB3,RB4,RB5
ए	RB0,RB4	ठ	RB3,RB4,RB5	र	RB0,RB1,RB2,RB4
ऐ	RB2,RB3	ड	RB0,RB1,RB3,RB5	ल	RB0,RB1,RB2
ओ	RB0,RB2,RB4	ढ	RB0,RB1,RB2,RB3,RB4,RB5	व	RB0,RB1,RB2,RB5
औ	RB0,RB2,RB4	ण	RB2,RB3,RB4,RB5	श	RB0,RB3,RB5
अं	RB4,RB5	त	RB1,RB2,RB3,RB4	ष	RB0,RB1,RB2,RB3,RB5
अः	RB5	थ	RB0,RB3,RB4,RB5	स	RB1,RB2,RB3
क	RB0,RB2	द	RB0,RB3,RB4	ह	RB0,RB1,RB4
ख	RB3,RB5	ध	RB1,RB2,RB3,RB5	ळ	RB0,RB1,RB2
ग	RB0,RB1,RB3,RB4	न	RB0,RB2,RB3,RB4	क्ष	RB0,RB1,RB2,RB3
घ	RB0,RB1,RB5	प	RB0,RB1,RB2,RB3	ज्ञ	RB0,RB4,RB5

Table 3. pic Braille Interfaced Port B Pins Active Low For Plotting Numbers

No.	Pic port B active low pins for braille	No.	Pic port B active low pins for braille
0	RB2, RB3, RB4, RB5. RB0	5	RB2, RB3, RB4, RB5. RB0.RB4
1	RB2, RB3, RB4, RB5. RB0, RB1,	6	RB2, RB3, RB4, RB5. RB0,RB1,RB3
2	RB2, RB3, RB4, RB5. RB0, RB3	7	RB2, RB3, RB4, RB5. RB0,RB1,RB3,RB4
3	RB2, RB3, RB4, RB5. RB0, RB3, RB4	8	RB2, RB3, RB4, RB5. RB0,RB1,RB4
4	RB2, RB3, RB4, RB5. RB0, RB4	9	RB2, RB3, RB4, RB5. RB1,RB3

Table 4. pic Braille Interfaced Port B Pins Active Low For Plotting Signs

sym	Pic port B active low pins for braille	sym	Pic port B active low pins for braille	sym	Pic port B active low pins for braille
+	RB1, RB2, RB4	>	RB0.RB2,RB4	,	RB1
-	RB2, RB5	{	RB3,RB4RB2	!	RB1, RB2, RB4
X	RB2, RB4	}	RB2,RB4,RB5	:	RB1, RB4
%	RB0,RB3,RB5	[	RB0,RB1,RB5	;	RB1,RB2
=	RB1,RB2,RB4,RB5	]	RB3,RB4,RB2	“	RB1,RB2,RB5
(	RB0,RB1,RB5	<<	RB1,RB4,RB5	“	RB4,RB5,RB2
)	RB3,RB4,RB2	>>	RB1	?	RB1, RB5
<	RB2,RB3,RB5	.	RB1,RB4,RB5	&	RB1

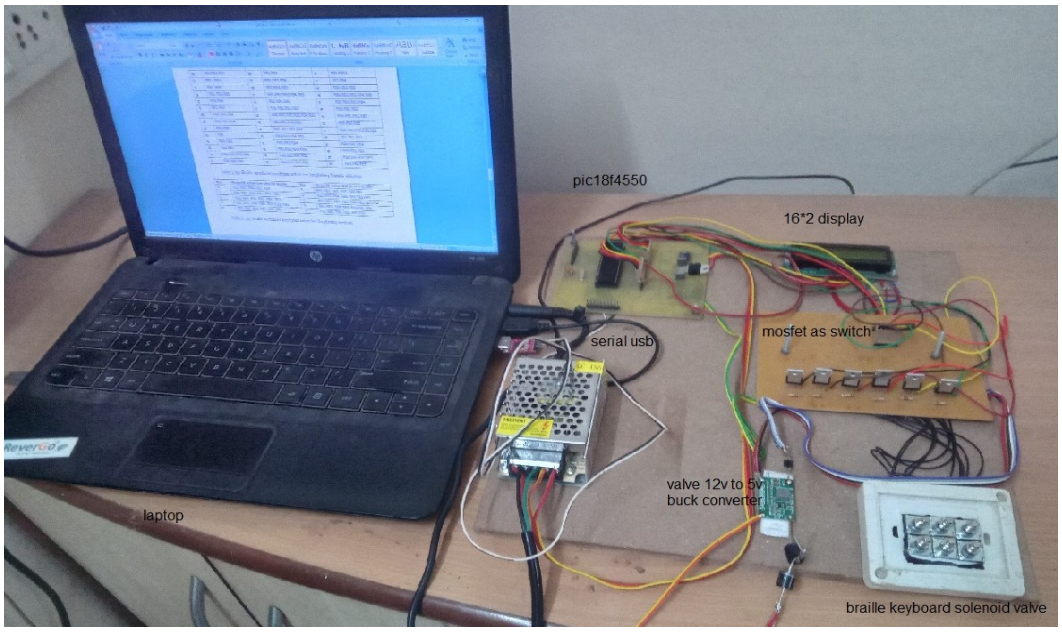

Fig 2. Text to braille converter with audio output model

CONCLUSION

Currently, data shows that over 18 million people are blind in India. Overall, the project aims to provide a device that enables blind and deaf people to understand video and spoken information in real time through a Braille driver. This system uses speech/suggestion, switching, driving, display unit, user interface, power, mobility, software and data/test models. The device helps blind and deaf people see information by converting text output from videos or real speech into Braille characters. Place the Braille and make sure it is there. The system supports multiple languages, allowing customization and personalization. This project has many advantages such as simplicity, affordability, portability and instant messaging. Motivates the user through promotion. Freedom and opportunity to provide information. This design focuses on simplicity, ease of use and maintenance. In general, this proposal meets the needs of blind and deaf people by providing solutions to access and understand texts and spoken materials in video in real time through Braille access. It has the potential to enhance learning and achievement while encouraging participation and independence in its target users. Recommend, explore, integrate with other assistive technologies, use cloud services, improve user interface, and encourage collaboration and feedback. These advances will enhance physical capabilities, improve user experience, and provide greater accessibility for people who are blind and deaf. The program has the potential to develop into a full digital technology service that supports users' independence, participation, and access to more information.

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