Refreshable Braille Display (RBD)

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ABSTRACT: The increased access to books afforded to blind people via E publishing has given them long sought independence for both recreational and educational reading. Many solutions have been proposed, some of which reduce costs by restricting the number of characters that can be displayed, even down to a single Braille cell. Here in this project , we are trying to take the input in the form of text (PDF) normally through the memory (SD Card) or keyboard, to the pi 3 board and convert to the equivalent Braille language (build of dots) using programming in python language.

KEYWORDS: Tesseract OCR, Solenoid Actuator, Braille.

I. INTRODUCTION

 A refreshable Braille display or terminal is an electro-mechanical device for displaying Braille characters, usually by means of round-tipped pins raised through holes in a flat surface. Blind computer users who cannot use a computer monitor can use it to read text output. Six pins to represents a character. Pins are movable and individually controlled. They can go upward and go downward. An equivalent signal is sent to the device and the corresponding character is displayed. Refreshable Braille Display (RBD) is a low cost refreshable Braille display for persons with blindness. It is a vision enhancement technology. It is to convert electronic text information to Braille language. It reduces number of errors increased as a function of presentation speed.
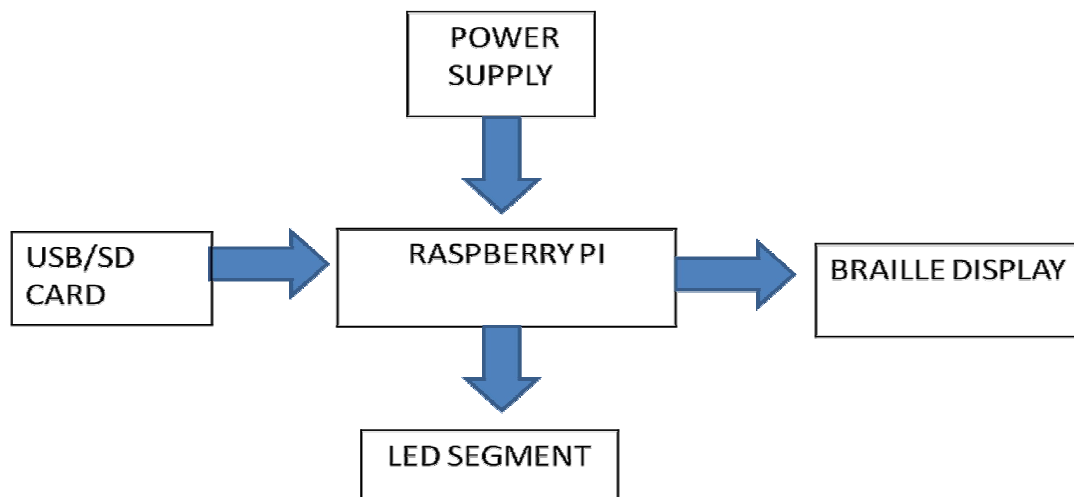
II. BLOCK DIAGRAM

Fig. 1: Block Diagram

Block diagram mainly consist of raspberry pi, Braille display, USB/SD Card, led segment and power supply. In this project, we have inputted the text image. If the data is in the form of text file we have convert the entire document into equivalent Braille language. The inputted document is converted to equivalent Braille language (basically built up of dots).After this equivalent Braille character is to be displayed. For each character we are setting the delays in order to locate the extract alphabet.
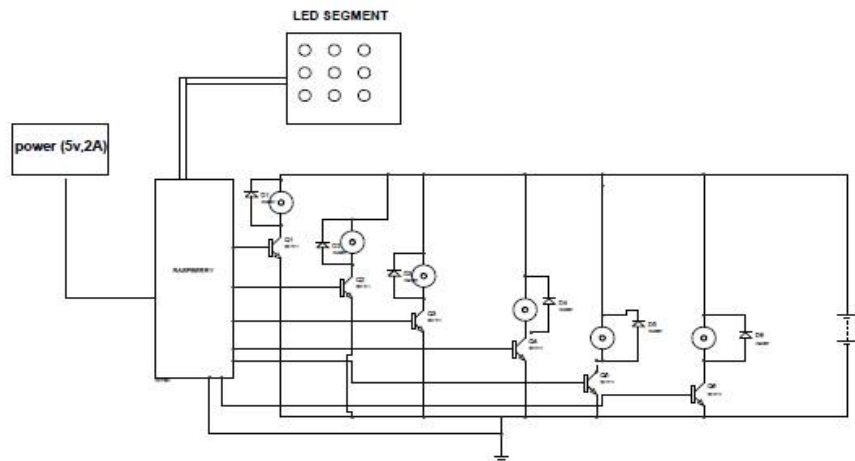
III. CIRCUIT DIAGRAM

Fig. 2: Circuit Diagram

The circuit diagram of the proposed system shown above, the circuit mainly consists of raspberry pi, six solenoid actuators, transistors, diodes and led segment. Raspberry pi 3 is used, in which 6 GPIO pins are connected to the 6 solenoids through the transistor CDH106 in order to protect the raspberry pi from overload conditions [1]. Since we are using solenoids there is a chance of generating back EMF, so free-wheeling diodes (1N4007) are connected across each solenoid actuators to cancel the back-EMF effect.

Raspberry Pi 3
- ❖ The Raspberry Pi 3 Model B features a quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz.
- ❖ 1GB RAM.
- ❖ Micro SD port for loading your operating system and storing data.
- ❖ Upgraded switched Micro USB power source (now support up to 2.4 Amps).
- ❖ It is recommended that we can use a powered hub so as not to overtax the on-board voltage regulator. Powering the Raspberry Pi 3 is easy; just plug any USB power supply into the micro-USB port. There's no power button so the Pi will begin to boot as soon as power is applied, to turn it off simply remove power. The four built-in USB ports can even output up to 1.2A enabling you to connect more power hungry USB devices (This does require a 2Amp micro USB Power Supply).

A. WORKING

To extract characters from the pdf, jpeg file we are using software which is called tesseract OCR. Tesseract is an optical character recognition engine for various operating systems. It is a free software. Tesseract is considered one of the most accurate open-source OCR engine [2].It is available for linux; windows and macos x. Tesseract can detect whether text is monospaced or proportionally spaced. By checking the outlines of characters and nesting of lines the tesseract OCR recognizes each other. And it will convert the image file in to a new file which will be containing only the extracted characters.

Talking about the hardware, 6 pins of the raspberry pi is connected to 6 solenoid attenuators. And the 6 solenoid actuators represent the 6 dots in Braille. In this solenoid actuator when we apply an electric signal. It creates an magnetic field and the resulting force pull out the pin [1]. In order a pin corresponding GPIO pin of raspberry pi is made high[4].

By inspection of the nesting of outlines, and the number of child and grandchild outlines, it is simple to detect inverse text and recognizes easily as black-on-white text [2].

IV. ALGORITHM

Step1: Start.
Step2: Inputting image file to extract.
Step3: Applying tesseract OCR**.**
Step4: Extract the characters**.**
Step5: List it in python.
Step6: Take each letter from the LIST and compare it with all the alphabets.
Step7: When the correct match is found, corresponding GPIO pins are made HIGH to display its Braille.
Step8: If letters are not completed go to step7 else go to Step9.
Step9: stop.

V. CONCLUSION

Refreshable Braille display will help the blind peoples to read the pdf files from computer like normal people and the blind people can read information by a single touch. The system is very compact since only one character is displayed at a time. It is light weight and portable.

REFERENCES

[1] Sensors and Actuators in Mechatronics: Design and Applications: Andrzej M Pawlak.
[2] Tesseract: an Open-Source Optical Character Recognition, Linux journal.
[3] Learning Python: David Ascher and Mark Lutz.
[4] Programming the Raspberry Pi: Getting Started with Python: Simon Monk.