

INSTANT BRAILLE KEYPAD

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Abstract

This work aims to assist the visually impaired people for reading a text material and detect objects in their surroundings. The input is taken in the form of an image captured from the web camera. The image is then processed either for the purpose of text reading or for object detection based on user choice. The Raspberry Pi acts as the processing of the entire process. The text reading is supported by software named OCR; other dependencies required for the process include Tesseract Library. The object detection is another aspect of the project which is implemented using a TensorFlow object detection API. It is able to detect various objects in its surrounding and provide text feedback about the same through braille keypad. In this project a raspberry pi board connected to a embedded camera module is used, using which a picture of the page is taken automatically. Braille is a system of reading and writing by touch used by the blind. It consists of arrangements of dots which make up letters of the alphabet, numbers, and punctuation marks. The basic Braille symbol, called the Braille cell, consists of six dots arranged in the formation of a rectangle, three dots high and two across. Other symbols consist of only some of these six dots. The six dots are commonly referred to by number according to their position in the cell. There are no different symbols for capital letters in Braille. Capitalization is accomplished by placing a dot 6 in the cell just before the letter that is capitalized. The first ten letters of the alphabet are used to make numbers. in the cell just before the letter that is capitalized. The first ten letters of the alphabet are used to make numbers.

1.Introduction

As per World Health Organization (WHO), out of the 6737.5 million of world population, 39.365 million people are blind, 246.024 million people are suffering from low vision, and 285.389 million people are visually impaired. New growing development in computer vision, portable computer and digital camera make it practical to verify or check these individuals by camera-based product that merges existing OCR system with computer vision.

A Braille Display is a touch sensation device that takes a pdf or normal text (.txt) file from a computer which is converted from image that has been captured and generates Braille dots for the people who have weak eyesight. Several types of actuators are employed by different types of Braille display devices. With the help of plunger movement in the coil, devices like solenoid prints out Braille. check these individuals by camera-based product that merges existing OCR system with computer vision.

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Braille is a system that enables blind and visually impaired people to read and write through touch. It was devised by Louis Braille in 1821 and consists of raised dots arranged in "cells." A cell is made up of six dots that fit under the fingertips, arranged in two columns of three dots each. Each cell represents a letter, a word, a combination of letters,

a numeral or a punctuation mark. The number and arrangement of these dots distinguish one character from another. The pattern of raised bumps or dots can be read with the fingers by blinds.

The Braille Cell



1.1 MOTIVATION

Braille is vital for communication and education purposes for blind and visually challenged people. They face difficulties in interacting and gaining full advantage of computers. Recently, and with the fast evolution in technology, researchers proposed to give the blinds the ability to take advantage of these advancements. Accordingly, designers and engineers started working on projects that relate input and output devices to the computers in order for the blind individual to have full control of the hi-tech machines.

However, investments in these kinds of hardware presented complexity in the design, in addition to the high cost imposed by the devices used. In order to overcome the above said challenges our idea is to design a portable device called "Braille Display". The project's objective is to design and develop a Braille System output device for the visually impaired individuals that enable them to interact and communicate.

1.2 OBJECTIVE AND SCOPE

This project uses an algorithm which enables the user to convert the text that we normally have in our day-to-day usage into Braille Script and thus gives impetus for the visually impaired to read that text. The Product that we will create will be very intuitive and simplistic in design that will enable the end user to feel familiar and at home with the product. This project was conceived keeping in mind the day-to-day struggles in usage of laptops faced by the visually impaired people.

1.3 Problem Statement

Previous implementation was image to voice. The Implementation which we are doing is image to braille conversion Means Image to text and text to braille. The speech recognition system is highly complicated to work on as everyone needs to wisp the exact language and also that it keeps the visually impaired away from the common users .

2.Guidelines

LITERATURE SURVEY

2.1 Overview

A literature survey or a literature review in a project report is that section which shows the various analyses and research made in the field of your interest and the results already published, taking into account the various parameters of the project and the extent of the project. It is the most important part of your report as it gives you a direction in the area of your research. It helps you set a goal for your analysis – thus giving you your problem statement. Literature survey is for the most part done with a specific end goal to break down the foundation of the present venture which discovers imperfection in the current framework and aids on which unsolved issues we can work out. Along these lines, the accompanying points represent the foundation of the venture as well as reveal the issues and which encourages to purpose arrangements and work on the current issues. An assortment of examination has been done on fault resilience for application. Taking after segment investigates diverse references that examine around a few subjects identified with fault tolerance.

2.2 RELATED WORK

[1]. "Enhanced Braille Display", Sangeeta Kumari, Akshay Akole, Pallavi Angnani, Yash Bhamare, Zaid Naikwadi. 2020 International Conference for Emerging Technology. Here we are implementing enhanced Braille system that helps blind people to read text or content. We scanned image form camera, processed that image-by-image processing techniques and same will be converted into text using OCR. The detected text will be given to raspberry pi which recognize every character and convert it into Braille code. With the help of solenoid, we are displaying that Braille code on Braille

[2]. “Tracing the effectiveness of braille reading patterns in individuals with blindness: Handedness and error analysis”, Vassilios Papadimitriou and Vassilios Argyropoulos. British Journal of Visual Impairment. The main objective of the present study was to investigate the potential effects of handedness on braille reading patterns during braille text reading. Thirty-two Greek students (from Grades 3 to 12) with visual impairments, who used systematically the braille code as reading medium, participated in this study. Handedness was assessed through a modified version of the Edinburgh Handedness Inventory, while their reading level was estimated via a standardized test. In turn, participants read 18 texts, which were chosen randomly from their textbooks. Results indicated that handedness affected braille readers’ selected reading patterns during text reading.

3.EXISTING AND PROPOSED METHODS

3.1 EXISTING SYSTEM

For enhancing the interaction with the computers by the visually impaired there were many systems that were created like E touch , speech recognition interacting system etc. Several companies today market computer programs that allow a blind person to use a standard computer. These computer programs are called "speech recognizers". A speech recognizer is itself a standard Windows computer application, but its job is to run alongside the other programs running on a computer and makes the blind person to speak out to enter the text on the screen.

3.2 PROPOSED SYSTEM

The proposed text-to-braille conversion system overcomes certain limitations of the existing text-to-braille conversion system. It is based on detecting the texts from any book, document or magazine through the images captured using a camera. The Raspberry Pi microcontroller can be programmed using Python. The Raspberry Pi microcontroller supports camera interface and more than 40 individually programmable GPIO pins. We use 18 of the available GPIO pins to activate the 18 braille pins electromechanically. The 3 Braille Units each consisting of 6 pins are raised electromechanically, i.e., like how a solenoid is raised or lowered due to the electromagnetic effect caused due to current flow. The concept of Braille keypad arises from the wooden dice. It is used to enter the text message in the form of characters, alphabets etc. only for the blind peoples having the specific standard pattern for each character or alphabet. Group of six raised dots or bumpy dots represent the particular letter. Braille keypad is consisting of 3x2 matrixes by which we can display 64 different characters.

3.3 BLOCK DIAGRAM

The main block diagram as shown in figure 3.1 consist of Raspberry pi, braille keypad, power supply, camera module, uln2003 drivers and SD card

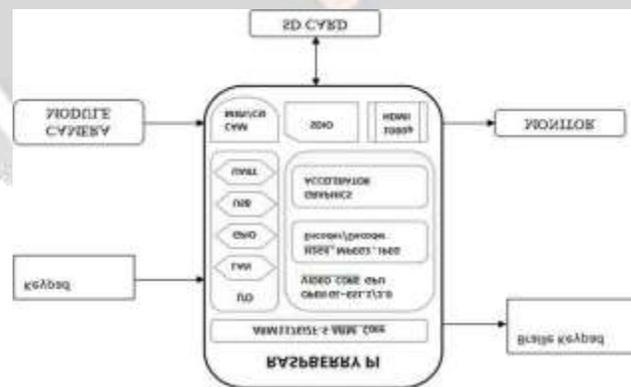


Fig3.3:Main block diagram

To produce Braille text, Raspberry pi receives text from the text file Send them to the control board via serial interface. Raspberry pi then converts the alphabets into Braille symbol and then equivalent servo control signals to actuate the Braille pins. The blinds can feel the sense of touch of the Braille pins that are popped up according to the input letter and they recognize the letter accordingly. The above control mechanism is been programmed in Python language in Raspbian operating system.

3.4 HARDWARE REQUIREMENTS

1. Raspberry Pi
2. Camera
3. SD Card
4. Braille Keypad
5. Uln2003 drivers
6. Power Transformer
7. Zener Diode
8. Farad Capacitor
9. Solenoid pull up motors
10. Led
11. Resistor

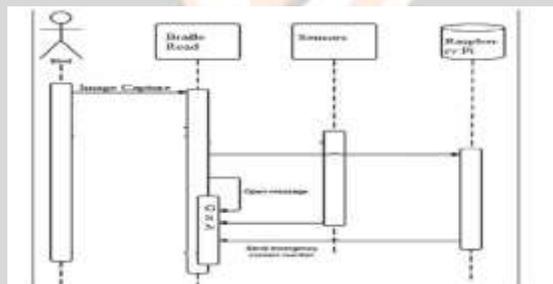
SOFTWARE REQUIRMENTS

1. Tesseract ocr
2. Open CV
3. Python
4. VNC Viewer DESIGN AND METHODOLOGY

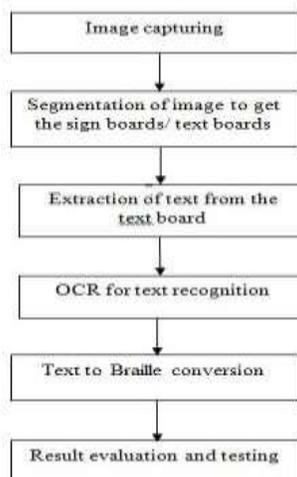
4. BRAILLE TEXT POPPER

Braille text popper is a key setup which has a solenoid pull up motors below each key. Each solenoid motors is responsible for lowering and raising a pin, which will emerge through perforations on the top plate to form a Braille dot. The perforations serve as guides for the pins and form six dots which is equivalent to one Braille cell.

4.1 SEQUENCE DIAGRAM



4.2 FLOW CHART



It basically describes the sequences of operations that takes places with respect to the project. Our project striking feature would be the image capturing for reading a particular text. The flowchart starts with capturing an image that the blind wants to read. Segmentation of the image takes place in order to retrieve the text from the image, which then makes use of the sign board to get the text identified. Extraction of the text from the text board converts the image to the text that the blind will want to read. We make use of OCR for the text recognition. This text is then converted into Braille which helps the blind person to read anything he desires. This feature keeps the blind informed with respect to the surrounding

5. IMPLEMENTATION AND RESULTS

5.1 IMPLEMENTATION: In this chapter we discuss about the outcome of our project. The figure 5.1 below show the snapshot of the hardware. A successful implementation of a Braille keypad is implemented in such way that a visually impaired person can get to know about the images placed in front of camera. The camera will capture the image placed in, it will focus on the character. Later on, it will compare with the database stored in SD card. If character is stored in database, then it will automatically convert into braille language in the form of dots through ocr software.



5.2 RESULTS: The brief process of braille keypad working starts from power transformer is of 3 amps which is connected to the PCB which supply only required amount of current to the ULN2003 driver and this transmits current to the solenoid motors placed in braille keypad. The camera captures the image which is placed in front of it then, the images are segmented into pixels, after this process the extraction of the text from the textboard will be done. Once the extraction is done optical character recognition(ocr) is used for the reorganization of the word then this will be converted into braille language and it will popped-up on the braille keypad, by placing the hand on the braille keypad the person can sense the words which is converted into braille dots.

5.3 CONCLUSION AND FUTURE SCOPE:

This device will surely help the visually impaired to be independent and flourish in this fastdeveloping world. Access to communication in its broadest sense is access to knowledge, and that is vital for us to achieve the highest degree of personal autonomy and be treated as equals. Visually impaired people has to face many issues while accessing the text which are not in braille script. To help them there are many technologies, one among them is text to speech converter, which converts text to speech hence they can hear the words. But usually voice which is used will be inconvenient to listen and even the spellings will not be known to the user. This can be avoided by using character by character recognition but its time consuming. Hence the other technology that can be used to help them is braille displays. The keyboard is aimed towards the welfare of visually impaired people. The visually impaired have an exposure to all the latest equipment's made especially for them, but none has attempted better research over this issue. Hence, this project is sure to create a revolution in its own field and ensure complete support from people of different societies. This project helps the visually impaired to interact with the computer system at a maximum probability and easier to communicate. At the international arena this project will definitely achieve greater heights and is expected to be welcomed by communities for helping the blind

5.4 REFERENCES

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