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Speech Assistive Device For Visually Impaired People

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Abstract: There are millions of people in the world who are visually impaired. Reading is one of the major requirements for them. They face a lot of problems in their daily life with accessing printed text. As the technologies are improving and emerging from time to time, it is necessary to take a measure to help visually impaired people, so they can lead an easy life in this modern world. In this paper, we propose an assistive device for visually impaired people which help them to break this hurdle. This project is developed using Raspberry Pi and the camera module is connected to Raspberry Pi by using the python code. Webcam is used to capture the image and the captured image is converted into text using Optical Character Recognition (OCR) and this text will be then converted to speech using eSpeak. This device enables blind people to read without the help of others.

Keywords: Raspberry Pi, Optical Character Recognition (OCR).

I. INTRODUCTION

Globally the number of visually impaired people is estimated to be 290 million, among them 40 million people are blind and the other 250 million people have some form of visual impairment. Reading is one of the major requirements of visually impaired people. There are many methods used by blind people to read, one of them is the Braille system in which letters are represented by raised dots, which requires a complete understanding. The main disadvantage of this system is for reading printed documents or books, they need to be converted into Braille alphabets. A Screen reader is an assistive technology that provides text as speech. Screen readers cannot describe images. A Finger reader is an index finger wearable device that helps the blind in accessing printed text through speech. The device can only read out the texts that have a particular size.

India, a home of highest number of blind population in the world certainly needs to improve the awareness of assistive technology. In order to facilitate the blind we have implemented the assistive device. The system consists of Raspberry Pi, camera, OCR software and TTS. OCR software is used to extract the text from the captured image. The extracted text is converted into speech using eSpeak.

II. LITERATURE SURVEY

Ray Kurzweil [1] proposed A K-Reader Mobiles, designed specifically for visually impaired people. It is a mobile application which allows user to read emails, receipts, and many other documents. Michael McEnancy [2] Finger Reader is an audio reading gadget for the index finger. It helps the visually impaired people in reading paper printed text, but the blind people can’t aim the letters accurately. Vasanthi. G [3] proposed a Vision-Based Assistive System for Label Detection and Voice Output. A camera-based assistive text reading framework to help blind persons read text labels and product packaging from the hand-held objects in their daily

resides is proposed. Marut Tripathi [4] proposed A Navigation System for blind people to navigate safely and quickly, in the system an obstacle detection and recognition are done through ultrasonic sensors and a USB camera. This system detects obstacles up to 300cm via ultrasonic sensors and sends feedback in the form of a beep sound via earphones to inform the person about the obstacle. Dimitrios Dakopoulos [5] proposed A Wearable Obstacle Avoidance Electronic Travel Aids for Blind. This paper presents a comparative survey among wearable obstacle detection systems (a subcategory of ETAs) to inform the research community and users about the progress in assistive technology for visually impaired people. Athira Panicker [6] proposed A Smart Shopping Assistant Label Reading System with voice output for Blind using Raspberry Pi. A camera-based assistive text reading algorithm was implemented to help blind people to read the text labels and product packaging from hand-held objects in their casual lives. William A Ainsworth [7] proposed A System for Converting English Text into Speech. The feasibility of converting English text into speech using an inexpensive computer and a small amount of stored data has been investigated but it is not suitable for all memory range of computers. Chucai Yi [8] proposed a portable camera-based assistive text and product label reading from hand-held objects in their daily lives. They proposed a novel text localization algorithm based on models of edge detection to extract text regions from complex backgrounds.

III. PROPOSED METHOD

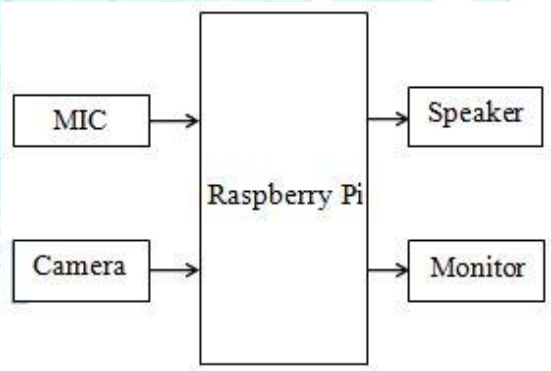


fig1:- Block diagram of proposed project

The main idea of this project is to assist visually impaired people in real-time in accessing the printed text through speech. The proposed system consists of a high resolution camera and speaker which are connected to Raspberry Pi board using python code. Camera is used to capture the image and text from the image is extracted using Optical Character Recognition Software. The text is converted into speech using eSpeak.

IV. HARDWARE DESCRIPTION

Raspberry Pi:

Raspberry pi is a simple single board computer that can be used cost effectively and for multi purposes in many projects and in real time operations. It can be easily connected to other components using GPIO (general purpose input output) for interfacing with outer environment and intercommunicate with cross-disciplinary domain.

Technical specifications:

- Quad Core 1.2GHz Broadcom BCM2837 64bit CPU
- 1GB RAM
- BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board
- 100 Base Ethernet
    - 40-pin extended GPIO
    - 4 USB 2 ports
    - 4 Pole stereo output and composite video port
    - Full size HDMI
    - CSI camera port for connecting a Raspberry Pi camera
    - DSI display port for connecting a Raspberry Pi touchscreen display
    - Micro SD port for loading your operating system and storing data and
        - Upgraded switched Micro USB power source up to 2.5A

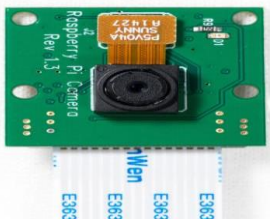
Fig 2:-Raspberry Pi 3 board.

Raspberry Pi Camera Module:

Camera module can be used for capturing images and video that can connect directly to the raspberry pi. Due to its low weight and tiny (less) dimensions it is easily compatible for multiple capturing and detections using camera in real time applications. And it has high resolution which can be an advantage for analysing the data and make perfect to use.

Technical specifications:

- Compatible with Raspberry Pi 4 Model B/3B+/3B/2B/Zero Wireless
- 5 Megapixel OV5647 Camera
- Camera specifications
- Static Images Resolution: 2592×1944
- Supported Video Resolution: 1080p/30 fps, 720p/ 60fps and 640 x480p 60/90 video recording
- Aperture (F): 1.8
- Visual Angle: 65 degree
- Dimension: 24mmx23.5mmx8mm
- Weight: 3g



- Interface: CSI connector

Fig 3:- Raspberry Pi-Camera Module

Speaker:

Mini USB portable mono speaker is used in the project which is used for delivering clear sound with consistent performance while avoiding jitters, pops or jumbling sounds from the surroundings. Because of its portable size it can be easily used and can provide effective results. Technical specifications:

- Operating voltage : 4V to 5.5V

V. SOFTWARE DESCRIPTION

Raspberry Pi Software:

Raspbian is a free operating system optimized for the Raspberry Pi hardware. It is highly optimized for Raspberry Pi line of compact single-board computers. The python code is written and is implemented using this software.

OCR:

Optical Character Recognition is used to convert image to text using pattern matching or feature extraction. It converts the image from colour or grey scale to black and white. It often pre-processes the image for successful recognition of letters, numbers and symbols.

eSpeak:

It is a compact, open-source, and software speech synthesizer for Linux, Windows, and other platforms. It uses a formant synthesis method, providing many languages in a small size. Much of the programming for eSpeakNG's language support is done using rule files with feedback from native speakers. The quality of the language voices varies greatly.

VI. IMPLEMENTATION

First step is to capture the image. It is done by pressing the button which is interfaced to the Raspberry Pi board. After capturing, pre-processing the image and extracting the text from the image is achieved using OCR software. The extracted text is converted into speech using eSpeak software. The audio output is heard using the speaker.

fig 5:- Circuit of speech assistive device for visually impaired people which consists of raspberry pi,pi camera,speakers

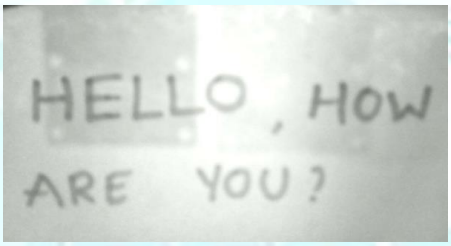


Fig 6:- Captured from pi camera is converted to image which is converted to text using ocr and it is given to the speakers.

VIII. CONCLUSION

We hereby conclude that the proposed device facilitates the blind people in accessing the printed text without the help of others. It helps them in leading a confident life. The system is of low cost and less weight. It provides effective results.

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