ABSTRACT

Ever heard of Hugh Herr? He is a famous American rock climber who has shattered the limitations of his disabilities; he is a strong believer that technology could help disabled persons to live a normal life. In one of his TED talk Herr said “Humans are not disabled. A person can never be broken. Our built environment, our technologies, is broken and disabled. We the people need not accept our limitations, but can transfer disability through technological Innovation”. These were not just words but he lived his life to them, today he uses Prosthetic legs and claims to live to normal life. So yes, technology can indeed neutralize human disability; with this in mind let us use the ability of Raspberry pi, simple sensors, camera and an audio device to build a Blind man’s stick that could perform more than just a stick for visually impaired persons and become their companion.

According to the WHO, about 30 million people are estimated to be permanently blind worldwide. The main objective of this project is to make a companion for Blind people using the latest technology available in the world. Generally Blind people have to face a lot of problem while walking outside on busy streets and are dependent on others to reach their desired destination. We have created, designed and built a “Speaking Blind stick with Electronic eye” device for visually impaired people who will help them to walk outside on streets and know texts written on any surface without any help of human assistance. This will make them independent and more confident. Using this device the person can know the exact distance of object or obstacle far from him/her and read the texts or words written on any surface. This project is mixture of smart blind stick and blind reader containing some of the latest technology currently available in the world.

The main components used in this device are Raspberry pi, ultrasonic sensor, camera, and speaker/earphone. The ultrasonic sensor transmits a high frequency sound pulse and then calculates the time to receive the signal of the sound echo to reflect back. The sensor has 2 circles. One of them acts as the transmitter and transmits the ultrasonic waves. The other one acts as a receiver (mostly a small microphone) and receives the echoed sound signal. The sensor is calibrated according to the speed of the sound in air. With this calibrated input, the time difference between the transmission and reception of sound pulse is determined to calculate the distance of the object. Camera is used to extract texts from image. Raspberry pi is the central processing unit of this device. It also converts texts to speech and the data can be listened in the form of voice using any audio device like speaker or earphone.

Chapter-1

PROJECT OVERVIEW

1.1 Introduction

This project is mixture of smart blind stick and blind reader. In this project ultrasonic sensor is used to measure the distance of the object. Espeak library is used to speak the distance of the object from the person. The camera module is used to capture the real time image of the product. Which is the given to the main module. The main module is raspberry pi which is a mini-computer on its own, which processes the image captured by the camera. Raspberry pi module, which contains the image processing code loaded, optical character recognition technique, is used to process the image. The image is processed internally in the raspberry pi hardware to separate the text from the captured image by using OPENCV (open source computer vision) library. The desired letters in the label is identified by using Tesseract OCR (optical character recognition). When the program is executed, this system captures the image placed in front of the web camera which is connected to Raspberry pi through USB. After that the captured image undergoes OCR Technology. OCR is the identification of printed characters using computer software. It coverts images of typed, handwritten or printed text into machine encoded text from scanned document or from subtitle text superimposed on an image. It also allows the conversion of scanned images of printed text or symbols into text or information that can be understood or edited using a computer program. In our system for OCR technology we are using Tesseract library. Camera acts as main vision in detecting the image of the paper then image is processed internally and separates texted region from image by using open CV library and finally identifies the text and identified text is pronounced through voice. Now converted text is converted to voice and listened by ear phone or speaker connected to audio jack port. Text-to-Speech (TTS) Platform is a modular hardware design for text-to-speech applications. Platform is a fully integrated

module that converts a stream of digital text into a high-quality English speaking voice. The text is converted to voice and then is heard from the audio jack port using ear phones.

To switch from distance measurement to blind reader a switch is used. When switch is pressed it will change the state and according to the conditions in program it will switch from distance measurement to blind reader or blind reader to distance measurement.

Chapter-2

Block Diagram

2.1 Block Diagram

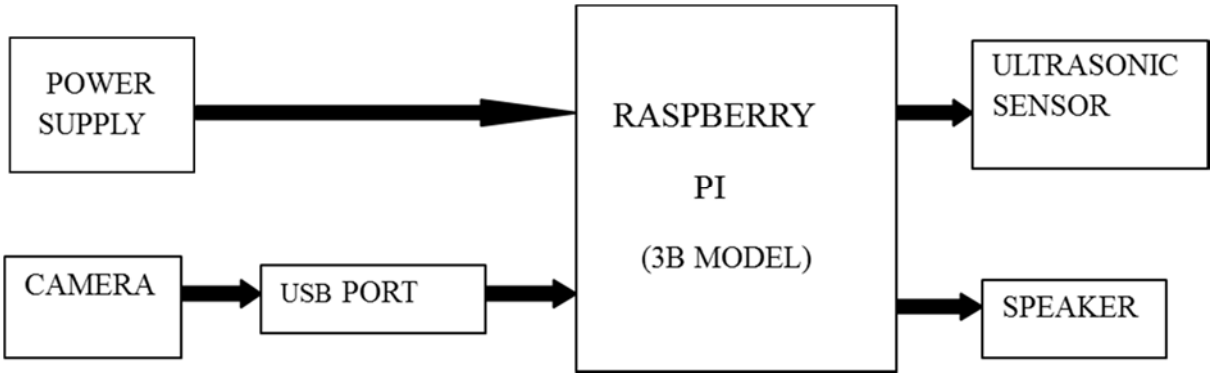

Fig 2.1 Block diagram

Chapter-3

Schematic Diagram

3.1 Circuit Diagram

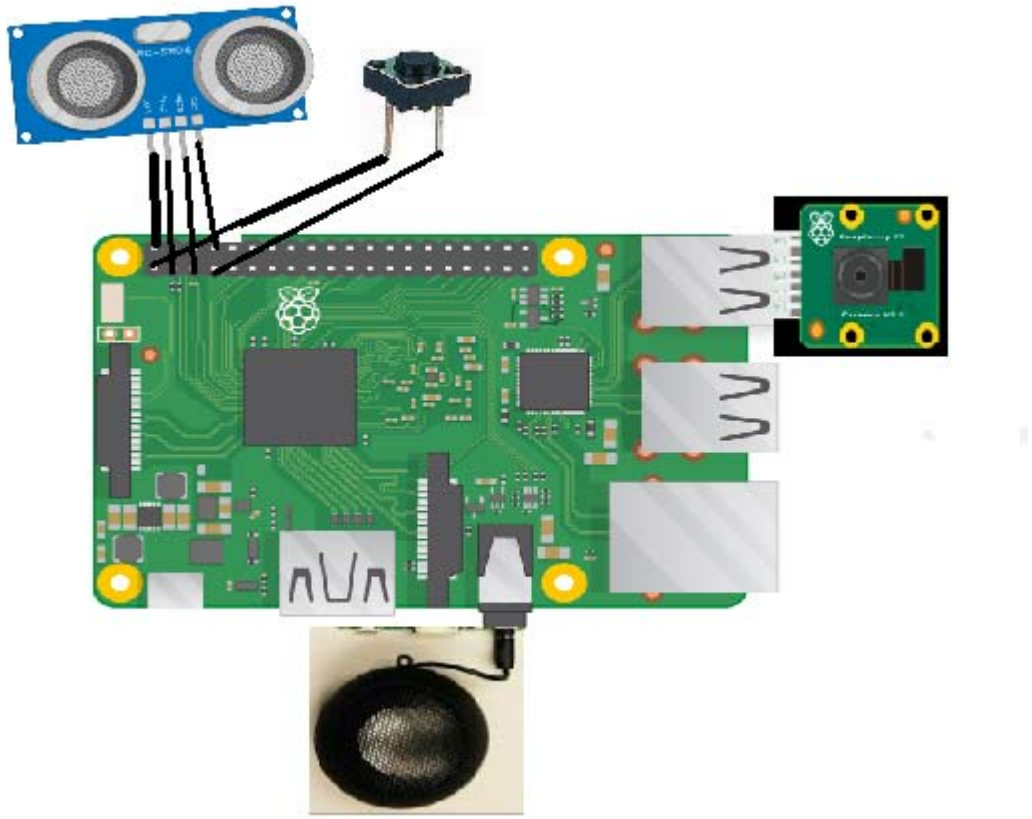

Fig 3.1 Circuit Diagram

Chapter-4

4.1 List of the Components

1. Raspberry Pi
2. USB Camera
3. Ultrasonic Sensor(HC-SR04)
4. Breadboard
5. Computer with Software
6. Jumper Wires
7. Switch
8. Bluetooth Speaker
9. Power Supply

4.2 Working

We know that sound vibrations cannot penetrate through solids. So what happens is, when a source of sound generates vibrations they travel through air at a speed of 220 meters per second. These vibrations when they meet our ear we describe them as sound. As said earlier these vibrations cannot go through solids, so when they strike with a surface like wall, they are reflected back at the same speed to the source which is called echo. The ultrasonic sensor transmits a high frequency sound pulse and then calculates the time to receive the signal of the sound echo to reflect back. The sensor has 2 circles. One of them acts as the transmitter and transmits the ultrasonic waves. The other one acts as a receiver (mostly a small microphone) and receives the echoed sound signal. The sensor is calibrated according to the speed of the sound in air. With this calibrated input, the time difference between the transmission and reception of sound pulse is determined to calculate the distance of the object. Now this distance is given at output in the form of voice using Espeak library in Python 2 and Raspberry pi.

The camera module is used to capture the real time image of the product. Which is the given to the main module. The main module is raspberry pi which is a mini-computer on its own, which processes the image captured by the camera. Raspberry pi module, which contains the image processing code loaded, optical character recognition technique, is used to process the image. The image is processed internally in the raspberry pi hardware to separate the text from the captured image by using OPENCV (open source computer vision) library. The desired letters in the label is identified by using Tesseract OCR (optical character recognition). When the program is executed, this system captures the image placed in front of the web camera which is connected to Raspberry pi through USB. After that the captured image undergoes OCR Technology. OCR is the identification of printed characters using computer software. It coverts images of typed, handwritten or printed text into machine encoded text from scanned document or from subtitle text superimposed on an image. It also allows the conversion of scanned images of printed text or symbols into text or information that can be understood or edited using a computer program. In our system for OCR technology we are using Tesseract library. Camera acts as main vision in detecting the image of the paper then image is processed internally and separates texted region from image by using open CV library and finally identifies the text and identified text is pronounced through voice. Now converted text is converted to voice and listened by ear phone or speaker connected to audio jack port. Text-to-Speech (TTS) Platform is a modular hardware design for text-to-speech applications. Platform is a fully integrated module that converts a stream of digital text into a high-quality English speaking voice. The text is converted to voice and then is heard from the audio jack port using ear phones.

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Conclusion

This project provides a novel concept for text reading and for finding distance of obstacles for the blind, utilizing a local-sequential scan. The system includes a text tracking algorithm that extracts words from a close-up camera view and an ultrasonic sensor that detect the objects. Text to speech synthesis is a rapidly growing aspect of computer technology and is increasingly playing a more important role in the way we interact with the system and interfaces across a variety of platforms. The planned system gives a very simple method for text to speech conversion. Text inputs like the alphabets, sentences, words and numbers are given to the system. Text to speech conversions is achieved and receives a better result which is audible and perfect. This system is very much used in the web applications; email reading, mobile applications and so on for making an intelligent speaking system.

In this project, we have described a system to read printed text and hand held objects for assisting the blind people is described. To extract text regions from complex backgrounds, a novel text localization algorithm based on models of stroke orientation and edge distributions using canny algorithm is proposed. Block patterns project the proposed feature maps of an image patch into a feature vector. Adjacent character grouping is performed to calculate candidates of text patches prepared for text classification. OCR is used to perform word recognition on the localized text regions

and transform into audio output for blind users. The camera acts as input for the paper. As the Raspberry Pi board is powered, the camera starts streaming. Speech recognition technology is of particular interest due to the direct support of communications between human and computers. The streaming data will be displayed on the screen. Using Tesseract library the image will be converted into data and the data detected from the image will be shown on the status bar. The obtained data will be pronounced through the ear phones.

An image to speech conversion technique using raspberry pi is implemented. The simulation results have been successfully verified and the hardware output has been tested using different samples. The algorithm successfully processes the image and reads it out clearly and it provides significant help for the people with disabilities. This is an economical as well as efficient device for the visually impaired people. We have applied our algorithm on many images and found that it successfully does its conversion. The device is compact and helpful to the society.

Advantages

- It is a perfect aid for blind people.
- Lower operational costs also text of different font scan be recognized
- This project can also be used by partial blind people and elderly people with different eyesight problems.
- It prevents blind people from hazards and helps them walk outside on streets without any companion making them more independent.

Disadvantage

- Small font size texts are difficult to recognize.
- The camera takes little time to auto-focus.

Applications

- Auto obstacle detection.
- Obstacle detection with speaking ability.
- No human assistance needed.
- Blind readers help visually impaired people to know what is written on any surface.
- Low cost and easy to use.

Future Expansion

The problem of adjusting the distance between text on any surface and camera can be solved by designing a robotic table that flips the pages automatically. By providing a battery backup to the raspberry pi, the main aim of the proposed project of portability can be achieved. The future work will be concentrated on developing an efficient portable product that can extract text from any image enabling the blind people to read text present on the products, banners, books etc. This project can effectively distinguish the object of interest from the background or other objects in the camera view, in future this project can be implemented in hardware which is used to detect and recognize object and vehicles on the road, so that it will assist person not to cross the road during vehicle movement. The algorithm can also be extended to handle non horizontal text strings. Future work will extend localization algorithm to process text strings with characters fewer than three and to design more robust block patterns for text feature extraction. The alignment of camera can be adjusted and use more function of ocr to enhance the application. By enhancing application the electronics labels, vehicles number can be scanned and processed and can be used for traffic monitoring.

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