Section A-Research paper

IoT-BASED WEARABLE READER FOR VISUALLY IMPAIRED PEOPLE

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***Abstract*—A portable, inexpensive reading aid designed for the blind is termed Blind Reader. Few people have access to Braille machines because of their exorbitant cost. The blind community, in particular, needs a portable text reader that is accessible and affordable. Blind Reader addresses the drawbacks of conventional Braille devices by making them accessible to the general public. This project involves building a smart reader for people who are blind using a Raspberry Pi. This effort's focus is on integrating a full text content examine-out system designed for those with visual impairments. The system consists of a webcam attached to a Raspberry Pi that can read printed text from a website. The tool reads the text aloud and employs OCR generation to turn images into text. On the device, data can also be stored. By creating a particular audio file, the system enables blind people to input sounds. The output audio is then played using an audio system or headphones. It is scanned onto a digital file using the raspberry pi's OCR (Optical Person Recognition) module, which is segmented and skew-corrected before feature extraction is used to perform class. With a text-to-speech conversion unit (TTS engine) installed on a Raspberry Pi, the text is labelled and then spoken aloud. Before they are read out, the results are fed into an audio amplifier.**

***Index Terms*—Raspberry pi, camera module, output speakers, microphone, VNC viewer software**

I. INTRODUCTION

At least 2.2 billion people were blind worldwide in 2019, and at least 1 billion of them had mild or treatable vision impairments, according to the World Health Organization (WHO). While 123.7 million people have untreated refractive issues, approximately 65.2 million people have cataracts. 826 million cases of presbyopia and diagnoses for glaucoma, ocular opacity, diabetic retinopathy, trachoma, and 6.9 million, 4.2 million, 3 million, and 2 million cases of each, respectively. 1 billion people on the planet, including those with fair to poor distance vision. For the blind, there are many text-accessible assistive technologies available.Text accessibility has become a very difficult task for people with disabilities. According to a 2018 survey, readily available technologies like screen readers, desktop scanners, smartphone apps, and e-readers are frequently underutilised because of their sluggish processing times or subpar accuracy. Braille had the disadvantage that blind people had to first learn and use the Braille alphabet. The first text-access and text-reading technology for blind people was braille. It is considered challenging to read Braille while moving. The portability and usability of the first readers were both hampered by their weight and related parts.Innovations in modern reading systems can be worn accurately. Earlier research has used a variety of techniques to locate text in images. A Gaussian filter is used in to automatically extract text before a series of nonlinear modifications are applied to extract features. The feature vectors are then computed to distinguish text from non-text pixels.Spatial scattering and Gabor filtering are used to automatically identify text portions. Moreover, attempts have been taken to appropriately align the finding text. created a device that can only read capital English letters. For text extraction, the highest pixel value should take precedence.

II. LITERATURE

Many systems and methods utilising Raspberry Pi, micro-controllers, and sensors have been discussed in the literature with the aim of creating assistive reading tools for people with visual impairments. These resources include things like Python and MATLAB. Many systems that use the OCR concept to gather images and synthesise text into audio signals are documented in the literature. In their article, Goel et al. suggested combining OCR with OpenCV and the text detection software tesseract to develop an assistive reading system for people who are blind or visually impaired. In their investigation, they proposed a text-to-speech module to translate text into speech signals. Mandar proposed a system in their research work that uses two modules: an image processing module and a voice processing module. He also made use of a tesseract. Also, he used a tesseract in the image processing module and text in

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the speech synthesiser. The proposed methodology's main flaw is that it only recognises font sizes up to 18. Subbia made a suggestion in a study published about how to use a Raspberry Pi to build a reader for blind people. The AdaBoost algorithm has been used by researchers to develop their own method of text to audio conversion. One of the key shortcomings of the Adaboost algorithm is its sensitivity to noise and outliers, which can degrade detection and convert to noise. Velmurugan developed a way to develop readers for the blind using OCR and a text-to-speech engine. In the voice synthesiser and the photo processing module, he also used text and a tesseract. The main flaw in the suggested methodology is that it only recognises font sizes up to 18. Subbia offered an idea for using a Raspberry Pi to build a reader for blind people in a study paper. Researchers have developed their own method for transforming text to audio by using the AdaBoost algorithm. One of the key shortcomings of the Adaboost algorithm is its sensitivity to noise and outliers, which can degrade detection and convert to noise. Velmurugan developed a way to make readers for the blind using OCR and a text-to-speech engine.

III. DESIGN

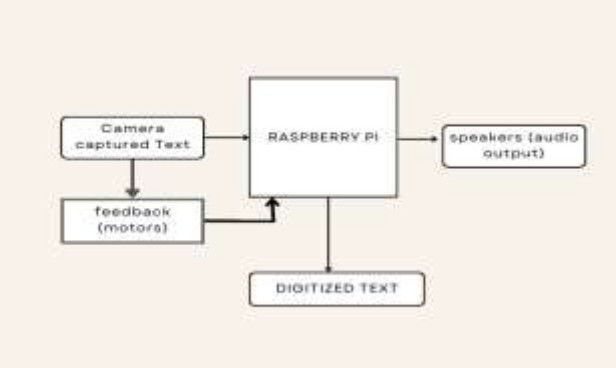

Fig. 1. block diagram

The processing of an imaging system with a camera attached to capture an image of a written document is shown in Figure 1 after that. An OCR algorithm receives the data and turns the picture data into text data. Each alphabet or letter is examined by the OCR algorithm as it scans the image. It then performs a database check and outputs the necessary text.To compare words discovered by the auto-correction system, consult a dictionary. Text-to-speech engine of choice that translates,The audio jack on the device converts text data to audio output and plays it through headphones.

A. Raspberry pi

The Raspberry Pi is a little computer with a variety of applications, including military and surveillance. The foundation's most recent product is the Raspberry Pi 4 model B. The Raspberry Pi has 40 general-purpose input and output pins in total. There are 26 general purpose input output pins, two 5V pins, two 3V3 pins, and seven zerovolt pins on the board (0V). The Pi 4 Model B's processor runs more than 90 percent as efficiently as the previous model while using 20–25 percent less power. It has two extremely small 4Kp60 "High-Definition multimedia Interface (HDMI)" connections. The Raspberry Pi 4 has four poles.The Raspberry Pi 4 has an audio port and a 4-pole stereo port. It has a slot for an SD card, which is helpful for loading the operating system, files, and images that the device requires. It is equipped with a USB-C connector. Since pi-4 has a 64-bit architecture, operating systems that were recently issued by the foundation should also be 64-bit. The Blue Ray video playback and 3.0 graphics are supported by the "Graphics processing unit GPU (GPU)" of the PI-4 B. There are four "USB" 2.0 and 3.0 connectors on it. They are compatible with external gadgets like mice, keyboards, and other accessories. The Pi-4-B has true gigabit Ethernet built in, enabling it to transmit Ethernet frames at a rate of 1 billion bits per second.

B. Camera

A webcam's function is to capture or transmit video to a computer or computer network. They are mostly utilised for security, livestreaming, and social networking. Most often, webcams are connected to a device using USB. There is software that enables PC-connected cameras to listen for sound and detect movement, capturing both when they are found. A webcam's charge-coupled device (CCD) reaction is linearly proportional to the amount of light entering the device. CCD technology in cameras makes it possible for them to capture visual data as an image or video. Color pixels on webcams may range in size from 5 to 10 m.Moreover, USB cameras have bigger, moveable lenses that result in better overall image quality. To make sure that the subject you are photographing is always in focus, you may alter the focus settings and vary the focal length for close-up or far-away photos with an adjustable lens. The 60-degree field of vision (FOV) on a camera allows it to show a single person using a computer. This webcam records images in a 16:9 horizontal landscape format. This has the ability to autofocus and correct for low light.

C. Speaker

A speaker is the user who is giving commands to a software program using text recognition.A speaker is an audio output hardware device that connects to a computer to generate audio signal.It is also used for the amplification of the itensity of the voice.

D. VNC software

A computer can be controlled entirely via the Remote Frame Buffer protocol (RFB) with the help of Virtual Network Computing (VNC), a graphical desktop sharing system. It relays the graphical screen updates while transmitting keyboard and mouse input from one machine to another over a network. There are clients and servers for numerous GUI-based operating systems as well as for Java, making VNC platform

independent. A VNC server can have several connections from different clients at once. The ability to view files on one's work computer from their home computer or vice versa is a common usage for this technology. There are several VNC versions available, each with its own unique set of features.

IV. IMPLEMENTATION

The implementation of the model requires following steps

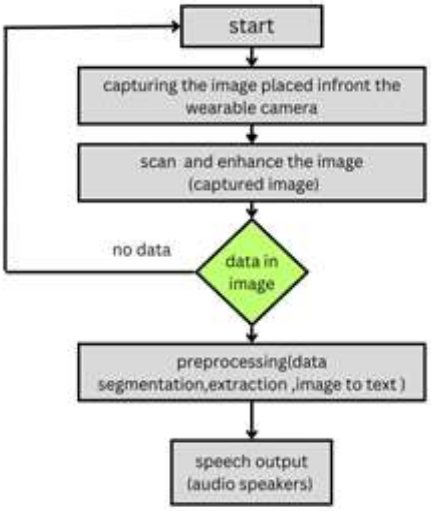

Fig. 2. flow chart

A. Scanned Image:

The first step involves placing a document in front of the camera so that it can take a picture of it. The collected photographs are of a high quality for quick and clear identification thanks to the high-resolution camera. The stages of preprocessing are distortion correction, linearization, and denoising. Analyze the captured image for skewedness. The image is probably skewed both to the left and to the right. The image in this case is brightened and binarized first.An orientation angle of less than 15 degrees is checked using tilt detection. If one is discovered, the image is simply rotated till the line coincides with the actual horizontal axis, producing a skewed rectified image. Prior to capture, any noise created by page degradation or during capture

B. Enhanced Image:

Once the wearable camera captures a picture, image enhancement is performed. After taking a stable image, it is shown on the computer in a software programme, where the next step is then taken. The best information is extracted from the collected image and forwarded to the following stage.

C. Character Segmentation and Database:

Character segmentation is a process that aims to separate a picture of a line of characters into smaller images representing distinct symbols. It is a decision-making process in an optical character recognition system (OCR). The follows is based on that character database.

D. Image to Text Converter:

The Raspberry Pi board converts detected characters' ASCII values. Each character in this instance is compared to its pattern before being saved as a normalised text transcription. The audio output is then given this recording.

E. Source Synthesis:

The completion of the prior oonCharacter Recognition module is the starting point for this module's scope. The module performs the conversion of the text into a digital audio. The onboard audio of the Raspberry Pi is produced by a PWM output and is lightly filtered. It features an onboard audio connection. Sound quality and amplitude may be considerably enhanced using a USB audio card. Use the Tesseract algorithm and Python programming to process the character code in the text file on the Raspberry Pi device to identify the character once recognition is complete. Next, play the audio output.

V. CONCLUSION

In this research, we offered a clear approach for helping blind persons by scanning hand-held items and written language. To extract text areas from extensive backdrops, we created a special text localization algorithm that supports edge distribution models and stroke direction models.

Its functional map assesses how each component of the text contributes to the overall structural function. To locate text in camera photos, Adaboost's related learning model is employed. The camera serves as a paper inlet for this analysis.

The Raspberry Pi board's strength allows the camera to begin broadcasting. The GUI app for screen damage displays streaming information. The picture displays on the board as soon as you push the capture button while holding the text reader in front of the camera.Using the Tesseract library, knowledge from images is reproduced, and the knowledge is then presented on the standing bar. By the use of voice synthesis and headphones, acquired knowledge is presented.

Fig. 3. Prototype of the proposed method

VI. RESULT

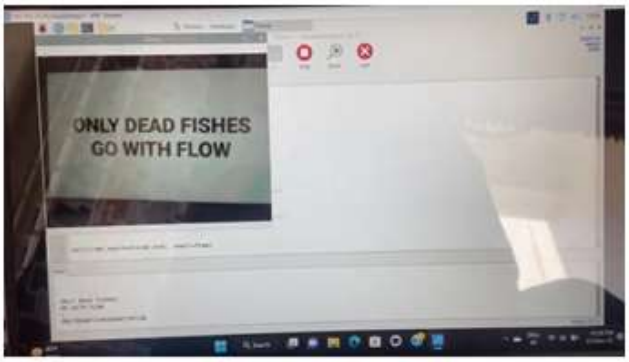

Fig. 4. Resultant of the VNC viewer software

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