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PYTHON BASED SMART READER FOR VISUALLY IMPAIRED PEOPLES

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***Abstract*: This project provides a smart book reader and object detection for visually impaired persons. The goal of this project is to develop a fullyintegrated system that is quick, less expensive and efficient while reading with high accuracy, there one low cost with high accuracy camera is used to getting the image, The camera is highly portable, Which can fix any Where like desk(or) any stand(or) hold with hands. In regular lightning in an environmental area, this can identify curvature and edge of the paper(or) document. Through the software development the image can be captured by camera. For output for this project is via auditory, Which readout the passage by speech synthesis engine.**

***Keywords* – Book Reading, Image Processing, Text to Speech Conversion, Synthesis Engine.**

I. INTRODUCTION

The purpose of this project for helping the visually impaired persons to get their visual through the technology on electronics. This project aims to read out the books, and to identify the objects through this project by speaker or earphones. A Digital camera is required for use with the interface. Which helps to capture the text in the books or papers by in real time. This process is called as a image acquisition process. The character recognition method is used to get the text from the image. To enhance the image here using certain softwares. The controller of the project is RASPBERRY PI 3 B+, Which is user friendly and it is easy to use and control. The tesseract software is used for connecting real time camera video to image and image to text, Which in program festive is used for getting output as speech format. This interface covers the image acquisition method that maintain integrity source, Which also provides character recognition challeges by inappropriate document location and the perspect images.

II. RELATED WORKS

Now a days system have been developed to recognize the conditional content of a spoken utterance. The (BOW) bag-of-words approaches, Which is from mel frequency ceptral coeffiecient , (MFCC),are used for speech emotions identification in high accuracy. It consist of various classification methods, and it contains (SVM). Using some techniques such as (KNN) (RF) (NB) perform embedded bag-of-words. And Extreme Gradient boosting (XG Boost) [1]. People with poor vision or vision impairment used Braille to read books and documents all across the world..but Braille is really expensive and the procedure is many times not available. For this Issue, Smart device convert any documents to the interpreted form for blinds. so the visual impaired persons can read the book via audio representation through the text into speech format, which is user friendly and effective interactive system [2]. Here the reader uses high resolution miniature camera that capture real time images of printed text from a book. The images are processed to convert as a computerized text using raspberry pi microcontroller. Vibration motors are used to mount the camera which is based on embedded device, which guide the user when they get deviated from the current text line. Then the computerized text heard as voice output. this device works upon touch sense of the visual impaired person they can drag horizontally when dragging the line will be read as audio output [3]. Here the optical character recognition(OCR) is used for implement the smart book reader for visually challenged persons to read the book or document .It has camera to capture the image. The frame work of the project is based on the raspberry pi module microcontroller, with image processing algorithms, OCR and text-to-speech (TTS) synthesis module. The cameracapture the printed form text in the image and process it by binarization process, de noising, de skewing segmentation and features extraction and fed into the OCR. OCR used here is Google tesseract and TTS is Pico. So the complete text read system is out come for the visually challenged persons [4]. Here smart book reader uses the IoT technology. Using an IoT device user friendly and simple to use, which provides IoT infrastructure and services. Raspberry pi is used which is in credit card size and simple to control or use it. The camera is used for catching the image from book or documents below the camera and will processed and recognize using OCR software, it will read aloud from the speaker. So the visually challenged person can hear it without tapping or touching or dragging .bythe help of IoT connectivity, both soft copy and hard copy of the documents or book, which can be converted into voice output through online and without the help of Braille system [5].

From the above papersdf, various prediction system used various approaches and methods to predict results. But the problem remains same. The problem of improving the system is not satisfactorily discussed so far. As the data will increase in future, the data handling, processing time can be affected. To solve this a complete novel (new) approach of parallelism can help. Lets see the existing system.

III. EXISITINGSYTEM

The complete architecture of the proposed work Reader for Blind Peoples. The system is based on the Raspberry Pi, which is a little computer that controls the entire circuit action of the system. We created a power supply unit for this system to deliver the required power supply to the circuit components. The power supply is meant to provide regulated power to meet the needs of the user. The system's architecture includes a camera that scans the printed text picture that the system is supposed to read. The image of the text printed on the paper is captured by this camera for reading purposes. The web camera is connected to Raspberry pi. The conversions are handled by the RASPION operating system on the Raspberry Pi. The audio output is extracted from the Raspberry pi's audio jack. The converted speech output is amplified using an audio amplifier. The audio output is taken out from the speaker which is also interfaced with the raspberry pi controller5V dc and 12V dc are required to power all of the components in this circuit. The 230V ac comes from the mains. Step down transformers convert 230V ac to 12V ac. transformer. The output is then delivered to the entire wave rectifier. Negative peak voltage is eliminated by the rectifier. of the voltage input the rectifier's output is the DC pulsing the use of error pulses eliminates them. filter capacitor Then, in parallel with the output, The 12V dc capacitor. However, the Micro Controller operates on5V dc. To convert 12V dc into 5V dc a regulator is used here. Regardless of the input, the regulator's output remains constant voltage input as illustrated in the circuit diagram above, the system's hardware includes a camera that is connected tothe Raspberry Pi. Camera module's VCC pins attached to the Raspberry Pi's pin 4 a 5V supply controller Furthermore, the underground supply is depleted. the raspberry pi controller's pin 9 as the system is represented in the circuit diagram above. The document that will be scanned using a camera. readout. The text data from the camera is scanned and captured. it to the Raspberry Pi controller A phonetic is assigned to the processed symbol. The phonetic is subsequently transformed into sound by the back end. In The Raspberry Pi controller is a small computer that runs on the Raspberry Pi. Tesseract 3.4, the most recent version, supports over a hundred languages. The Raspberry Pi then uses a TTS (text to speech) converter to transform this data into audio. TTS application Speech synthesis is the technique of turning text to speech using a computer. Speech synthesis is carried by using a text to speech system (TTS). A TTS has two parts: the front end and the back end. The text is converted to a symbol, such as a number, by the front end. It supports English and has a wide range of voices. The English language was employed. The data is subsequently output inaudio form by the system through a speaker. And the speaker is attached with the controller of Raspberry pi. This speaker is attached to the Raspberry Pi controller's GPIO pin22.

IV. PROPOSEDSYSTEM

This project's main goal is to provide a smart book reader and object detection for visually impaired people. People who like reading books, novels, and newspapers. For readings, get a smart reader. It will amuse the audience while simultaneously gathering information. The hearing abilities of visually handicapped people provides them with ocular vision. A microcontroller is present. Among other controllers, the Raspberry Pi reduces the complexity of this operation. Which is user-friendly and straightforward. Where VNC Server is a method of controlling a Raspberry Pi board with an operating system placed on a memory card. Python code is used to store the memory of the process, as it contains less code lines and a faster processing rate. Python minimizes code length and increases processing speed. The portable digital camera is used to detect objects, letters, and lines in books and documents. The python code takes a picture as input and converts it to binary format, which the coding recognizes as text, and then outputs it as music using the festive function in Python. where the output was received as audio through speaker or headphone, making it easier to hear the text being read. This initiative enables visually impaired people to regain their eyesight with the use of technology in today's society. They will not be concerned with this world, instead focusing on making their own world happy and instilling positive concepts in their minds. This initiative aids in instilling self-assurance in their minds.

Block Diagram

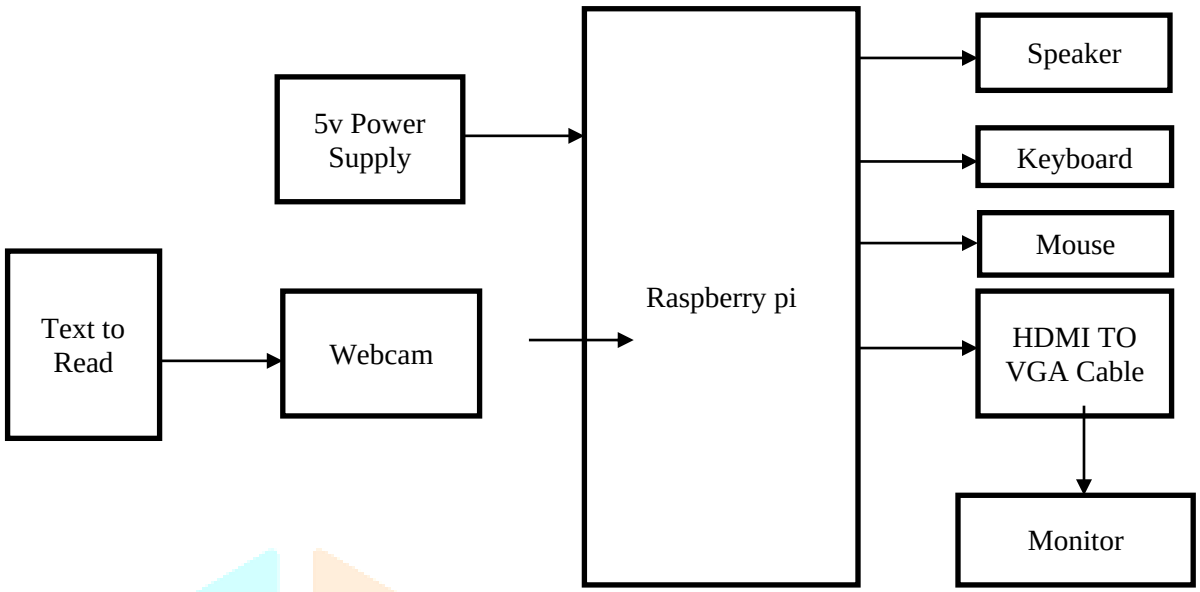

Fig.1 Proposed block diagram of book reader.

Tools Required:

This project is mainly focused to help visually challenged persons to read the book or document papers and to identify the objects. The hardware setup of this project is that the Raspberry pi 3 B models used. Which is very user friendly to use and compact in size. It is very easy to control. A SD card is inserted in the raspberry pi to store the data and to install the OS. A camera is used to capturing the image which is 360° rotatable, which is used for adjusting the camera. An VNC server ids used for control or to operate the raspberry pi. The software used here is raspbian stretch OS, VNC and SD formatter are used.

Programming modules:

Using the python programming platform the raspberry pi is controlled to image recognition process using python program in the software. The various programming modules used in this project is, the open CV library is used for preprocessing and image capturing. Where the Google cloud vision API and python tesseract is used for converting the image into text conversion. The GTTS Google Text to Speech conversion engine is used in this project, which have festive function which converts text to speech conversion operation for voice or audio output Python-VLC-Sound player is used and for dictionary query feature Py dictionary is used to correctspell or grammar mistake in the program.

System Design:

A Digital Cameras, one on the lateral side and one above the book, were used to create the system. Book-related assistance: A simple wooden box with a flat surface for transporting goods. Background paper for taking images for the book. To make extraction easier, use a solid-colored cloth or material, especially black. Through the lateral camera, the book's curvature is seen. The book reader system is depicted in a block diagram. To ensure a high-quality image, the person positions the printed text in front of a camera. The text localization algorithm is provided by the assistance system. a level of precision When the system first starts up, it checks to verify if all of the devices are connected. and the links between them are correct. The user interface is graphical. displays the current condition of the selected image A Raspberry Pi computer is a small computer. a computer with integrated peripherals. According to references, there are numerous types of reading material for the visually impaired, but none that can read the backdrop or intricate patterns that exist beneath the text of printed materials or books. Different typefaces, colours, scales, and arrangements can all be found in these patterns. The purpose is to enable visually impaired persons to read and search text from portable objects such as books and documents using a camera-based text reading framework that records the area of text included in the object. Extract text data from any decently hand-held objects or books using the proposed algorithmic program, which is effectively acclimated to handling completely varied background patterns. Individuals are becoming increasingly bored of reading vast numbers of pages, and someone is required to assist visually impaired people in reading text aloud and explaining it while we construct so that anybody may hear the text.

Fig.2.Hardware system setup

Methodology:

A method is enabled to detect a sequence of characters that exist and display the current read Line. The OpenCV (Open Source Computer Vision) library is used to capture images of text and perform character recognition and more. The smart reader architecture is shown in Figure 1. Here is the text that the plastic sheet reads. Optical Character Recognition (OCR) is a technology used to convert captured images from written text to machine-coded text Digitizing text helps save storage space Because it takes time to edit and publish a text document written on paper, It is mostly used in analysis and storage purpose. Terribly it is used to turn documents to electronic files. Here OCR Technology is used for machine translation and text-to-speech process. At the end the recognized text document transforms to the output device.

The method's procedure as illustrated in Fig.2, the process flow describes the stages involved in identifying text from a given image, processing the text, and receiving the desired output in the form of voice. By moving the gadget on a printed page, the built-in camera captures a text image. Skew correction, Linearization, and Noise reduction are the three processes of preprocessing in picture capture. First, the skew of the acquired image is examined. For picture intensities that have been enhanced and binarized, there are two possible orientations: left or right Fig. 2 Flow of the procedure If the result is correct, a simple image rotation is applied, followed by skew. The image that has been rectified is used. The binarized image's line-to-line distance is evaluated during segmentation. If the image contains an interline space, it will be divided into a series of paragraphs that span the gap. To determine the width of the horizontal line in the backdrop, an image histogram is employed. Lines are scanned vertically at vertical space intersections.

The first character is specified by a set of attributes such as character height and breadth, the number of horizontal and vertical linespresent, and the number of circles present in various regions in feature extraction. For image-to-text conversion, the Raspberry Pi board uses ASCII values. By matching each character to the corresponding template, the normalized text's transcription is preserved. Image for audio conversion output is created using minimal filtered PWM output. To boost the quality and volume of your sound, you can also utilize a USB audio card. The microphone is connected to the Raspberry Pi through USB microphone andexternal USB sound card.

Application and Future scope:

Beyond image processing, computer vision assists in extracting useful data from images and making decisions based on that data. To put it another way, computer vision is the process of teaching a computer to see like a person. The following are the basic processesfor creating a computer vision application: Acquisition of images, image modification, obtaining important data, decision-making, andso on.

Because computer vision is still in its early stages of research, it has not yet reached the point where it can be used to tackle real-world problems. With the passage of time and the rapid pace at which research is conducted, Computer Vision, or more precisely, Object detection, will become entirely ubiquitous. Machine Learning includes a section on Computer Vision. Accounting Number of Objects, Automobile Spotting, Biometric Detection, Medical Diagnosis, Supervision, and Machine to Man Communication are some of the most prevalent and widely utilized applications of object detection.

The goal of this thesis was to see if a real-time object detection system could be operated on a Raspberry Pi. At varying input sizes, two models, SSD and YOLO, were implemented and assessed for accuracy and speed. The findings indicated that both versions are exceedingly sluggish, and that utilizing the Raspberry Pi as hardware is only practical for applications that do not require high performance. Because there isn't enough processing capacity to have both, there must be a trade-off with precision if higher speeds areto be accomplished. This led to the conclusion that selecting the optimal input size is critical for achieving the right combination of speed and accuracy for a given application. Others attempting to create object detection on similar hardware might find this work useful in achieving that balance. In the future, we may be able to incorporate it into the Jetson Nano Controller. And, because to time constraints, several things that may have been done to improve the study's results, such as more testing of various objects, distances, and input sizes, were left out. To explore if you can improve accuracy for microscopic things, train your own models on alternative datasets with lesser resolutions. Another part of the experiment that was neglected was the influence of lightning on a model's ability to detect objects; this is something that might be further examined in the future.

V.CONCLUSION

The book reader is an automatic device when all the basic setup is done properly, which has the capacity to create the audio book. It takes over 1.5 minutes to record the audio of a single printed picture, including scanning, OCR, andreading. In this scenario, the picture utilised for character recognition is raw. If correct noise reduction, alignment, and other procedures are followed, the outcomes will be faster and better. The project's main purpose is to determine whether the Raspberry Pi can be used in a real-time object detection system. Two models, SSD and YOLO, were implemented andevaluated for accuracy and speed at various input sizes. In both the versions, the result produced is extremely slow. The usage pf Raspberry Pi as hardware is only feasible that do not require high speed in applications. Because processing capacity isn't have enough speed to have both, so there should be trade-off with precision if higher speed is to accomplished. This results in selecting the optimal input size is critical for a given application to achieve the right balanceof accuracy and speed. To find this work useful in achieving that balance can be seen in others attempting to build the object and printed image detection on a similar hardware.

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