International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 6 June 2022, pp: 2516-2519 www.ijaem.net ISSN: 2395-5252

Facial Recognition Smart Cap for Visually Challenged Persons

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Submitted: 20-06-2022 Revised: 27-06-2022 Accepted: 30-06-2022

ABSTRACT: Developing a tool for the visually impaired people is not a recently emerged problem. But developing a computer aided tool is a still developing area. The Smart cap project helps blind and visually impaired people to detect and recognize the office tools around them, which they see through a small camera, the camera is fixed on the cap.This technique helps providing job opportunities for the blind, especially office work through a voice message sent to an earphone placed on the blind ear to help them find various items easily and independently, also saves time and efforts. Our aim is to create an intelligent system, imitating the human eye, which transfers different scenes and images to the brain. The brain in turn analyzes the images or scenes, and based on previously stored information, the surrounding objects are identified. For this purpose, we use a small device that performs similar to the human brain, called "Raspberry Pi"; It is a small device that analyzes the images and scenes with the help of the camera. This project has an in-built sensor in it which spreads ultrasonic waves in the direction the person is going by scanning at most 5-6 meters of 30º range. This new system may solve some of major problems of blind persons that are still existing. Finally, the sound of each person in the database is called, and a message is sent to tell the blind about the person in front of them.

I. LITERATURE SURVEY

[1] In first paper we propose a smart cane with a face recognition system to help the blind in recognizing human faces. This system detects and recognizes faces around them. The result of the detection is informed to the blind person through a vibration pattern. The proposed system was designed to be used in real-time and is equipped with a camera mounted on the glasses, a vibration motor attached to the cane and a mobile computer.

The camera attached to the glasses sends image to mobile computer. The mobile computer extracts features from the image and then detects the face using Adaboost. We use the modified census transform (MCT) descriptor for feature extraction. After face detection, the information regarding the detected face image is gathered. We used compressed sensing with L2-norm as a classifier.

Cane is equipped with a Bluetooth module and receives a person's information from the mobile computer. The cane generates vibration patterns unique to each person as to inform a blind person about the identity of the detected person using the camera. Hence, the blind people can know the person standing in front of them.

[2] In the second paper a camera based system which will help blind person for reading text patterns printed on hand held objects.This is the framework to assist visually impaired persons to read text patterns and convert it into the audio output. To obtain the object from the background and extract the text pattern from that object, the system first proposes the method that will capture the image from the camera and object region is detected. The text which are maximally stable are detected using Maximally Stable External Regions (MSER) feature. A novel algorithm is evaluated on variety of scenes. The detected text is compared with the template and converted into the speech output. The text patterns are localized and binarized using Optical Character Recognition (OCR).

[3] Developing a tool for the visually impaired people is not a recently emerged problem. But developing a computer aided tool is a still developing area. The Smart Glasses project helps blind and visually impaired people to detect and recognize the office tools around them, which they see through a smalcamthe camera is fixed on the glasses.

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[4] The objective of this paper is to presents new design on assistive smart glasses for visually impaired. The objective is to assist in multiple daily tasks using the advantage of wearable design format. The proposed method is a camera based assistive text reading to help to blind in person in reading the text present on the text labels, printed notes and products in their own respective languages. It combines the concept of Optical Character Recognition (OCR), text to Speech Synthesizer (TTS) and translator in Raspberry pi. Optical character recognition (OCR) is the identification of printed characters using photoelectric devices and computer software. It converts images of typed, handwritten or printed text into machine encoded text from scanned document or from subtitle text superimposed on an image. Text-to-Speech conversion is a method that scans and reads any language letters and numbers that are in the image using OCR technique and then translates it into any desired language and at last it gives audio output of the translated text. The audio output is heard through the raspberry pi's audio jack using speakers or earphones.

II. PROPOSED WORK

Our device consists of a camera to capture image, Raspberri pi to process the captured image and recognize the image, and a audio output to give the output to the blind person so he can identify the person in front of him.

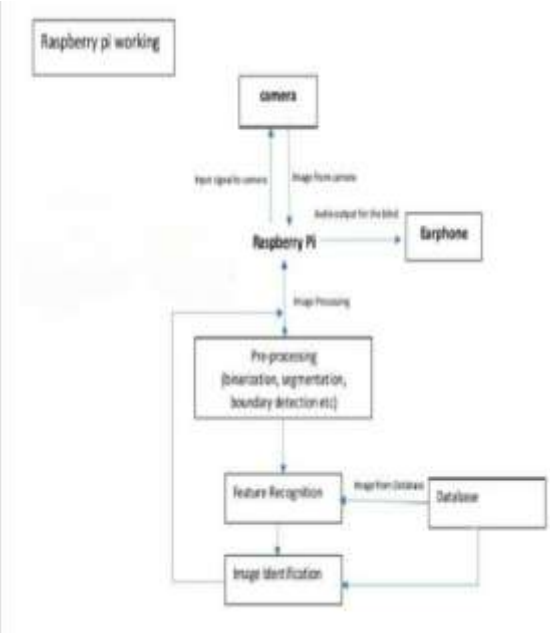
The idea is to implement it in on a spectacle. This is done so to make the image capturing easy and on human eye level. Image/ face recognition was done using OpenCV and TensorFlow which uses python language.

The coding was done in VScode. Camera is attached to the center of the cap and the image captured is compared in real time. the system is possible to identify people stored in the device in real time. the system has a model which can identify any person which is trained in TensorFlow.

Face recognition is done using OpenCV which only needs a few images to identify a person from testing the system is pretty accurate in identifying person stored in database. In order to make the system faster the device only recognize person only if that specific person is within a specific distance.

The name of the recognized person is found from the database and is converted into audio using google translation API.In order to add new people a button is added to the device and device will add the person in front of the blind user whenever he presses the button the device captures the image and finds the person in the image and crops it and saves it in the database along with the name of the person which can be added as voice input. All this is done using pi4 .

III. BLOCK DIAGRAM



The device consists of a ultrasonic sensor to measure distance and a camera to recognize persons The ultrasonic sensor is always finding the distance it checks if there is any obstacle or person within specified distance from the blind person. when within this limit the processor sends a request to the camera to take real time image of the person and the camera sends it to the processor the processor (Raspberry pi).

The processor then does a series of preliminary processing such as segmentation and boundary detection. Then it compares the image with the reference data in database and find matching features. If the device finds a match from database it then finds the name and details of that person from database and sends that data to the processor; and it is converted to voice signal and given as voice output to the blind.

The second section of this device is to add a person to the database for which the cooperation of the person is also required; when the user wants a person to be added he then sends an input [redacted] to the system.

The process for adding the person involves taking different views of the person, the processer then processes the image and stores the features of that person in database. For this the database has to be made dynamic and future editable.

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IV. ALGORITHM

1.start
2.Initialising
3.Press the Button
4.Camera capture Images.
5.Camera sends image back to raspberry pi
6.Raspberry pi recieves the image and convert it into grey scale.
7.Raspberry pi finds the boundary of face
8.From the pretrained model it extracts the features.
9.It then classifies the image according to featured model.
10.Then compares the feature with the database of the saved person to find matching face.
11.If matching face is not found it then ignores the person.
12.when a matching face is recognised it search the name(string) of the person from database.
13.It then converts string into audio signal and send it to speaker.
14.stop

First we done Initialising, Whenever a person is infront of the blind/the user. The camera captures the image in real time and sends it to the raspberry pi the image is captured using the function in cv2 called video capture. Then from that video frames are captured where the image recognition is done on each frame in real time. First of all the captured image is resized depending on the required need which in the program is 250×250 pixel. The face is recognised by using the trained model. The image then is converted into greyscale. The face can be recognised from the trained model. if the features from the image matches to that of a person which is saved in the database(feature match greater than 0.9).

Then the person from that database is taken as the identified person.Whenever a match is found corresponding name from database is taken and that text is converted using Google translation API and is converted into voice output which is given to blind person/user. Whenever you want to add a new person on to the saved faces; A button is pressed which then alerts the system that a face is to be added to the database.

A folder is made using os functions with the name of the person which can be taken as the voice input from microphone.Frames is captured from the video using video capture function which is then converted in to 250×250pixel.Different angles of the person is captured for the best results.

The image is then stored in the folder with the name of persona and a unique id is given to the capture images. The image is then scaled to be between o/1(BG).A labeled dataset is made from the unique identifiers of the image. A three layer model is created using these images using tensorflow. The model is then trained to identify the common features(face) in the images a approximate of 50 epochs is done to train the model. This model can be used in future to recognise that person.

V. RESULT AND DISCUSSION

People with visual impairment face various problems in their daily life as the modern assistive devices are often not meeting the consumer requirements in term of price and level of assistance. This project presents a new design of assistive smart cap for visually impaired persons. The objective is to assist in multiple daily tasks using the advantage of wearable design format. The aim of project of Blind assistance is promoting a widely challenge in computer vision such as recognition of persons of the surrounding practiced by the blind on a daily basis. The camera placed on blind person's cap.A dataset of persons gathered from daily scenes is created to apply the required recognition.The camera is used to detect any person. The proposed method for the blind aims at expanding possibilities to people with vision loss to achieve their full potential.The main object of the project is to design and implement a rea ltime object recognition using blind glass.

VI. CONCLUSION

We designed and implemented a smart glass for blind people using special mini camera. This project presents a new concept of smart glasses designed for visually impaired people using low cost single board computer raspberry pi 2 and its camera. For the demonstration purpose, the glasses are designed to perform text recognition. The system capability however can be easily extended to multiple tasks by adding more models to the core program, albeit restricted by the size of the raspberry pi SD card. Each model represents a specific task or mode. The user can have the desired task run independently from the other tasks. The system design, working mechanism and principles were discussed along with some experiment results. This new concept is expected to improve the visually impaired students' lives despite their economic situations. Immediate future work includes assessing the userfriendliness and optimizing the power management of the computing unit.

Technology played a very important role in our life. We use it almost everywhere and every time. The distinct and quick development that we discover each day proof for us that there is no point to give up and struggle with our obstacle in life. Technology offers us a lot of significant solutions to our problems and disapplies. Our role is to use it properly to reach the success level that benefits individual, society and

whole country as well. While the team members were working on the implementation, they thought of many ideas and improvements for the "Smart Glasses". However, they wished they have more time and knowledge to do them.

"Smart cap" can be improved in the future for blind people and people who have vision difficulties by adding new techniques. For instance, direction and warning messages to prevent expected accidents, messages to tell the user about the battery level, video detection to provide a full healthy life for people with vision difficulties, develop mobile application to control Smart Glasses.

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