International Journal of Innovative Research in Science and Engineering
Volume 08, Issue 06, 2022
www.ijirse.com
ISSN: 2454-9665

SMART GLASSES FOR VISUALLY CHALLENGED PEOPLE USING FACIAL RECOGNITION

Dr. B. Sudharani[1], K. Lokanath[2], G. Bhavya[3], K. Hema Priya[4], K. Venkat[5], G. Revanth Sri Chandu[6]

[1]*Associate Professor, Dept. of ECE, S V College of Engineering, Tirupati, A.P, India.*

[23456]*B.Tech Students, Dept. of ECE, S V College of Engineering, Tirupati, A.P, India.*

ABSTRACT

The Smart Glasses project helps blind and visually impaired people to detect and recognize the faces of the person around them, which they see through a small camera, the camera is fixed on the glasses. This technique helps providing comfort for the blind in finding people, especially when they went outside through a voice message sent to an earphone placed on the blind ear to help them find persons easily and independently, also saves time and efforts. A person who is visually impaired can't predict the obstacles and also can't even know who is standing in front of him. There are so many systems exist which help for blind people in navigation. Our system not only helps in navigation but also tells the blind people about who is standing in front of them. Using Facial recognition, it is possible to tell the person about who is standing in front of them. Using ultrasonic sensor, we can calculate the distance. So our system helps to find both the obstacle distance detection and also tells to the user about the person in front of them whether he is known or unknown to them.

Keywords: *Python- Espeak, NumPy, OpenCV, face recognition, Raspberry-pi.*

1. INTRODUCTION

The number of visually impaired people is growing over the past decades. As reported by the world health organization (WHO), about 285 million people worldwide are estimated to be visually impaired. However, until now many schools and jobs cannot accommodate them mainly due to lack of assistive technologies and economic barriers. As a result, 90 % of them still live in low level of income. Even when the new aids or technologies become available, they are either too expensive ($3000and above), or affordable ($200) but with single or limited task functions only. Among all assistive devices, wearable devices are found to be the most useful because they are hand free or require minimum use of hands. The most popular types head mounted device. Their main advantage is that the device points naturally at the viewing direction, thus eliminates the need of additional direction instructions, unlike other devices. This paper presents a new design of smart glasses that can provide assistance in multiple tasks while maintaining at a low building cost. The design uses the new

raspberry pi 2 single board computer, a camera, and an earpiece to convey information to the user.

In this paper the smart glasses is introduced which designed by using raspberry-pi, pi-camera, ultra-sonic sensor and python libraries like OpenCV, NumPy. These glasses are compatible, efficient and cheaper compared to another designs.

2. LITERATURE SURVEY

[1] **Paper Name: Smart Glasses for visually impaired individuals, Authors:** Dr.Stephen Hicks. To validate the utility of smart glasses for visually impaired individuals, research by Dr.Stephen Hicks at the University of Oxford set out to determine if the mobility of people with low vision and registered as blind could be improved. Dr.Hicks and colleagues created smart glasses with a camera and displays to present information about the distance of obstacles to the wearers. The glasses are also able to increase the brightness of obstacles. Indeed, Dr.Hicks' team concluded that low vision patients using their smart glasses had improved independent mobility. These findings were published in the Journal of Investigative Ophthalmology & Visual Science.

[2] **Paper Name: AR vision for people with severe peripheral vision loss (tunnel vision) Author:** A group developed at Harvard. In 2001, a group at Harvard developed a device that produced AR vision for people with severe peripheral vision loss (tunnel vision) . The device comprises a wide-angle camera and one display unit that projects a processed image (cartoon style) from the camera on the regular (healthy) vision area. The device was tested on healthy and vision impaired people and the results showed improvements of self-navigation and object finding. However, this solution created a double vision that could cause distraction and reduce the efficiency of a healthy vision.

[3] **Paper Name: Detecting traversable area and avoiding obstacles, Authors:** Yang et ai-Detecting traversable areas and avoiding obstacles for visually impaired people was proposed by Yang et al. The authors presented a sensor combination, multi-thread assistance framework integrating wearable smart glasses, Inertial Measurement Unit (IMU) sensor, and the Intel RealSense RS410 depth camera. Although the proposed work enhanced the path finding task for blind and visually impaired people, the system did not provide any information about the type of the detected objects or the motion model of the dynamic objects in the user's environment.

[4] **Paper Name: A lightweight device to help visually impaired people, Authors:** A group of researchers from Munich. A group of researchers from Munich developed a lightweight device to help visually impaired people during their everyday activities. This wearable device uses two depth cameras for data collection and a real-time depth processing algorithm extracts information from the video stream to produce acoustic outputs. The use of this low power, low latency sensor is useful to

ISSN: 2454-9665

develop a user-friendly device that performs real-time processing. However, the clinical tests for this system revealed that real life scenarios are far more complicated and need more sophisticated systems and algorithms to deal with dynamic motion and multiple object detection.

[5] **Paper Name: Obstacle Detection for Visually Impaired, Authors:** Ayush Wattal. This paper proposes to develop an electronic device for obstacle detection in the path of visually impaired people. This device assists a user to walk without colliding with any obstacles in their path. It is a wearable device in the form of a waist belt that has ultrasonic sensors and raspberry pi installed on it. This device detects obstacles around the user up to 500 cm in three directions i.e., front, left and right using a network of ultrasonic sensors. These ultrasonic sensors are connected to raspberry pi that receives data signals from these sensors for further data processing. The algorithm running in raspberry pi computes the distance from the obstacle and converts it into text message, which is then converted into speech and conveyed to the user through earphones/speakers. This design is beneficial in terms of its portability, low-cost, low power consumption and the fact that neither the user nor the device requires initial training.

[6] **Paper Name: Smart Visibility Glasses for the Blind, Authors:** Amogh Rane, Siddhesh Pujari, Gandhar Khopkar, Azhar Khan, Jyoti Dange.People with visual impairment face various problems in their daily life as the modern assistive devices are often not meeting the consumer requirements in terms of price and level of assistance. This paper presents a new design of assistive smart glasses for visually impaired students. The objective is to assist in multiple daily tasks using the advantage of wearable design format. As a proof of concept, this paper only presents one example application, i.e., text recognition technology that can help reading from hard copy materials. The building cost is kept low by using a single board computer raspberry pi 2 as the heart of processing and the raspberry pi 2 camera for image capturing. Experiment results demonstrate that the prototype is working as intended.

3. EXISTING-METHOD

Blind Walking Stick:

Blind stick is an innovative stick designed for visually disabled people for improved navigation. The blind stick is integrated with ultrasonic sensor along with light and water sensing. this uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles, the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it where detects water and alerts the blind. The blind stick may be efficient in some cases, but it has

ISSN: 2454-9665

some drawbacks as well. It may be difficult to detect the hanging obstacles and may lead to collison.

3.2. Smart Shoes:

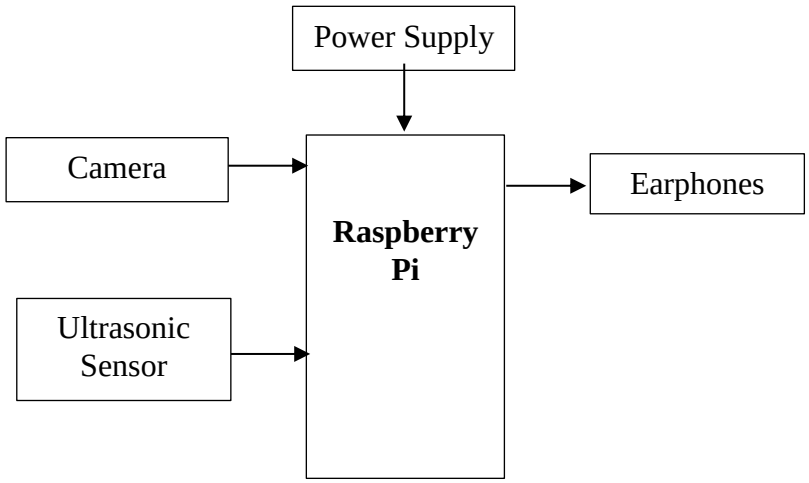
It is a shoe that navigates the route from source to destination. Since the system is implemented in shoes, battery is used for power supply. Bluetooth is used to get the location coordinate from mobile phone by using GPS setting from mobile. Need an android app for searching the route destination to source route. Here a novel technique is proposed to assist blind person to track route in efficient way. The shoes sync up with a Smartphone app that uses maps and vibrate to tell users when and where to turn to reach their destinations. When any blind person needs to go to a destination, the target is set in maps using mobile and the Smart shoe gives the directions to the destination with the vibrations.

4. PROPOSED METHOD

4.1. Smart Glasses for Visually Challenged:

Our main motive of this project is to help the visually impaired people, not accurately but to make their life a little bit easier and become self- dependent. In this project, the glasses we will be using would be able to take pictures via camera. “Glasses can recognize images and determine each object in the images”. It can determine the distance between the blind person and each object. Conversion of captured image information into the voice will be provided to the user through headphones that help the blind people to know who is in front of him/her. It will also give notification to the user if the object is very close or far away from him/her.

Block diagram:

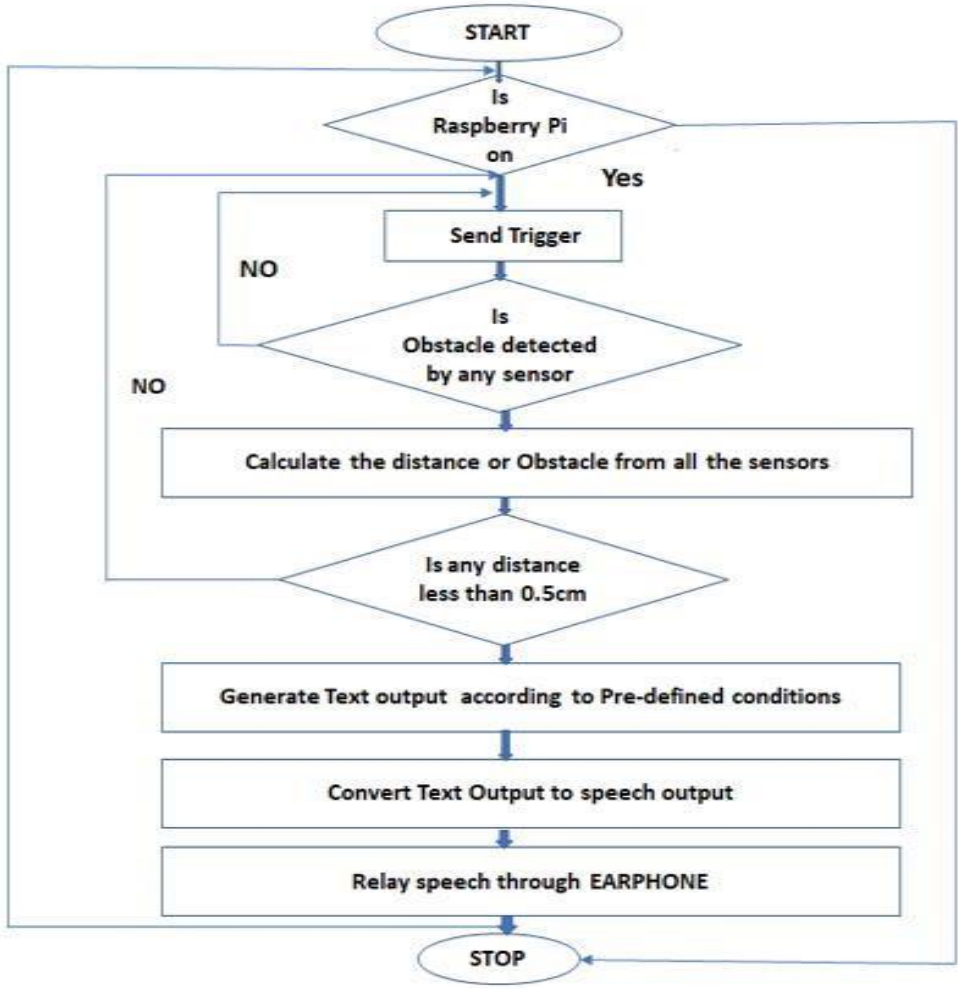


In this project we are using ultrasonic sensor for the people detection. When it detects the person then the image will be taken and is searched in the predefined data base. If the image matches, then the person’s name will be given as voice through earphone otherwise it will say unknown person.

ISSN: 2454-9665

4.1.3. Working flow:

The control flow of the project can be observed in the below flow diagram



5.METHODS OR TECHNIQUES USED IN OUR PROJECT

The Smart Glasses works on the bases of Camera and Sonic wave mechanism. When the person or an object comes Infront of the glasses the user is notified by Espeak module on the distance he is from the object/person. The camera module shall recognize the person face using Face dataset folder and shall display a name or shall display as unknown. The Smart Glasses is powered by 5 Volt battery and runs on python3.

5.1 Face Recognition System Requirements OpenCV:

OpenCV (Open-Source Computer Vision Library) is an open-source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code. The

ISSN: 2454-9665

library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc.

5.2 Espeak:

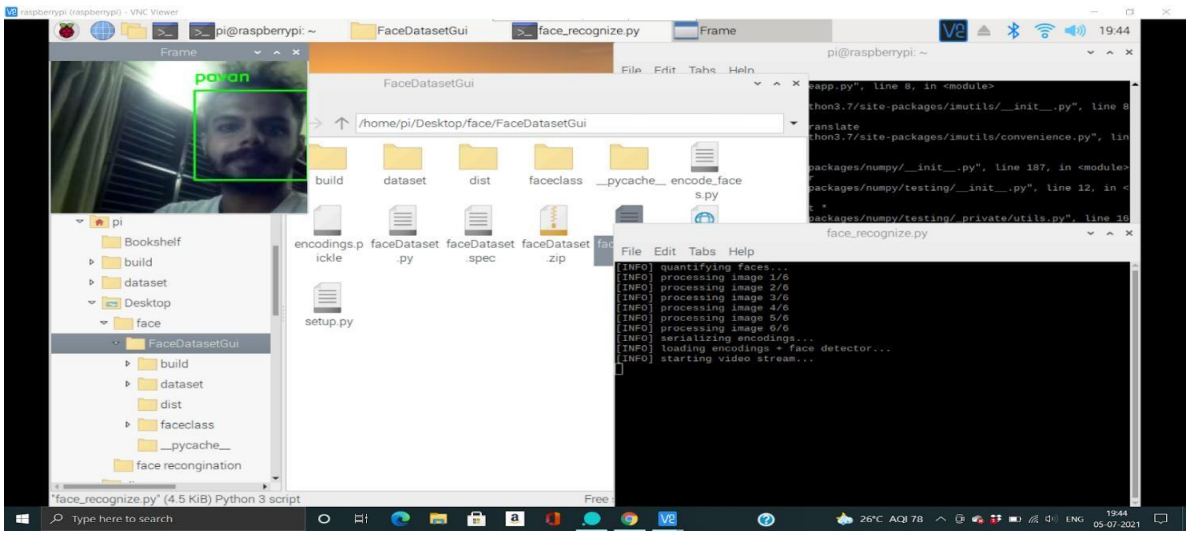
Espeak is a python library which is used to give the output through audio from the text or a stdin. Espeak is a compact open-source software speech synthesizer for English and other languages Linux and Windows. It sounds very robotic.

5.3 NumPy:

NumPy is a Python library used for working with arrays. It also has functions for working in domain of linear algebra, Fourier transform, and matrices. NumPy was created in 2005 by Travis Oliphant. It is an open-source project and you can use it freely. NumPy stands for Numerical Python.

6. SIMULATION RESULT

The simulation of the device is shown below.



ISSN: 2454-9665

The screenshot of live demo of the camera module is shown. When a person comes Infront of the smart glasses, the camera module i.e., Pi camera captures the image of the person and will run a analysis with the Face Dataset folder and if any matches is shown then the name of the person is given as voice command through earphones connected using the Facial recognition. If no matches found it shall give as unknown. Whenever an obstacle is detected, the device gives the command 'Forward obstacle' with the distance between the user and obstacle.

7. CONCLUSION

Design and simulation of Smart Glasses for visually challenged people has been done by using Raspberry-pi, camera, and ultrasonic sensor. Smart Glasses for Visually Disabled People is currently an existing Technology outside of India. As computer vision algorithms, sensor technologies and hardware have been used together, the idea of developing wearable or portable assistive technologies for visually impaired people evolved. The device has been developed by us at a low cost of manufacturing, comes with audio output, and is convenient to use for day-to-day activities. The primitive version of these systems used basic image processing and computer vision techniques, while the recent versions are smart enough to draw a safe path for user navigation.

The system proposed in this paper is consumer cost friendly and can be worn easily as a glass. Using face recognition, ultrasonic sensor and pi-camera, we have proposed an advanced system providing the distance calculation, voice outputs and face recognition. Since the option of loading and training the face recognition module we can store and process N number of familiar faces. And would bring in hassle free and without anyone else assistance for a person to lead a life.

8. FUTURE SCOPE

The system capability however can be easily extended to multiple tasks by adding more models to the core program, but 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 user-friendliness and optimizing the power management of the computing unit.

ISSN: 2454-9665

9. REFERENCES

[1] Dakopoulos D., Bourbakis N. Wearable obstacle avoidance electronic travel aids for blind: A survey. IEEE Trans. Syst. Man Cybern. Part C (Appl. Rev.) 2010; 40:25–35. Doi: 10.1109/TSMCC.2009.2021255. [CrossRef] [Google Scholar]

[2] Vargas-Martín F., Peli E. SID Symposium Digest of Technical Papers. Volume 32. Wiley Online Library; Princeton, NJ, USA: 2001. Augmented View for Tunnel Vision: Device Testing by Patients in Real Environments; pp. 602–605. [Google Scholar].

[3] Balakrishnan G., Sainarayanan G., Nagarajan R., Yaacob S. Wearable real-time stereo vision for the visually impaired. Eng. Lett. 2007; 14:1–9. [Google Scholar] .

[4] Elango P., Murugesan K. CNN based Augmented Reality Using Numerical Approximation Techniques. Int. J. Signal Image Process. 2010; 1:205–210. [Google Scholar]

[5] Fiannaca A., Apostolopoulos I., Folmer E. Headlock: A wearable navigation aid that helps blind cane users traverse large open spaces; Proceedings of the 16th international ACM SIGACCESS Conference on Computers & Accessibility; Rochester, NY, USA. 20–22 October 2014; pp. 19–26. [Google Scholar]

[6] Cloix S., Weiss V., Bologna G., Pun T., Hasler D. Obstacle and planar object detection using sparse 3D information for a smart walker; Proceedings of the International Conference on Computer Vision Theory and Applications; Lisbon, Portugal. 5–8 January 2014; pp. 292–298. [Google Scholar]

[7] Roodhooft J. Leading causes of blindness worldwide. Bull. Soc. Belge Ophtalmol. 2002; 283:19–25. [PubMed] [Google Scholar]

[8] Brostow G.J., Fauqueur J., Cipolla R. Semantic Object Classes in Video: A High-Definition Ground Truth Database. Pattern Recogn. Lett. 2008; 30:88–97. doi: 10.1016/j.patrec.2008.04.005. [CrossRef] [Google Scholar]

[9] Benabidvww A., AlZuhair M. User involvement in the development of indoor navigation system for the visually impaired: A needsfinding study; Proceedings of the 3rd International Conference on User Science and Engineering; Shah Alam, Malaysia. 2–5 September 2014; pp. 97–102. [Google Scholar]

[10] Paredes H., Fernandes H., Martins P., Barroso J. Gathering the Users' Needs in the Development of Assistive Technology: A Blind Navigation System Use Case. In: Stephanidis C.,

ISSN: 2454-9665

Antona M., editors. Universal Access in Human-Computer Interaction. Applications and Services for Quality of Life. Springer; Berlin/Heidelberg, Germany: 2013. pp. 79–88. [Google Scholar]

[11] Jafri R., Khan M.M. User-centered design of a depth data-based obstacle detection and avoidance system for the visually impaired. Hum.-Cent. Comput. Inf. Sci. 2018;8:14. Doi: 10.1186/s13673-018-0134-9. [CrossRef] [Google Scholar]