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Smart Blind Stick Using Face Recognition

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Abstract — The smart walking stick helps blind people to do their work easily and comfortably. To normal stick, the detection of the obstacle is extremely difficult and normal stick isn't efficient for visually impaired persons. Because the blind person doesn't know what sort of things happening ahead of them. It's difficult to manoeuvre here and there. Here we use a fresh stick which uses Machine Learning and Artificial Intelligence to guide blinds on their daily lives. It Consists of Integrated Sensors for measuring distance between a vehicle and the user, and informs the user whether they can able to cross the road so they won't have to rely on anyone to guide them. It also predicts or informs the obstacles ahead of the user, so it will help the user to understand whether there is steps or anything that causes the user fall down. This stick even has built-in Cameras and Headphone to recognize people who move towards the user, only the saved one will be recognized, new person are going to be informed to the user that "A stranger is approaching".

Keywords—Smart Blind Stick,Raspberry Pi,Ultrasonic Sensor,Face Detection,Vehicle Detection

I. INTRODUCTION

Eyesight plays a serious role in collecting most of the knowledge of the important world which information is going to be processed by the brain, visually impaired people suffer inconveniences in their daily and social life. Blindness or visual defect may be a condition that affects many of us around the world. This condition results in the loss of the precious sense of vision. Worldwide, there are many people that are visually impaired, where many of them are blind. The necessity for assistive devices can be continuous. There is a good range of navigation systems and tools existing for visually impaired individuals. The blind man truly requires an identifying objects. Visually impaired persons have difficulty to interact and feel their environment. They need little contact with surroundings. Physical movement may be a challenge for visually impaired people when obstacles appearing ahead of them, and they are not able to move from one place to different. They depend upon families for mobility and support. Their mobility opposes them from interacting with people and social activities. Most of the problems are can be solved by using "SMART STICK FOR BLINDS". In this project, we specially designed to detect obstacles which can help the blind navigate carefree. The audio messages will keep the user alert and considerably reduce accidents. It also provides the blind to acknowledge the face of one that is talking ahead of them. The proposed system contains the ultrasonic sensor, microphone, raspberry pi, a stick and a camera module. The proposed system detects the obstacle images which are present in outdoor and indoor with the assistance of a camera. The camera module also helps the blind to detect the face of persons by using image processing. If the obstacle comes almost them the beep sound will produce and therefore the distance between the smart stick and the vehicle is calculated by using the Ultrasonic sensor.

II. RELATED WORK

ETA device has become a revolution over the previous couple of decades to guide a visually impaired person and to form their life even easier and safer. Because the ETAs getting popular day by day, the researcher has been working during this field to make the device even more light, portable, safe and low cost for better service. An ultrasonic sensor based blind stick is PROPOSED BY AGARWAL & KUMAR [4] in 2015 with GPS system, vibrating motor and a buzzer. As they didn't give any pictorial view of the stick, so consistent with device description it seems to be pretty heavy. Besides that, there was no information about how long the buzzer & vibrator would be in ON condition. And therefore the sending SMS issue by an illiterate, blind man seems to be quite impossible. Another sensor based smart stick is introduced by Gayathri in 2014 [2]. It uses a GPS receiver, a vibrator and a headphone navigate the blind person. But the device has some limitations like: - water sensor can detect if the water level is over 0.5 cm, the stick can detect only four sorts of obstacles (concrete wall, physical body, plastic & cardboard box) and it's not feasible to supply guidance at high intermittencies. An outside navigating device also came into attention in 2012. The stick uses GPS technology and an SD card to store information about different locations. But the device cannot help an inside environment as there's no GPS signal available. In 1989, a

navigating device equipped with a little computer and sensors was planned [5]. It took images, then translated them into a series of audio cues to tell the user which routes are blocked by obstacles. And after late nineties, the wearable obstacle detection system was introduced, which was quite heavy to wear and handle.

III. METHODOLOGY

A. PROPOSED SYSTEM

The idea is to develop a smart stick with face recognition. The smart walking stick helps blind to do their work easily and comfortably. In normal stick, the detection of the obstacle isn't done and normal stick isn't efficient for visually impaired persons. Because the blind man doesn't know what sort of things or what sort of the objects are available in front of them. It's difficult to move here and there. Here we use a brand new stick which uses Machine Learning and AI to guide blind in their daily lives. It Consists of integrated sensors for measuring distance between a vehicle and the user, and informs the user whether they can ready to cross the road so they won't have to rely on anyone to guide them. It also predicts or informs the obstacles in front of the user, so it will help the user to know whether there is steps or anything that causes the user fall down. This stick also has built-in cameras and Headphone to acknowledge people that move towards the user, only the saved one going to be informed to the user that "A stranger is approaching".

B. SYSTEM ARCHITECTURE

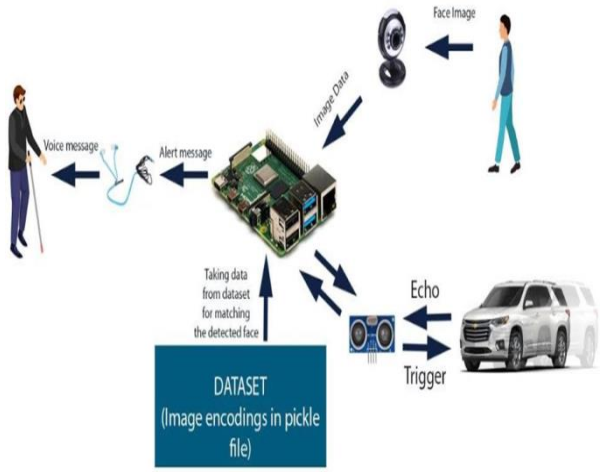

Fig 1: System Architecture

When a random person is approaching towards the blind person, it will capture the face of the person using the webcam and it will be sent to the raspberry pie. The images of random persons are encoded and made a pickle file which stores data in a simple manner and that can be easily to access using the python. The system then encodes the face data, and it will perform the matching process with all the saved encoded data in the datasets. A Sensor is used to find the distance, vehicle movement and obstacle ahead. If it finds a match or if it does not find a match, then it will send the voice message to the blind man.

An ultrasonic sensor is used to find the distance, movement and obstacle ahead the blind man by using the echo and trigger signal. It is used for detecting the obstacles and vehicle movements. It frequently checks the distance and informs the system if it founds any obstacle within the given range. If a vehicle moves towards the blind man, it will detect the vehicle movements and the signals will be sent to the raspberry pi and the raspberry pi will send the alert message to the blind man through the voice.

C. SYSTEM REQUIREMENTS

a) HARDWARE REQUIREMENTS

- Microprocessor (Raspberry Pi)
- Distance Sensor
- Camera Module

b) SOFTWARE REQUIREMENTS

- Raspbian Buster with desktop version 4.19
- Putty – serial communication software
- Python Packages – OpenCV, Face Recognition

IV. RESULTS AND DISCUSSION

The images of random persons are encoded and made a pickle file which stores data in a simple manner and easy to access using python. Then it is saved in the system. When the system is turned on, it started detecting faces. If it detects a face inside the frame. It captures the face and send it to the raspberry pi. The system then encodes the face and performs matching with all the saved encoded data. If it finds a match, It extracts the name associated with the data and informs name of the blind man. If it does not find a match, it will say that it is a stranger.

Fig 1: System Architecture

An ultrasonic sensor is used to find the distance, movement and obstacle ahead the blind man. If frequently checks the distance and informs the system if found any obstacle

within a given range (we gave 20 cm for the prototype). If a vehicle moves towards the blind man, it will detect the vehicle movement and informs the blind man. The system showed a lag to function as it has comparatively low processing speed and capacity. We should improve the processing speed and capacity of the system to make it a more speedy and accurate.

V. CONCLUSION AND FUTURE SCOPE

The project proposed the planning and architecture of a replacement concept of smart stick for blinds. The advantage of the system lies in the fact that it is often proven to be a really low cost solution to many blind people worldwide. The technologies behind blind sticks are upgrading day by day. And our model ensures one thing that's making the task of moving of a blind man easy and cozy. The project "Smart Stick for Blind" is meant to make a system using Ultrasonic sensors providing Voice command through headphone to the blind people. The stick is additionally very light and handy to hold. And therefore the components or parts that we utilized in the stick also are easily available and less in cost. And besides all that the manufacturing cost is additionally quite low, that creates the stick affordable for people of all classes and age. The proposed system is that the solution for the some blinds problems. The blind can detect the obstacles nearby them. They will cross the road without others help they will recognize the people who standing in front of him/her by using image processing. The advantage of the system lies within the fact that it can convince be a coffee cost solution to many blind people worldwide. The smart stick detects objects or obstacles in front of users. This stick reduces the dependency of visually impaired people on other relations, friends and guide dogs while walking around. The proposed system tries to eliminate the faults within the previous system. It aims to solve the problems faced by the blind people in their lifestyle. The system also takes measures to make sure their safety.

A. ADVANTAGES AND LIMITATION

a) ADVANTAGES

- Recognizing faces are a great help to blinds that they can avoid thief attacks and misleads
- Can cross roads by their own
- Can avoid obstacles in an accurate way
- Easy to use
- High performance than the existing system
- Flexible

b) LIMITATIONS

- Difficult to add faces, can't add new faces instantly
- Malfunctioning of the system may result in an accident.
- The proposed system depends on the accuracy of users face

B. FUTURE APPLICATIONS

In future, if further improvement and investment is administered with the stick, then it'll be a simpler device for the longer world

- Can add a provision to feature new people in the known people list.
- Can improve the processing speed and memory of the system.
- The Braille data input device gives the blind man an uncomplicated method to supply the destination address for navigation. The programmable wheels would steer the stick far away from the obstacles and also leading the blind person towards the destination.
- Internet of Things may be a trending concept which may increase the advantages of the smart stick by allowing one stick to communicate with another smart stick (or mobile, PC)
- In order to run this integrated set of hardware we will use solar panels as an alternate to the battery.

REFERENCES

[1] Rene Farcy, Roger Leroux, Alain Jucha, Ronald Damaschini, Colette Gregoire, Aziz Zogaghi "Electronic Travel Aids And Electronic Orientation Aids For blind people: Technical, Rehabilitation And Everyday Life Points Of View", Conference & Workshop on Assistive Technologies for People with Vision & Hearing Impairments Technology for Inclusion CVHI **2006.**

[2] Gayathri, G., Vishnupriya, M., Nandhini, R., and Banupriya, M. M."Smart Walking Stick For Visually Impaired." International Journal Of Engineering And Computer Science, Vol.3, pp.**4057-4061**,2014M. Mohammad, "*Performance Impact of Addressing Modes on Encryption Algorithms*", In the Proceedings of the 2001 IEEE International Conference on Computer Design (ICCD 2001), Indore, **USA**, pp.**542-545**, **2001.**

[3] K. Chaitrali, D. Yogita, K. Snehal, D. Swati, and D. Aarti, "An intelligent walking stick for the blind," International Journal of Engineering Research and General Science, vol. 3, Issue1, November, **2016.**

[4] Ankit Agarwal, Deepak Kumar, Abhishek Bhardwaj "Ultrasonic Stick for Blind," International Journal of Scientific Research in Computer Sciences and Engineering, vol. **4**, Issue **4,** pp. **11375-11378** April, **2015**.

[5] Johann Borenstein, and Iwan Ulrich "The Guide Cane-A Computerized Travel Aid for The Active Guidance Of Blind Pedestrians," IEEE International Conference on Robotics and Automation, Albuquerque, NM, Apr.**21-27**, **1997**.

[6] Jismi Johnson, Nikhil Rajan P, Nivya M Thomas, Rakendh C S, Sijo TcVarghese "Smart Stick for Blind" International Journal of Engineering Science Invention Research & Development; Vol. **III**, Issue **IX**, March **2017**.

[7] Ayush Wattal, Ashuthosh Ojha, Manoj Kumar "Obstacle Detection Belt for Visually Impaired Using Raspberry Pi and Ultrasonic Sensors" Department of Information Technology JSSATE, Noida, India. National Conference on Product Design (NCPD 2016), July **2016**.

[8] Shruti Dambhare, et al., "Smart stick for Blind: Obstacle Detection, Artificial vision and Real-time assistance via GPS", 2nd National Conference on Information and Communication Technology (NCICT), **2011**

[9] G. P. Fajarnes, L. Dunai, V. S. Praderas and I. Dunai, CASBLiP- a new cognitive object detection and orientation system for impaired people, Proceedings of the 4th International Conference on Cognitive Systems, ETH Zurich, Switzerland, **2010**.

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Ms. Beksy Anna Prasad is currently pursuing her Bachelor Degree in Computer Science and Engineering at St.Thomas college of Engineering and Technology, Kerala, India. Affiliated to APJ Abdual Kalam Technological University. She is an aspiring Multitalented girl with good Technical and Management skills, Ability to deal with People, Resolve Issues Quickly and Fairly, Best Team Player.

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Mr. Anish George pursued Bachelor of science and master of science from New Jersey Institute of Technology, Newark, New Jersey, USA in the year 2003. Currently working as an Assistant Professor in Computer Science Department at St.Thomas College of Engineering & Technology, Kerala Technical University, Kerala, India. He has attended several International Conferences and Seminars. His research areas are Software Engineering and Artificial Intelligence. He has two years of teaching experience and seventeen years of industry experience in IT.

