International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 08 | Aug 2020 www.irjet.net p-ISSN: 2395-0072
National Conference on Recent Advancements in Communication, Electronics and Signal Processing-RACES'20
Organised by: Department of ECE, Velammal Engineering College, Chennai-66

SECURITY SYSTEMFOR VISUALLY IMPAIRED PEOPLE

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ABSTRACT: We propose a security system with a face recognition system and obstacle detection system to help the blind person in recognizing human faces and aware of obstacles. The proposed system was designed to be used in real-time and is equipped with a camera for the face detection, the camera sends the image to mobile computer. The mobile computer extracts features from the image and then detects the face using haar cascade classifiers. Ultrasonic sensor is used to detect the obstacle and these are informed to the blind through headphones using e-speak software and also the MEMS sensor is used in order to detect if the blind person is fallen down and inform that to the concerned person with the message and location via sms.

Key Words: Security system, Face Recognition, Raspberry Pi, Ultrasonic sensor, e-speaker.

INTRODUCTION:

Approximately 285 million people are visually impaired across the world, among which 39 million are blind and 246 have low vision according to WHO statistics of 2011.This number will be increasing in the following generation ages. These visually impaired people have great difficulty in perceiving and interacting with the surroundings, especially those which are unfamiliar. Fortunately, there are some navigation systems or tools available for visually impaired individuals. Blind people are usually dependent on assistance from others. The assistance can be from human beings, dogs or some special electronic devices. There are already many existing devices which help a blind person in walking. The most common is the simple walking stick or cane. The blind man uses it to detect the obstacles by sweeping the cane back and forth but unfortunately sometimes the blind man gets aware about the obstacle too late. With the recent advances in technology normal walking cane has been modified to a blind stick with an ultrasonic sensor attached to it. It has several limitations. The increasing number of people with disabilities in world attracts the concern of researchers to invent various technologies, hoping that these technologies can assist the disabled people in carrying out their tasks in everyday life like normal people. So we want to make something for them that would help them become independent. An security system project is what we want to create. This security system can assist them while walking alone in new environments. Therefore, the solution that has been portrayed in this paper is cost effective, reliable, robust and portable device which would help a blind person to walk on the streets almost like any other pedestrian

LITERATURE REVIEW

In a rapidly flourishing country like our innumerable number of attempts has been made for the welfare of especially able people of our society. One of such attempts is the project W.C.S.S. Simoes[2] where an indoor navigation wearable system based on visual markers recognition and ultrasonic obstacles perception used as an audio assistance for blind people has been proposed. To avoid obstacles this project used a couple of ultrasonic sensors. The audio assistance provided to the user makes use of an audio bank, with simple known instructions to indicate precisely the desired route and obstacles."Feng Lan"[3], an empathetic attempt towards the blind children to help them gain knowledge of a set of obstacles around them by using wireless bone conduction headphones. ASM Iftekhar Anam,[4] worked on how a blind people can be able to detect the obstacles present in front of visually challenged people where they have used ultrasonic sensors. They have used ultrasonic sensor, beeping component, a pair of glasses and a power supply. The Obstacle detection module and the output device is connected to the processing unit. The power supply is used to supply power to the central processing unit. The obstacle detection module basically consists of a ultrasonic sensor, processing unit consist of a control module and the output unit consists of a buzzer. The control unit controls the ultrasonic sensors and get the information of the obstacle present in front of the man and processes the information and sends the output through the buzzer accordingly. These Ultrasonic Smart Glasses for Blind people is a portable device, easy to use, light weight, user friendly and cheap in price. These glasses could easily guide the blind people and help them avoid obstacles. Perspective glass is wearable pair of glass

which is designed for blind people which helps them in resolving a major difficulty they face such as identifying the objects or obstacles present before them during walking. In [6] these Smart Glasses for Blind people is a portable device, easy to use, light weight, and user friendly. These glasses could easily guide the blind people and help them in better handling of obstacles. The Perspective glass consists of a raspberry pi board, 5 mp camera, ultrasonic sensors, buzzer, headphone, power source. This glass is controlled by a Power button which when pushed ON, will take pictures of the surroundings with respect to the position of the person wearing it.

EXISTING METHODOLOGY:

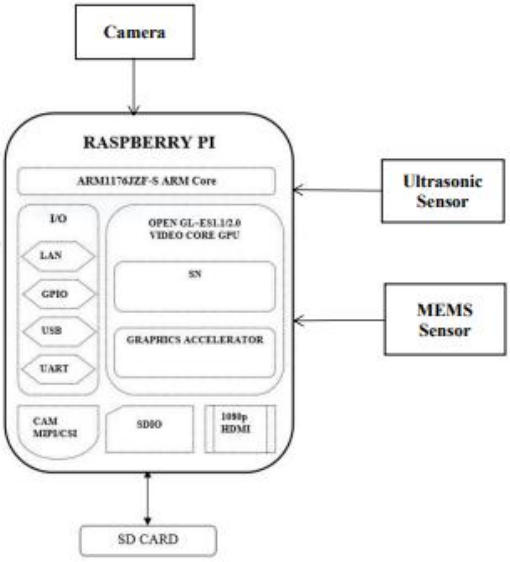
In the existing system smart glasses are provided to recognize face and detect obstacles. Several face recognition algorithm and various techniques has been employed in numerous processes. The face recognition is considered to be a very tough process. The existing face recognition system runs on MATlab platform which is not an open source software and is less portable. The PCA technique employed with Eigen face algorithm is widely used. The disadvantages that occur with the usage of PCA technique has been overcome by Haar cascade classifier. Open cv software is an open source software which is being used to run this project efficiently.

PROPOSED METHODOLOGY:

Objectives: Visually challenged people faces lot of problems in day to day life. Our goal is to make them lead a life which is of security and safety for their own wellbeing. This makes them confident to lead their life normally.

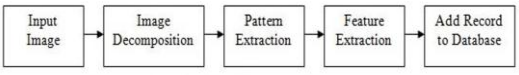
- To recognize the known persons.
- To be cautious about the obstacles.
- To alert the other person about the blind person, if he/she is in danger.

To design the security system with automatic face recognition system, the camera is turned on. It recognizes the faces using Haar cascade algorithm. The faces of the person known to the visually impaired person is stored in the Raspberry Pi. If the person is known, the name of the person is said to the visually impaired through e-speaker.

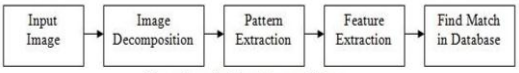


1. Monitor with camera: To monitor the people from a remote area we have interfaced the camera to the system. The monitoring process is completely done through wireless transmission.

2. Image processing using opencv in python: Image processing is the process of manipulating pixel data in order to make it suitable for computer vision applications or to make it suitable to present it to humans. For example, changing brightness or contrast is a image processing task which make the image visually pleasing for humans or suitable for further processing for a certain computer vision application.



Procedure for Facial Feature's Extraction.



Procedure for Face Recognition.

Fig.1.Basic block diagram of face recognition

BLOCK DIAGRAM OF THE PROPOSED SYSTEM

3. Haar-cascade Detection in OpenCV: OpenCV comes with a trainer as well as detector. OpenCV already contains many pre-trained classifiers for face, eyes, smile etc. Those XML files are stored in opencv/data/haarcascades/ folder.

Steps to create face and eye detector with OpenCV :

- Load the required XML classifiers.
- Then load our input image (or video) in

grayscale mode.

- Find the faces in the image.

4. Raspberry Pi B: Raspberry Pi B is a small single-board Computer developed in UK by Raspberry Pi B foundation to promote the teaching of computer science in schools and in developing countries. Original model become far more popular than anticipated sealing outside of its target market, for uses such as robots.

RASPBERRY PI 3

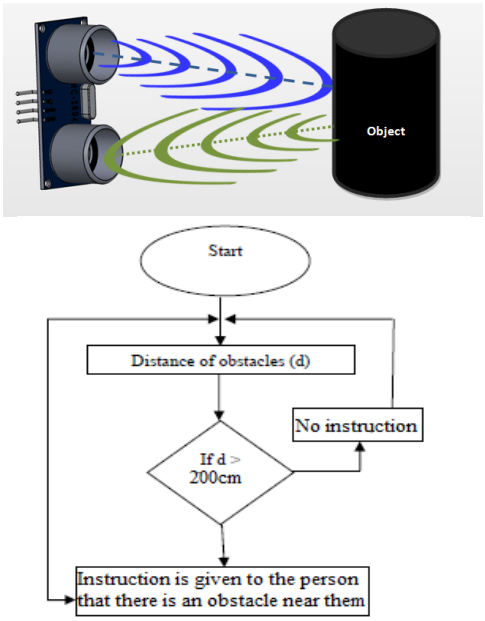
5. Ultrasonic sensor: Ultrasonic sensors sense whether the obstacle is present by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head.

ULTRASONIC SENSOR

As shown above the HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is avery popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

Distance = Speed * Time

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below



Block diagram of obstacle detection

6. MEMS sensor: Micro-electro-mechanical Systems (MEMS) Technology is one of the most advanced technologies that have been applied in the making of most of the modern devices like video projectors, bi-analysis chips and also car crash airbag sensors. This concept was first explained by Professor R. Howe in the year 1989. Since then many prototypes have been released and revised and has thus become an integral part of the latest mechanical products available in the market today. In the paper if the MEMS sensor changes its direction(i.e. if the person falls down) it sends the message and location of the that person to their family members.

MEMS Sensor

An accelerometer is an electromechanical device that is used to measure acceleration and the **force producing** it. Many types of accelerometers are available in the market today. They can be divided according to the force (static or dynamic) that is to be measured. Even today, one of the most commonly used one is the **piezoelectric accelerometer**. But, since they are bulky and cannot be used for all operations, a smaller and highly functional device like the MEMS accelerometer was developed. Though the first of its kind was developed 25 years ago, it was not accepted until lately, when there was need for large volume industrial applications. Due to its small size and robust sensing feature, they are further developed to obtain multi-axis sensing.

7. GPS: GPS systems are extremely versatile and can be found in almost any industry sector. They can be used to map forests, help farmers harvest their fields, and navigate airplanes on the ground or in the air. Here it detects the accurate location of the patient in order to reach them from nearby hospital as fast as possible. Stands for "Global Positioning System." GPS is a satellite navigation system used to determine the ground position of an object. The GPS system includes 24 satellites deployed in space about 12,000 miles (19,300 kilometers) above the earth's surface. They orbit the earth once every 12 hours at an extremely fast pace of roughly 7,000 miles per hour (11,200 kilometers per hour). The satellites are evenly spread out so that four satellites are accessible via direct line-of-sight from anywhere on the globe.

CONCLUSION:

The paper objective is underlined by the necessity of voice assistant system for the increasing number of blind people all over the globe. We want visually impaired to see, not literally but make life a little bit easier for them and that's going to be goal. Our main purpose of this product is to put some hope in visually impaired and make society accept them. It does have a few limitations which we'll solve in its future developments.

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