Smart Blind Stick

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Abstract- *Blind people have their own share of problems. They face several difficulties while interacting with nearby environment. It provides blind people with a tool which will guide and help them navigate easily. The plan is to propose a working model, Smart Blind Stick. The blind stick includes in-built ultrasonic sensors. The ultrasonic sensor is used for detecting obstacles using the ultrasonic waves. When an obstacle is encountered, the sensors pass the data to a micro-controller, which processes the data and calculates the distance of the obstacle. If the obstacle is close enough, the micro-controller sends an alert signal to the sightless person. If the obstacle is not close, it does nothing. The working model also embeds an e-SOS system. The e-SOS(electronic Save Our Souls) is a distress call button which helps the sightless person navigate in an unfamiliar environment. Upon pressing the distress call button, live video streaming starts by the help of pi-camera. The video streamed can be viewed by the family members of the sightless person, through an Android application.*

Keywords- blind stick, blind cane, blind navigation, blind, IoT

I. INTRODUCTION

Many people have been visually impaired since a young age and have a very hard life paved ahead of them, and they have to be completely dependent on others to perform simple tasks. This certainly motivated our cause to develop a smart walking blind stick to help make the lives of these innocent souls a little easier and less dependent. We have also involved an SOS navigation to improve the productivity and performance of the stick and provide greater security and safety of the person using this stick.

Considering the modern advancements and life style, and strain that has been caused to the eye there are many reasons favoring the rise in visual impairments and eye-sight problems. We will ensure that the people are less dependent on others, and they have more positive approach towards things in their life. The existing methods are less efficient and cannot be reliable over time and hence making room for advancements. In this paper, we aim to tackle this worldwide problem using advanced technical approach. We propose to develop a smart blind stick which eliminates most of the disadvantages discovered in the existing methods. This modern smart blind stick will help the blind person to navigate easily by detecting the obstacles around him [13]. The stick will raise an alarm alerting the user about any obstacles nearby which helps him to navigate easily to his destination. In case of emergency situations when the blind person cannot make a decision about his next movement, he can make use of the e-SoS button [5]. On pressing the SOS button, a live video streaming will be directed to his family member along with the exact location of the user, from which hec an guide the blind person to navigate safely.

II. TOOLS

1. Raspberry Pi

This is the main component of the whole system. performs all the communication and processing required by the system.

Fig.1Raspberry Pi 3b

2. Raspberry Pi Camera

This is an 8-megapixel High quality Camera which is lightweight, portable and supports Raspberry Pi.

Fig. 2 Raspberry Pi Camera

3. SoS button

This is just a simple push button which on press is used to control a mechanism in operation of any system. These buttons are usually made of plastic or metal.

Fig. 3 Push button

4. Ultrasonic Sensors

These sensors emit ultrasound waves and on reaching any object they reflect back the waves from nearby object. This technique is used by the sensors to measure the distance between the obstacle and the sensor.

Fig. 4 Ultrasonic Sensors

5. Other Peripherals

Some of the other components essential for the working of the system include earphones/headsets, power bank and a mobile.

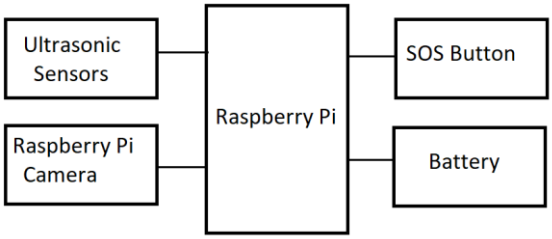

Fig.5 Architectural Diagram

III. METHODOLOGY

A. Object Detection using Ultrasonic Sensor

The model involves, object detection using Ultrasonic sensors. Three sensors are used, which face three different directions (the front, left and right). These Ultrasonic Sensors sense any obstacle and alerts the blind person [2].

Distance is measured using: Distance = (Time x Speed of Sound) / 2. We use "2" because the sound has to travel back and forth. First, sound travels away from the ultra-sonic sensor, and thenr eturns back. Providing stable and accurate distance measurement from 2cm to 450cm.

B. The SoS Button

The blind stick has a SoS button attached to its handle. During emergency situations, the visionless person can press the SoS button, which sends a SoS message.

If the visionless person feels any discomfort while navigating using ultrasonic sensors, he can quickly press the

SoS button which sends an emergency message to the blind persons family members. After receiving the message, they can start the e-SoS video call.

The video streaming/call is hosted on a Raspberry pi with Raspberry pi camera, as an Application Programming Interface that is end to end secured (API).

Raspberry pi and the pi camera will be connected to the nearest and the same hotspot device. They should also be connected with the same IP address. Once this connection is successful, the camera on the blind stick is activated and starts video streaming.

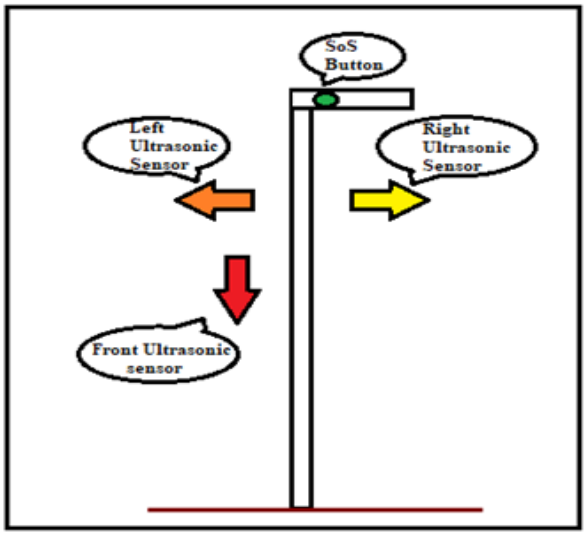

Fig.6 Structural Diagram

The device on which the family member uses the application, should also be connected to the same IP address.

C. Mobile Application – The Blind Stick

The mobile app is the main part of the Blind stick where the video Streaming is done. Once the Raspberry Pi camera is activated and the IP address is entered, on clicking the start Stream Button the video call will begin using whichthe family member will be able to guide the blind and alert him if there is any danger nearby.

The family member can help by giving instructions to the blind person by using the Google Speech to Text conversion and vice versa. Firstly, the family member using the blind stick app will guide the blind using Google Speech, which will be converted into a text and will appear on the app. This text will again be converted into speech and will be transferred to the stick.

The blind person using the audio output device connected to the stick can hear the message from his family member and act accordingly.

Blynk App and The SOS button

The Blynk app will be installed in the family members phone which will be connected to the Blind stick using the authentication code generated at the initial stage of app installation. Once the blind stick is in use, the Blynk app is automatically activated.

During emergency situation, when the blind presses the SOS button a notification is received by the family member through the Blynk app. This alerts the family member and he can immediately access the geo-location of the blind person and act accordingly. The family member can also start a video call to know the current situation of the blind person.

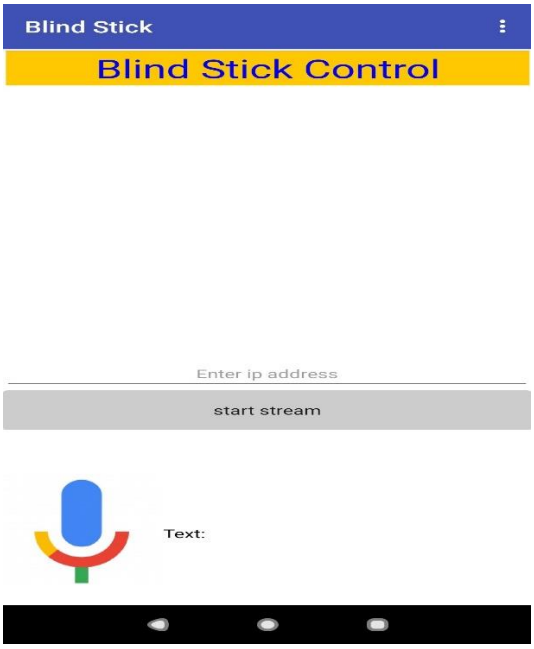

Fig.7 View of the Blind Stick app

D. The Overall System Implementation

The system aims at providing a visionless person with a tool that can help him navigate independently and easily. The “Blind Stick” is a light weight stick which is easy to carry and runs on a battery. When there is an obstacle in the way of the visionless person, the Ultrasonic sensor generates a beep sound which informs the blind person about the obstacle.

If the blind man feels any discomfort while navigating, he can switch to the assistance mode by pressing the SoS button. The message sent via the SoS button will reach the family member or friend’s mobile application,

through which they can guide their friend (The sightless person).

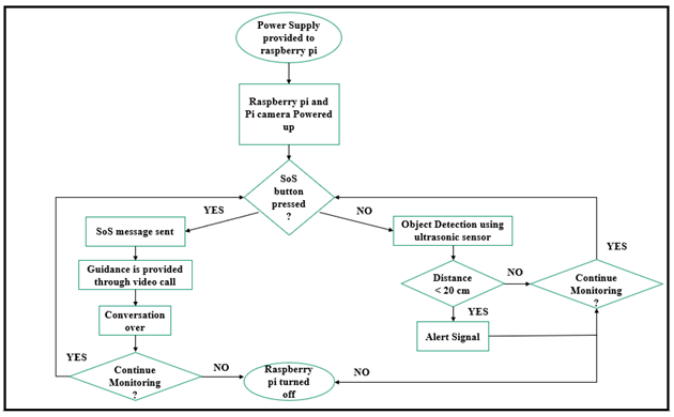

Fig.8 System Design

IV. RESULT

Firstly, we observe the working of ultrasonic sensors which is mainly an object detection model. Here, the figure depicts the real-time look of the model that is implemented.

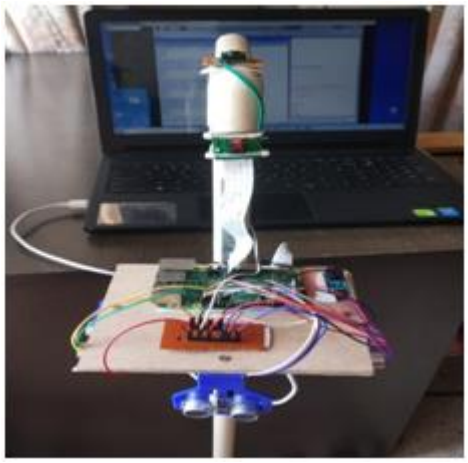

Fig.9 Real time model

Here we have three ultra-sonic sensors that can sense the obstacles in three different directions i.e. left, right and front. This increases the range of vision for the system and overall efficiency of the blind stick.

There is also a camera that is placed in the front to capture the video of the nearby surroundings so that it can be streamed to the family members later on the mobile application installed.

The figure shows how the mobile application looks:

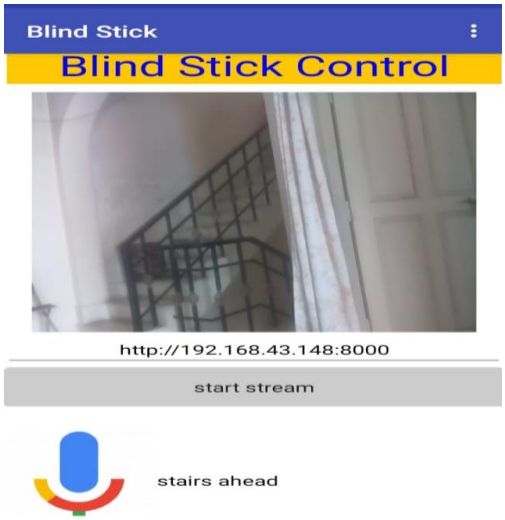

Fig.10 Streaming on Mobile Application

When the microphone button on the application page is clicked it enables the family member to guide a blind person through audio [3].

Also, depending on the situation when the blind person does not receive enough help through audio guidance and senses some kind of emergency around him then he can press the SOS distress call button on the blind stick. This feature sends an immediate notification on the mobile application so the family members can reach out to the blind person and make sure he gets immediate assistance.

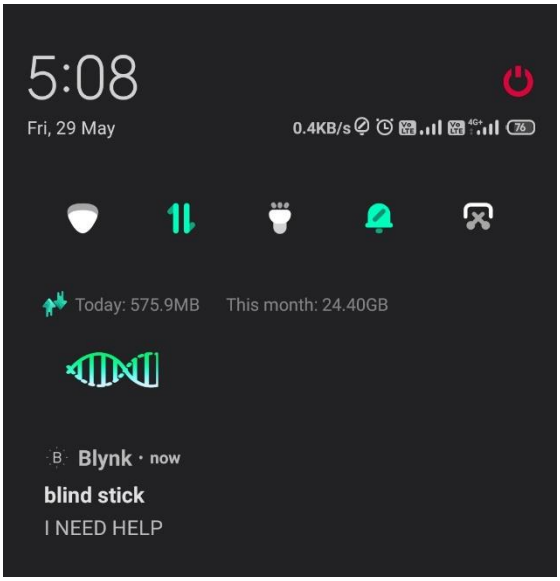

Fig 11. Mobile Application Notification Window

We also have the Geo-location enabled on the blind stick that gives us the location of the blind person on the mobile app.

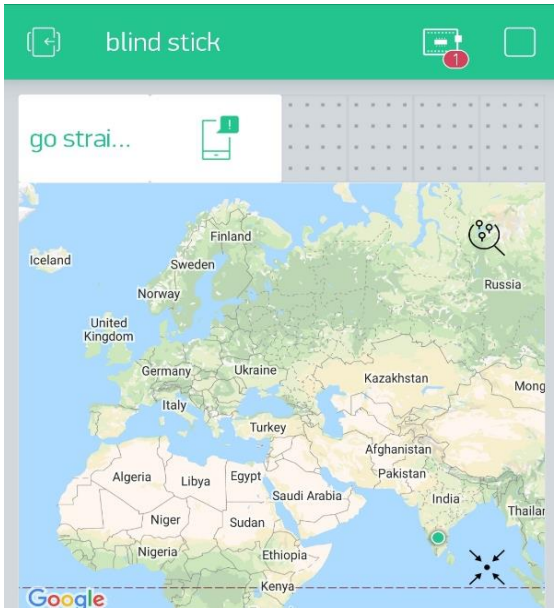

Fig 12. Geo-location on Blynk app.

V. FUTURE SCOPE

- The blind stick and the Aadhar Card of the blind can be linked; this can be used by the government to help and serve the blind in a more advance way.
- Water sensors can be added to the stick which helps the blind people to move about safely without slipping during rainy season.
- A feature with a set of glasses and an earphone mic can be wirelessly connected to the smart stick.

VI. CONCLUSION

The Blind stick is designed and implemented in a way to help any blind person navigate independently and altering them if any obstacle is present in the way. Furthermore, the video streaming is a useful feature when the blind requires any assistance to travel around an unknown place. With all these features, this smart stick brings positive changes in the lives of blind and adds more confidence to overcome their fears.

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