SMART E-STICK FOR VISUALLY IMPAIRED USING MOBLIE APPLICATION

[1]Prof Priyanka Kedar, [2]Piyush Rane, [3]Devansh Singh
1Assitant Professor, [2]Student, [3]Student
[123]Department of Computer Engineering,
[123]Dhole Patil College Of Engineering, Pune,India

Abstract : In this proposed work, a simple, cheap, friendly user, smart stick will be designed and implemented to improve the mobility of both blind and visually impaired people.Presently, a simple stick is used as an aid inoredr to perform their daily chores. By using this stick does not make them completely independent when they are perforing their daily tasks..We are presenting a smarter approach where a microcontroller based automate hardware will act like an artificial vision and alarm unit for the blind to address this problem. The main aim is to provide a affordable,simple yet an efficient solution for the visually impaired. The idea behind the design of the stick is to keep it structurally similar i.e. thin, lightweight and easy to handle, yet give an active feedback and guidance to the user regarding the hazards in his walking path. All these functionalities are being provided at relatively lower cost and using efficient NLP features. Hence this system enables the blind to move with the same ease and confidence as the normal sighted people.

***IndexTerms* –Smart blind stick,Obstacle detection,Natural Language Processing,Ultrasonic sensor,Arduino,Mobile Application**

I. INTRODUCTION

With increase in population around the world, the number of people affected by vision loss has increased substantially over the years. Blindness or visually impaired is a term used for completely blind or partially blind people. Visual impairment may cause people difficulties while performing daily activities such as driving, reading, socializing, walking, etc. Hence this paper presents a system to aid the blind people and try and make their life easier. Presently, the visually impaired people use a simple stick as an aid to perform their daily chores. But the use of this stick does not make them completely independent and as confident as the people with normal eyesight. They are not capable of independently navigating to various locations, detecting obstacles or potholes, or even efficiently communicating with people in case of emergencies. This also increases the probability of accidents among the blind community. The smart e-stick is an IoT-based project that has Ultrasonic Sensors for the detection of potholes, staircases (up and down), low lying and knee level obstacles and even those above the waist. It also has buzzers which will buzz with changing frequencies according to the varying distance of the obstacle. The smart blind stick is also interfaced via Bluetooth with the users smartphone to introduce GPS navigation for the complete independent navigation of the visually impaired. GPS navigation will be provided through mobile application that will guide the blind. In case of emergency the blind person will be able to call or send his location to his/her relatives .The user will speak through earphones provided to him to make call or send a message along with is location. This functionality will be provided using mobile application which will function completely via Natural Language Processing (Speech-to-Text and vice-versa).This will help the blind person to navigate alone safely and to avoid any obstacles that may be encountered, whether fixed or mobile, to prevent any possible accident. Our motto is to make a stick that would be affordable to everyone with all the sensors that will help them to overcome the disabilities in the traditional stick.

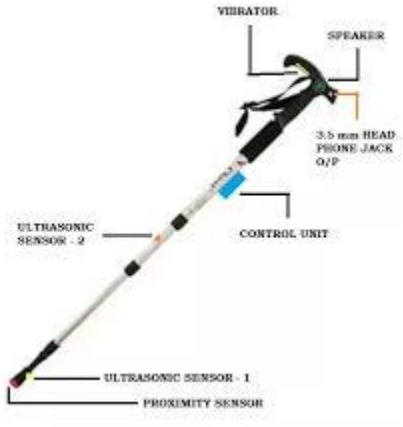

Figure 1: Smart e-stick

II. EXISTING SYSTEM

Presently, the visually impaired people use a simple stick as an aid to perform their daily chores. But the use of this stick does not make them completely independent and as confident as the people with normal eyesight. They are not capable of independently navigating to various locations, detecting obstacles or potholes, or even efficiently communicating with people in case of emergencies.This also increases the probability of accidents among the blind community. As of now there is such blind sticks are developed with different approaches. The existing devices are made using GPS (Global Positioning System) and GSM (Global System for Mobile Communication) modules. GSM module is used to enable SMS and Calling with the help of which the blind person can make a call or send an SMS to the saved contacts. It included sensors to detect the obstacles in front of the person. Only Arduino microcontroller controlled these all devices and processed the data received from the sensors and modules.The GSM and GPS modules used in these devices increases the cost of overall stick and it makes the stick bulky.Also these GSM and GPS modules are not completely reliable.

III. PROPOSED SYSTEM

We are making a smart stick which will be not only dependent on the arduino microcontroller but also on mobile application for its working. In the existing system GPS and GSM modules were used which were not totally reliable as even with high speed internet it was not giving those accurate expected results. Along with that the overall cost and weight of the stick was increased. To overcome this instead of using those modules we are making use of an android application .Nowadays mobile phones are available with everyone. So an android application will be developed with the help of which the person will be able to call and send message during emergency. This application will be turned on whenever required with the help of a sensor on the stick. So the processing of data on arduino is reduced and also overall cost of the stick is reduced with this approach.

The entire project is divided into the following parts:

1. Obstacle detection
2. Pothole detection
3. Text to Speech (and vice-a-versa)
4. Android application

IV. SYSTEM ARCHITECTURE

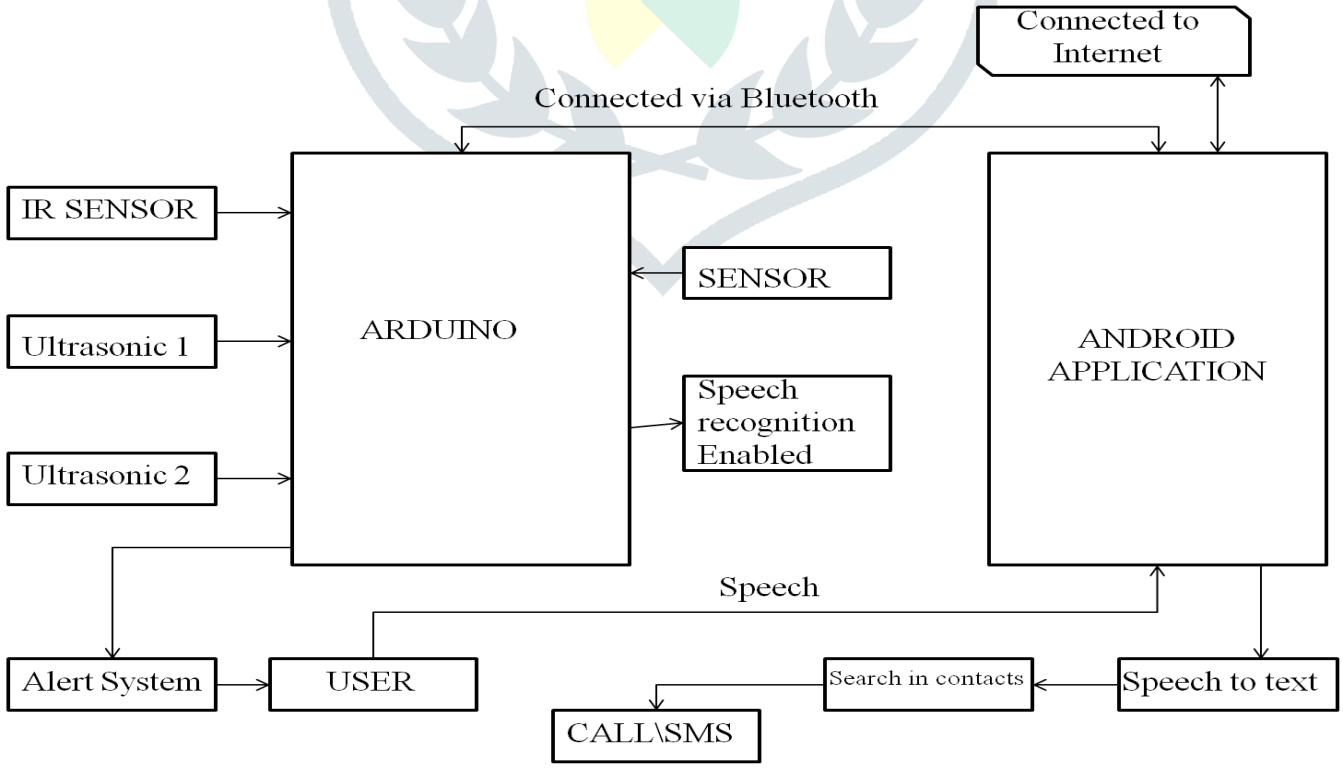

Fig 2 :System Architecture

The working of the stick totally depends on the sensors, arduino microcontroller and android application. Firstly the sensors will sense the potholes and the obstacles in front of the person with the help of ultrasonic sensors .This data collected by the sensors will be given to the arduino for processing and after the successful detection of obstacles the arduino will alert the person through earphones provided alerting 'Obstacle ahead' or by making the buzzer on. The android application is triggered by the working of a sensor. Firstly android application and arduino are connected to each other through bluetooth .So whenever the person needs to send his location via SMS or make a call he will have to place hand on that sensor and the sensor will trigger the application .The contacts on the mobile phone of the user will be used by the application .The user will speak out the name of a person he wishes to call or send location .The application will search in contacts and if available will send his location to the prescribed person or make a call, For this speech to text conversion feature provided by the android studios is used which will perform the conversion and execute the task.

IV. FEATURES

4.1 Microcontroller based automated stick

Table1 Hardware Modules and it's components

Hardware Components	***Description***
Microcontroller	Central control system
Ultrasonic Sensor	Obstacle detection
Water Sensor	Wet/Muddy surface detection
LDR Sensor	Vehicle detection at night
Buzzer	To provide voice alerts
Push button	Activating/ Triggering specific system features
Rechargeable battery module	Power supply to the system

1.Obstacle Detection

For detection of obstacle two ultrasonic sensors are placed on the stick.One on the lower end to detect the obstacles at lower area and one on the center of the stick to cover the mid region in front of the blind person.The buzzer is placed on the stick to alert the blind person as soon as obstacle is detected in front of him/her with the help of ultrasonic sensors. The buzzer will then buzz with changing frequencies according to the varying distance of the obstacle from the stick.

2. Pothole Detection

The smart blind stick will have Ultrasonic Sensors facing in the downward direction for detecting and measuring the pothole distances. The buzzer will buzz with varying frequencies accordingly and the blind person will be alerted regarding the same.With this the blind person ca avoid potholes on it's way.

3. Water and moisture detection on the ground

If the surface is wet or muddy, it can cause accidents. In order to have precaution against the wet surface a Water sensor is located at the base of stick. When the Water sensor comes in contact of the wet surface its resistance changes and it produces an electrical signal which triggers the processor. Immediately the processor will enable the buzzer for informing the presence of wet or muddy floor to the blind

4.2 Android Application

1. Stick Detection

Instructions in the voice format can be accepted by the android application and Bluetooth signals can be sent to the Bluetooth module present on the stick. Once these signals are received, the buzzer on the stick will buzz using which the stick can be located by the blind.

2. GPS Navigation

GPS navigation will be provided for the guidance of the blind. The destination will be accepted form the visually impaired person using speech-to-text module and the blind will be given the directional-instructions in the form of speech output.

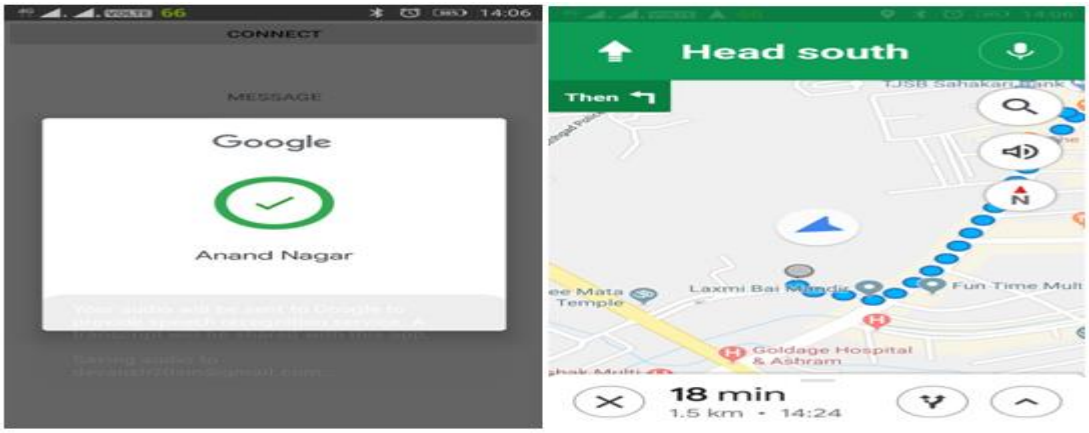

Fig.3 Navigation Feature

3. Live Location Tracking

Also in case of emergency situations, a simple button on the stick can be triggered to send a Bluetooth signal from the microcontroller to the android app. The application will then automatically send a message containing the current location of the blind to his relatives or to the nearest help centres.

4. Voice Controlled Communication

The blind person can make a call or send message through voice commands with the help of android application.The speech to text conversion will take place in android application and the call or message will be sent to the person listed in the contact list.

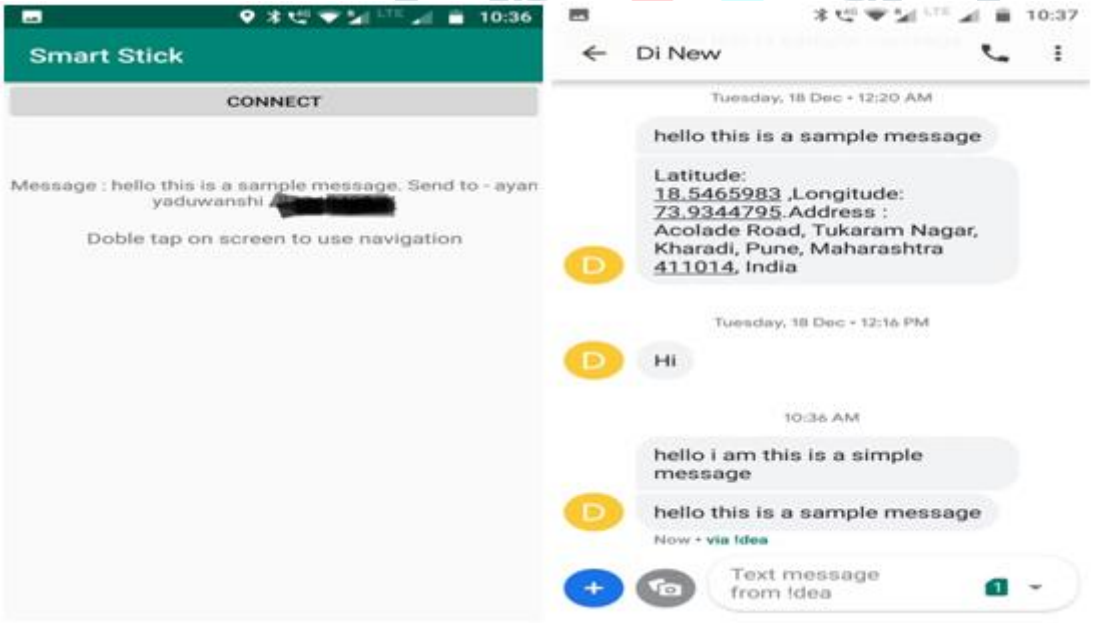

Fig.4 Simple message along with location sending feature

V. CONCLUSION

Hence this paper proposes a stick for the blind which is more useful and much smarter than the conventional stick used by them today. This e-stick could be considered a crude way of giving the blind a sense of vision. Using this smart blind stick, it will be possible for the blind to perform all their daily activities like navigation and routing through various locations, stick detection, obstacle detection, pothole detection as well as communication with people with much more ease and efficiency. Hence keeping the design of the stick structurally similar, advanced functionalities have been incorporated to generate a simple, affordable yet an efficient solution for the visually impaired. Thus, in this project we are incorporating the current trending technologies for developing a project which would benefit the society.

VI. FUTURE SCOPE

The smart stick can further be upgraded by adding features like vehicle detection, fire/smoke alarms etc. Smart transport facilities for the blind can also be added in the android application for providing further travel ease. We can increase the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles may prove to be useful.Solar cells can be used instead of battery so there is no need of electric charging.Android application can be enhanced by supporting multiple languages.Technology like Cloud Vision API can be used foer detection of traffic signals and road side sign boards . Thus, future scope of implementation can be combined with our current system to improve the system utilities.

VII. REFERENCES

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