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THE SMART STICK ASSISTANT FOR VISUALLY CHALLENGED PEOPLE USING AI IMAGE RECOGNITION

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Abstract: This study focus to test students of understanding of the IoT subject studied on Internet of Things. IOT projects that are relate to our field of study such as design, development and other requirements. Therefore, I have selected to develop "The Smart Stick Assistant For Visually Challenged People Using AI Image Recognition". "The Smart Stick Assistant For Visually Challenged People Using AI Image Recognition" is a blind assist tool which basically come out from traditional white or blue cane and improved into today's technology. It's an enhancement project for blind people in order to help them to get assist during their journey on their way. This current automation of executing topical technology components like Blynk app and ESP shield will aids least the difficulties of the visually challenged people community in achieving better response from their surroundings on their activity.

Keywords: IOT Smart Stick, Blind People, Voice Smart stick, ultrasonic sensor, Luman Sensor

I. INTRODUCTION

IoT is emerging and is being carried out with and used in various ways than one can ever imagine. It can create virtual world of information to real world of things about the connected objects, analyze it, and make decisions;

In today's digital landscape, it automates our lives and offers security & enhances personal protection. Have we ever thought

Such automation would really revamp the lives of disabled people across the world. Visually impaired persons feel themselves facing difficulty to travel out. There are immeasurable blind folks around world. Keeping this in mind, This project Smart Stick assistant developed.

II. LITERATURE SURVEY

Technologies demands increase for human comfort and better life. Globally, at least 2.2 billion people have a near or distance vision impairment. vision impairment could have been prevented or has yet to be addressed. As humanity still exists, we address those people and suspect for giving a hand or help in walking up they could always depend on others for seeking the guideness in many situation they come across. At some or other point they couldn't find help and never knew whom to reach out at that cases they might become helpless and regret themselves of being impaired as compare to normal people.

To avoid such relaying situation, Smart technologies like smart blind sticks makes the way more better by navigating themselves independently without seeking human assistance in the most of the situations.

There are many basic products of reliable tools for blind community to guide and help them to lead a possible life without facing difficulty. Those comes with high designed outlook tool with just detecting the hurdles in front with less identifying intelligence and with no guaranteed services when the tool gets in damage. It also comes with heavy design that makes difficult to handle. Also a high cost where the visual disabled people don't afford such price.

Back ground the project explained in order to get an over view of understanding the subject and keeping this scenarios in mind, I have redesigned and modified the existing prototype generating requirements with easy detectable features, voice assisted one, touch sensor, comfort handling and with less affordable cost.

III. Proposed System

This prototype has been developed on a cane stick a mobility tool which detects the obstacles and measures the distance ahead and detects wet surfaces. The vibration motor is used to translate the sensor outcomes by giving the vibrating pressure triggers the user's hand when the stick is hold. It comes with voice commands assistance also I worked to provide an emergency button for the blind person which is when pressed will give a distress call to the already registered person of his closed ones or family members. The live tracking location can quickly reach out the blind after receiving the distress call. The blind's movement can be monitored live. There is also a major concern when it comes to safety of those individuals as they navigate themselves. Additionally I have included the feature of detecting whether it's a morning or night and another feature is when the user's misplaces his stick nearby there is a buzzer fitted on the stick will beep so that the users can identify the sound coming from respected distance through google voice assistant on his mobile . Besides this, the prototype of mine stands unique from the products available in the market is that with the help of AI technology embedded with Raspberry pi device with an app interface and a pre programmed code identifies the things when the user come across on his way more easily for example: The things like cars, cats, tables, etc which would make more accurate and simplified feeling for the visual impaired persons. It's a user friendly one too.

IV. Design and Development

In the method of collecting information and data, a lot of sources had been referred to. Most of the information was obtained from the journals and article available on internet about blind people assistant tools.

Hardware Requirements

The entire hardware component that listed is very crucial to the project. Hereby is the list of the components that will be used for this project:

@Arduino Uno R3 board

@ESP 8266 Node MCU Wi-fi module shield

@ Rapberry pi

@ Luman Sensors

@ HC-SR04 Ultrasonic detector

@USB cable

@Power adapter

@ Battery button connector cable

@ Android smartphone

@Switch and relay

@ Speaker

@camera

@ Blynk App

@ Google Assistance

After collecting all the data provided on web and articles, The prototype idea is "Smart Stick Assistant" tool for The components required for this made to react properly in the angles of head and ground levels and to detect the incoming obstacles and give back the response to the users.

V. IMPLEMENTATION TECHNIQUES

On a white PVC or wooden stick a microcontroller board named Arduino UNO R3 is attached to it which has PWM outputs, six analog inputs & USB connection. Where the cable wirings are used to pin voltage, ground and two signals for connection. The other one is HC-SR04 Ultrasonic sensor having 4 pins need to be connected to the UNO board to be functioned. It is used based on the Echolocation

technique to determine the location of obstacles or objects using reflected sound. The sensor design comes in handy to use. The toggles switches have the lever design of the switch used to interrupt the flow of electrons in a circuit and toggles the micro - controller board to send message based on the sensors. 9v battery is recommended for functioning .The Relay helps the DC motor to turn on and off when the motor experiences a torque and gets the tendency to move according to specific commands given.

Assembling each other according to it's function The C language used to program and list of instructions. For Arduino to follow using Arduino software IDE makes it easy to write the code for the board. The process works in importing the library. The ultrasonic sensors will send notification along with vibration on handle of the stick. The Arduino works and other components of the circuit functions according to it will process the feedback and send notification to the user's smartphone.

Java code and speech library for speaker is preinstalled for giving out voice commands which can generate speech from which it is encoded from an app called talky that comes with thousand words of speech data which is included in the prototype.

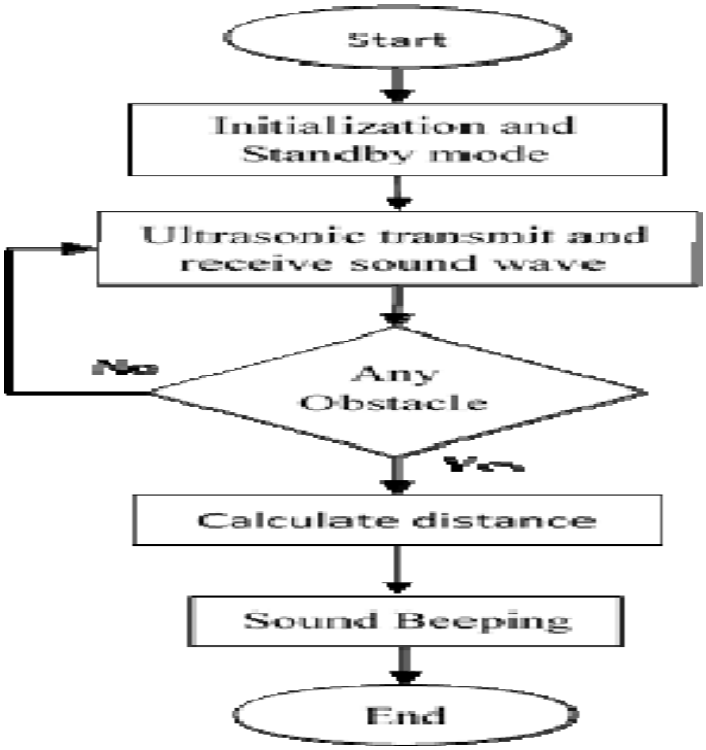

Fig 1: Flowchart of Working Prototype

Here's how the sensors detects the hurdles is the ultrasonic waves of 40khzis transmitted by ultrasonic sensors are reflected back and soon as it interacts and reflects waves then it is received by the receiver module of Ultrasonic sensor. It outputs the distance detected in the form of serial data the microcontroller board receives the distance detected by Ultra sonic sensor and decodes it and then analyzes whether the result is less than the threshold value of 80, then the cycle continues but if the result reaches the threshold value the speaker will speak to the user and guide according for example surface level detected as low, high, closer to.

Moreover, ESP shield library will enables Arduino board to operate user smartphone to get features like sending & receiving SMS or call, connect to internet over a GPS network. Combing the GPS & ESP shield library code helps the possibility to provide location of user along the function to send notification to target the user along with Latitude and Longitude measures.

The unique feature included in the project is that the Lumen meter is a device used to calculate the amount

of light fall in a certain area when the user is around it is identified by pressing a buzzer attached to it with vibration sensor connected so it simplifies the user's need to identify whether it's a day light or night even when he is not carried out a smart phone.

Raspberry pi is preprogrammed with Python code it facilities with an app interface called Blynk app where it is interconnected it fetches the data collected by MC's and display the output using GUI by pushing the button on it. We should preprogram some of its the library by firstly gathering and organizing data to work with and secondly build and test a predictive model. Thirdly use the model to recognize images which we come across daily the basic things that lie around us connecting a camera in front of the stick.

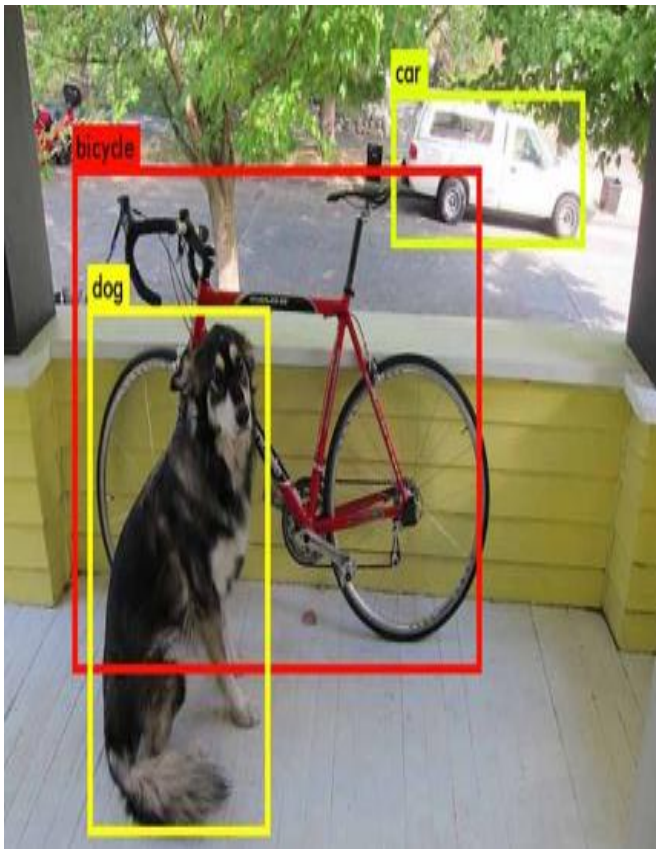

Fig 2: Recognizes Images in front of User

VI. RESULTS

This prototype is used to test and enhance design. The Device is compatible to the user's need. The Ultrasonic sensors detects wet conditions and heading obstacles accurately to the ground and high level guiding out the route instructions made easy. It will send back the new output to Arduino board it will process according to the flowchart .As it gets the readings from accelerometer & magnetometer calculates the measures with the help of compass mode if heading right or left by wandering the stick in mid air to sense the obstacles ahead. The DC motor will vibrate according to the pulse generated. The blynk app is ready to work on the location of the user and sends the emergency SMS it wanted then it sends a emergency call to other guardian's smartphone of User.

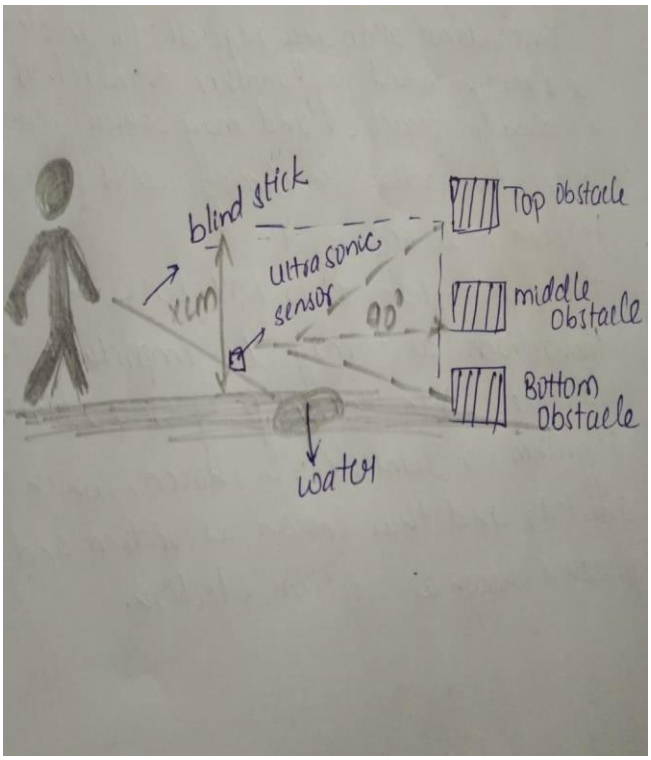

Fig 3: Smart Stick with Object Range Detection

When the user is nearer to the obstacle then it vibrates fast, when far away from the obstacles a low vibration is observed. It sense the purpose of image identification at somehow in a good level.

VII. CONCLUSION

From the tests components, It carried out on its functions revealed that the developed prototype which is named "Smart Stick Assistance" tool for visually impaired people has achieved it's objectives. In order to improve the prototype several suggestions are made like introducing solar batteries for unlimited source to function, a proper Image identification must be included after developing the sensor model files to detect an appropriate image of the objects. The stick must also gets the design of soft padding with comfort handles along the circuits should get a protection from drop test.

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