Smart Cane for Visually Impaired with Navigating Assistance Using IOT and Cloud Support

Triveni.[1], Prajwal Kumar.G.[2], Riya Thyagraj.[3], Gowthami.L[4]
[1]*Triveni, Asst. Professor, Dr. Ambedkar Institute of Technology*
[2]*Prajwal Kumar.G, Student, Dr. Ambedkar Institute of Technology*
[3]*Riya Thyagraj, Student, Dr. Ambedkar Institute of Technology*
[4]*Gowthami L, Student, Dr. Ambedkar Institute of Technology*

Abstract **- This paper presents design and implementation of an ultrasonic sensor based walking stick for visually impaired person. An ultrasonic sensor module, HC-SR04 is used for obstacle detection in the path of the blind person and a buzzer is used to make the person alert. The proposed system is implemented using Raspberry Pi microcontroller. Blind persons can use this walking stick for safe navigation. It can detect obstacle within 5 to 35 cm range of distance. This model has been successfully developed with the concept of Internet of Things [IoT] by integrating necessary sensors and Raspberry Pi.**

Index Terms- IoT, Navigation assistant, CLOUD, Microcontroller, Smart Walking Stick

I. INTRODUCTION

In the list of disabilities, blind people are facing more difficulties on their day to day life. Nowadays every technology becomes smarter, in the list of them, Navigating their way to home by redefining the user's home through the Google map navigator and to know the places near to their location like shops. Researchers have spent the decades to develop an intelligent and smart stick to assist and alert visually impaired persons from obstacles and give information about their location. Over the last decades, research has been conducted for new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at danger places. Smart walking stick is specially designed to detect obstacles which may help the blind to navigate care-free. The alert sound will keep the user alert and considerably reduce accidents. A voice enabled automatic switching is also incorporated to help them in private space as well. This system presents a concept to provide a smart electronic aid for blind people, both in public and private space The proposed system detects the obstacle images which are present in outdoor and indoor with the help of a camera. The Stick measures the distance between the objects and smart walking stick by using an ultrasonic sensor. When any objects or obstacles come in range of an ultrasonic sensor then the head phone tell the name of obstacle which is in front of the stick. The smart walking stick is a simple and purely mechanical device to detect the obstacles on the ground. This device is light in weight and portable. But its range is limited due to its own size. It provides the best travel aid for the person. The blind person can move from one place to another independently without the others help. The main aim of the system is to provide a efficient navigation aid for the blind persons which gives a sense of vision by providing the information about their surroundings and objects around them.

A. Objectives

- Basically it is difficult for blind people pass their day to day life with their disabilities. To make their stick smarter,
- We interfaced some system with their walking stick. In this system we interfaced some smart functions with their stick.
- Whenever the obstacle is detected on the way through ultrasonic sensor placed on the stick, So that blind can able to identify the object in-front of them, if it is identified that is a human in their way, they can ask for any help.
- If there is a large obstacle like a car, they can be able to walk based on the object in-front of them. Additionally, by interfacing GPS with the system, with the help of Google maps, the system will be able to track them

II. LITERATURE SURVEY

[1] An Intelligent andMulti-Functional Stick for Blind People Using IoT- Shamim Ahmed; Md. Munam Shaharier; Srijan Roy; Anika Akhtar Lima; Milon Biswas; Md. Julkar Nayeen Mahi; Sudipto Chaki; Loveleen Gaur-2022

The primary goal of this study is to aid blind people who do not require human assistance. People who cannot see the world have difficulty perceiving the obstacles in front of them, putting their lives in jeopardy. Using an intelligent and multipurpose bright blind stick will allow them to recognize their environment. In this study, we presented a low-cost, innovative, and versatile stick for blind individuals in our community adopting IoT to better their lives. A person can walk more confidently with the help of this brilliant blind stick. This stick can identify impediments in the route of blind people thanks to an Arduino.

[2] Multi-Functional Blind Stick for Visually Impaired People-Vanitha Kunta;Charitha Tuniki; U. Sairam-2020

One of the biggest problems faced by the visually impaired is navigating from place to place, be it indoors or outdoors. Further, the adverse conditions of the roads make it even more difficult for them to walk outdoors. They have to be alert at all times to avoid consequences like colliding with stable or moving obstacles, ascending or descending staircases, slipping down wet terrain. Also, at times they may be in distress and might want to send an alert message to their relatives or friends about their whereabouts. These problems of blind people can be addressed with the intervention of technology. The proposed solution employs the Internet of Things (IoT) paradigm to provide a medium between the blind and the environment. Several sensors can be used to detect anomalies like obstacles, staircases and wet terrains respectively. The prototype discussed here is a simple, sophisticated and affordable smart blind stick equipped with various IoT sensors and modules. Also, this solution provides a way to send a message about the whereabouts of the user to the concerned people.

[3] Smart Walking Stick Design For Blind People Cansu Akbay; Şeyma Kılıç; Şerife Kaya; Hamza Ünsal; Elif Hilal Şen-2022

In this study, it was aimed to design smart walking stick in purpose of detect obtracles that cause danger for blind people. The selected sensors and electronic components were programmable with Arduino. Ultrasonic distance sensor was used for detect obtracles in determined closest distance. A buzzer was used to provide audible alert when obstracles were detected via ultrasonic distance sensor. Additionaly, experimential studies were applied on GPRS sensor which is used for send locational information via SMS to caretaker of blind person when she or he lose the way.

[4] IoT based Smart Stick with Automated Obstacle Detector for Blind People-Vyash Natarajan; Yogeshwaran M;Aroul Canessane-2022

The world is overwhelmed by its new technologies and inventions. Recent years witness that, every part of the world is integrating with technology to become more productive and powerful. To contribute more to this technology driven society, this research study attempts to propose an automated model for the blind stick used by blind people to assist and establish a safe and secure environment for the blind population as a part of this generation's dedication to contributing more to society through technology. This model has been successfully developed with the concept of Internet of Things [IoT] by integrating necessary sensors and Arduino UNO processor.

[5] WiFi and Bluetooth based Smart Stick for Guiding Blind People-T.S. Aravinth-2020

Basically it is difficult for blind people to spend their day to day life with their disabilities. To make their stick smarter some systems interfaced advanced techniques like gadgets with their walking stick. This technology makes strolling stick smarter which has many applications together with on foot stick indicator in case if they miss the stick through sound beeping, they might walk utilizing the way of themselves. If they face any obstacle, they can sense it by a vibration sensor, and also they can hear the guide directions in the headset. The camera is used to detect the obstacle through an ultrasonic sensor placed on the stick. The captured image is sent to the microcontroller to

identify the type of the object and then it is intimated as a voice command through the speaker or via earphones connected with Raspberry pi. So that blind can able to identify the object in front of them, if it is identified that is a human in their way, they can ask for any help. If there is a large obstacle like a car, they can be able to walk based on the object in-front of them. An interfacing GPS is used to identify the exact location.

III. METHODOLOGY

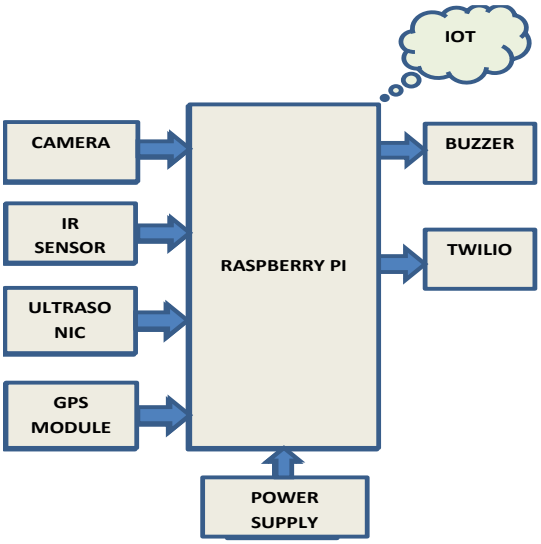

Fig.1. Block diagram of the proposed model

Raspberry Pi is a microprocessor board used in this project. The board is equipped with sets of GPIO/BCM pins that may be interfaced to various expansion boards and other circuits. The GPS module also helps to trace the blind person through the data collected by it. Also, by the information coming from the GPS blind person will come to know the location. Wi-Fi module is inbuilt in Raspberry Pi used to upload data to the cloud. IR sensor is used to detect objects present on path while walking. Ultrasonic sensor is also used to detect obstacles. Camera is used to detect the object/person.

IV. COMPONENTS

Hardware requirements:

- Raspberry Pi
- Ultrasonic sensor
- IR sensor
- Camera
- GPS module
- Buzzer
- Power supply
- Twilio

Software requirements:

- Python IDLE
- Thingspeak IOT

V. WORKFLOW

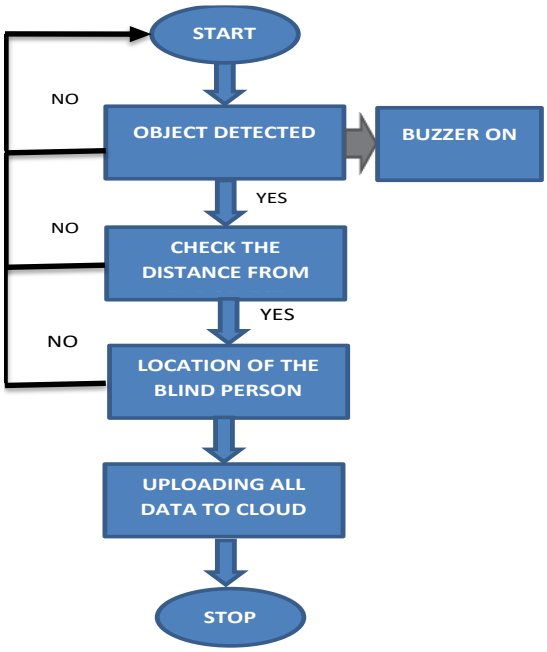

Fig.2. Flowchart showing the working of the model

1. Initialization: Set up the necessary parameters and configurations for the ultrasonic sensor, such as the trigger pin, echo pin, and measurement units.
2. Trigger Signal: Send a short high-level pulse to the trigger pin of the ultrasonic sensor. This signal acts as a trigger for the sensor to start emitting ultrasonic waves.
3. Echo Detection: Start a timer or timestamp as soon as the trigger signal is sent. Listen for the echo signal on the echo pin of the ultrasonic sensor. The echo signal is a pulse that is generated when the ultrasonic waves emitted by the sensor hit an object and bounce back.
4. Calculate Distance: Measure the time taken for the echo signal to return. This can be done by comparing the current timestamp with the timestamp when the trigger signal was sent. The time difference represents the round-trip time for the ultrasonic waves.
5. Convert Time to Distance: Use the speed of sound in the medium (usually air) to convert the round-

trip time into a distance measurement. The speed of sound is approximately 343 meters per second at room temperature.

6. Output: Return the calculated distance as the output of the algorithm. This distance represents the proximity of the ultrasonic sensor to the object that reflected the sound waves.

VI. CONCLUSION & FUTURE SCOPE

Automation places vital role in every technology, this system can also be innovated further by giving more automation like doing every operation automatically by analyzing their day to day life. Instead of walking stick we can use the band as smart technology for the blind person assistant.

Personalization and User Preferences: Future smart walking sticks can be designed to adapt to individual users' preferences and needs. This could include adjustable handle heights, ergonomic grips, customizable settings for sensitivity, and personalized feedback based on the user's gait patterns.

Enhanced Sensor Technology: Future iterations of smart walking sticks can incorporate advanced sensor technology to provide more accurate data about the user's movement, posture, and balance. This could include pressure sensors, gyroscopes, accelerometers, and even computer vision for object detection and obstacle avoidance

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