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# SMART SOLUTION FOR BLIND

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***Abstract:***

This paper focuses on enhancing the mobility and independence of blind and visually impaired individuals through the development of a smart walking stick and smart spectacles. Traditional navigation aids, such as white canes or guide dogs, provide limited assistance. To address these limitations, we propose a system equipped with ultrasonic sensors and buzzers that detect obstacles and guide users safely.

The smart stick uses ultrasonic sensors to detect nearby obstacles and provides real-time feedback through vibration or sound, enabling users to avoid collisions. It is built using Arduino Nano and ESP32 microcontrollers, ensuring efficient processing and seamless functionality. Additionally, water sensor is used to detect wet surfaces and Arduino Bluetooth app is used to get voice prompts about obstacle detection and water detection. The smart spectacles helps to detect obstacles in front of the user's head. Equipped with an ultrasonic sensor, the device continuously scans the environment and sends a signal to the microcontroller when an obstacle is detected within a certain range. The microcontroller sends the signal to the buzzer, then it produces a sound alert to notify the user about the obstacle. The device is compact and wearable, providing a convenient and easy-to-use solution for visually impaired individuals to navigate their surroundings safely.

According to the World Health Organization (WHO), over 30 million people worldwide are blind, and 285 million suffer from visual impairments. The proposed smart specs and stick aims to overcome the limitations of conventional aids by detecting obstacles, identifying corners, and providing directional feedback to enhance spatial awareness.

***Keywords: Spectacles, Stick, Blind person, Obstacle detection, Arduino nano, ESP32, Ultrasonic sensor, Buzzer***

## 1. INTRODUCTION

According to WHO, it is estimated that approximately 30 million people are permanently blind and 285 billion people with vision impairment. Visually impaired people are the people who find it difficult to make out the smallest detail with healthy eyes. Those who have the visual acuteness of 6/60 or the horizontal range of the visual field with both eyes open have less than or equal to 20 degrees. These people are regarded as blind. A survey by WHO (World Health Organization) carried out in 2011 estimates that in the world, about 1% of the human population is visually impaired (about 70 million people) and amongst them, about 10% are fully blind (about 7 million people) and 90% (about 63 million people) with low vision. Smart guide blind spectacles and stick is an innovative gadgets designed for visually disabled people for enhanced direction-finding.

In this paper a highly developed blind spectacles and stick that allows visually challenged people to navigate with ease using advanced technology. The smart guided blind spectacles and stick is incorporated with ultrasonic sensor. In this paper ultrasonic sensors used to detect obstacle in front the user using ultrasonic waves. On sensing obstacles, the sensor triggers the microcontroller. There after microcontroller processes this signal and calculates distance of the obstacle. If the obstacle is not close enough then circuit does nothing. If the obstacle is close to the blind person, then microcontroller sends a signal to buzzer to get the sound alerts. In stick, another alert feature also added, the vibration motor also arranged to get the alert by vibrating the stick. When the user is not able to listen to the sound from the buzzer, by using the DPST switch the user can change the alert modes according to the surroundings. And the water sensor is also arranged at the bottom of the stick. This water sensor is used to detect the wet surfaces. Whenever it detects the water, it will sends the signal to the microcontroller. Then the microcontroller gives the signal to the buzzer and gives the sound alert. The arduino Bluetooth application is used to give voice prompts about obstacle detection and water detection. Thus, this system allows for obstacle detection and water detection.

Independence plays the most important role in our lives in achieving our goals, dreams and objectives in our lives. Blind or visually impaired persons always looks for some kind of helping hand from the other person whenever they go out of the house which make them feel less independent. Blind people go through a lot of problems while walking on the streets. This system design and develops a spectacles and stick which will help the blind person navigate easily on the streets and make them more comfortable and independent. The blind spectacles and stick which we have developed will help visually impaired people roam easily and comfortably without any problem.

## 2. LITERATURE SURVEY

S. Gangwar (2011) designed a smart stick for blind which can give early warning of an obstacle using Infrared (IR) sensors. After identifying the obstacles, the stick alerts the visually impaired people using vibration signals. However, the smart stick focused only for obstacle detection but it is not assisting for emergency purposes needed by the blind. And also, the IR sensors are not really efficient enough because it can detect only the nearest obstacle in short distance.

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S. Chew (2012) proposed the smart white cane, called Blind spot that combines GPS technology, social networking and ultrasonic sensors to help visually impaired people to navigate public spaces. The GPS detects the location of the obstacle and alerts the blind to avoid them hitting the obstacles using ultrasonic sensors. But GPS did not show the efficiency in tracing the location of the obstacles since ultrasonic tells the distance of the obstacle.

Harpreet Singh, V. B. Kirubanand proposed Smart Stick for Blind People Using IOT. In which they discussed the Yolo algorithm and compared it with the existing method. Keeping the cost of the stick minimal, they used the GPS tracking for the blind stick. Their future scope also was to make the entire process fast and more efficient for the detection of objects.

Niveditha K, Kavya P D, Nivedha P, Pooja B, and Lakshmi kantha G C suggested virtual Eye for Blind using IoT. They used GPS technology which was integrated with pre-programmed locations which helped to determine the optimal route to be taken. They used raspberry pi as the main device because of its compatibility with the ARM processor.

Antara Ghosal, Anurima Majumdar, Palasri Dhar, Adrija Kundu, Avirup Mondal, Ananya Biswas, Bikram Saha, and Palabi Ghosh proposed Smart stick for blind using IOT. They used an ultrasonic sensor, Flame sensor, and water level detecting sensor which showed a good result for detecting obstacles for a range of 4 meters. The system was low cost and effective.

For visually challenged people doing their routines would be the toughest thing. To make it finer, a traditional cane is converted into an assistive cane by penetrating an infrared sensor and Arduino UNO to it.

This system includes an embedded e-SOS (electronic Save Our Souls) system with an ultrasonic sensor and Arduino Nano. It works based on android application.

CMP compass sensor 511 is used to give information about the direction of wind flow. The output is sent as the sound, and the buzzer activates within the range of 3 cm-150 cm when the obstacle is detected with a speed of 0.3 sec. [9]. This model combines the three sensors: an Ultrasonic sensor, a Force sensor and a pressure sensor. The force sensor is attached to the individual shoe, measuring the distance between the stick and shoe. The pressure sensor helps to the individual walk if the individual lost the grip on the stick handle. This trio makes the stick into an assistive one.

It is hard to live a life with disabilities. To make blind people smart, so we are implementing so many sensors, which makes it a smart stick, which gives alarm when the user faces any obstacle and gives the audio command through speakers connected by Bluetooth.

A Survey of voice Aided Electronic Stick for Visually Impaired People. We got idea about latest technology like Graphics Positioning System (GPS) & Graphics System Messaging (GSM). Which will help for tracking the location & used for making module of smart stick for visually impaired people and it gives us idea about Voice message get from Android Phone to that blind person.

Smart Cane: Assistive Cane for Visually-impaired people. We got idea from this paper for Voice message & Vibration when person detect obstacle with help of smart stick then blind person get aware to it by understanding Vibration alert & Voice message which comes from smart phone.

## 3. PROPOSED SYSTEM

This proposed smart cane and spectacles system is designed to solve the problems of current devices by focusing on affordability and including features like obstacle detection and audio guidance. This system is easy to carry, simple to use, and affordable, making it accessible to many visually impaired people.

Using technologies like the Arduino Nano and ESP32 controller, it offers advanced features without being expensive. These smart cane and glasses will help visually impaired individuals feel more independent and confident by giving them accurate, real-time information about what's around them.

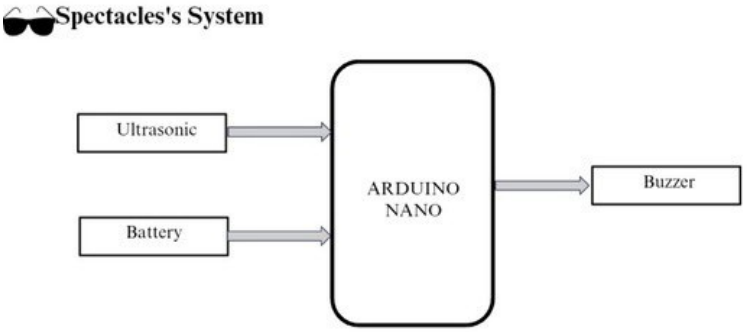


**Figure 1: Block diagram of spectacles system**

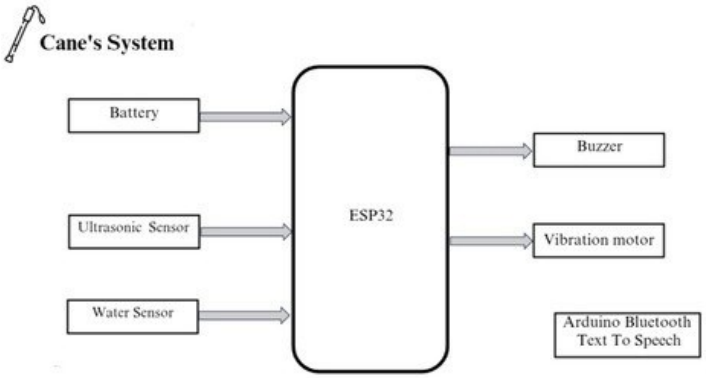


**Figure 2: Block diagram of cane system**

In this proposed methodology typically includes the following key components:

- Obstacle Detection: Ultrasonic sensors detect obstacles, sending data to the Arduino Nano micro controller in spectacles and ESP32 micro controller in cane, which triggers only sound alerts in spectacles and sound or vibration alerts in cane, depending on the mode selected.
- Dual Alert Modes: The DPST switch enables users to toggle between sound and vibration alert modes, ensuring alerts are perceived in noisy environments.
- Water Detection: Water sensors detect water on surfaces, triggering sound alerts to prevent slipping or drowning.
- Voice Commands and Alerts: The Arduino Bluetooth Text-to- Speech app provides voice commands and alerts about obstacle and water detection.

**Applications :**

Smart cane and spectacles enhanced safety and secured for applications such as:

- The visually impaired individuals can use this smart spectacles to avoid the obstacles.
- The blind person can use this smart cane to protect them from hitting the obstacles, falling on the wet surfaces and drowning in manholes.

**Advantages:**

The following are the advantages of our spectacles and cane system.

• Visually Impaired Individuals: The system can be used by visually impaired individuals to navigate their environment with greater confidence and safety.

• Fall Prevention: The system can help prevent falls by detecting obstacles and alerting the user.

• Slip and Fall Prevention: The water sensor can detect wet surfaces and alert the user to prevent slipping and falling.

• Assistive Technology: The system can be integrated into assistive technology devices to enhance the lives of individuals with disabilities.

## 4.EXPERIMENTAL ANALYSIS

Figure 1 shows a collection of original images that are spectacles system , whenever the ultrasonic detects the obstacle it will sends the data to the arduino nano controller and then the arduino nano starts operating the buzzer and gives sound alerts according to the distance between the sensor on the specs and the obstacle ..

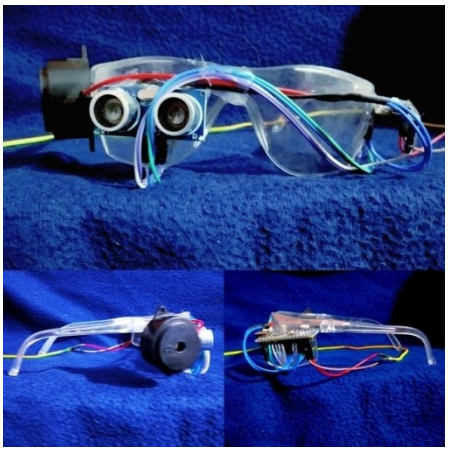

**Figure 3: Spectacles system**

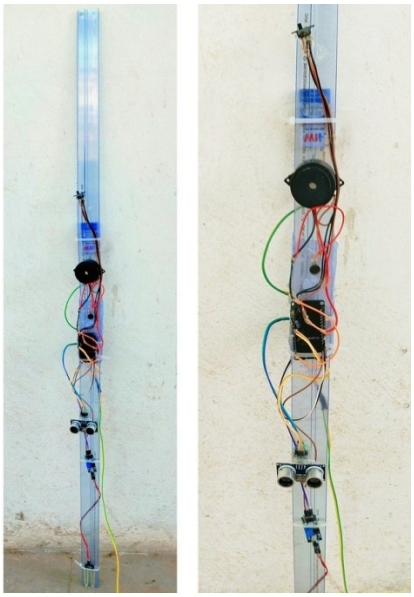

**Figure 4: Cane system**

Figure 2 displays a set of images of cane system. In cane there are different kinds of alerts provided. Whenever the ultrasonic sensor detects the obstacle, it will sends the data to the ESP32 controller and then the ESP32 starts operating the buzzer and gives sound alerts according to the distance between the sensor on the stick and the obstacle. And If the user are not able hear the sound because of noise then by using DPST switch, the mode can be changed from sound alert mode to Vibration alert mode. In this vibration alert mode instead of buzzer's sound alert, the vibration motor gives vibration alerts. The water sensor is used to avoid slipping on the wet surfaces and drowning in the manholes. It gives the buzzer's sound alert when it detects water on the surface.The arduino bluetooth text to speech app is used to give the voice commands and alerts about the obstacle and water detection.

## 5.CONCLUSION

This innovative assistive technology system, comprising Specs and Cane components, is designed to provide visually impaired individuals with enhanced mobility and safety. The system leverages ultrasonic sensors, ESP32 controllers, buzzers, vibration motors, and water sensors to detect obstacles, water, and other hazards. This system has the potential to significantly improve the mobility and independence of visually impaired individuals. By providing real-time alerts and feedback, the system enables users to navigate their environment with greater confidence and safety. Overall, this innovative system demonstrates the potential for technology to improve the lives of visually impaired individuals, promoting greater independence and mobility.

## REFERENCES

[1] Hemalatha Dilli, Venkata Mounika Sang and Sita Kumari K, "Smart Blind Stick Using NodeMCU with Voice Alert", 2022 OPJU International Technology Conference on Emerging Technologies for Sustainable Development (OTCON), ISBN: 978-1-6654-9295-9.

[2] hree Lakshmi R, Sneha M, Swetha K and A. Thilagavathy, "AI-Powered Smart Glasses for Blind, Deaf, and Dumb", 2022 5th International Conference on Advances in Science and Technology (ICAST), ISBN: 978-1-6654-9264-5.

[3] Rajanish Kumar Kaushal, K. Tamilarasi, P. Babu, S. E. Murthy and M Jogendra Kumar, "Smart Blind Stick for Visually Impaired People using IoT", 2022 International Conference on Automation, Computing and Renewable Systems (ICACRS), ISBN: 978-1-6654-6085-9.

[4] Ali Mustafa, Ahmed Omer and Ogba Mohammed, "Intelligent Glasses for Visually Impaired People", 2022 14th International Conference on Computational Intelligence and Communication Networks (CICN), ISSN: 2375-8244.

[5] Prashik Chavan, Kartikesh Ambavade and Roshani Raut, "Smart Blind Stick", 2022 6th International Conference On Computing, Communication, Control And Automation (ICCUBEA), ISSN: 2771-134X.

[6] Harini Induri, Shivani Malloju, Deepika Javvaji and K. Gayathri, "Third Eye for Visually Challenged using Sensing System", 2022 Sixth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), ISSN: 2768-0665.

[7] Simra Nazim, Saba Firdous and Vinod Kumar Shukla, "Smart Glasses: A Visual Assistant for the Blind", 2022 International Mobile and Embedded Technology Conference (MECON), ISBN: 978-1-6654-2021-1.

[8] L. Shashitha and P. Ashok Babu, "Ultrasonic Smart Spectacles for Visually Impaired and Blind People", 2021 3rd International Conference on Advances in Computing, Communication Control and Networking (ICAC3N), ISBN: 978-1-6654-3812-4.

[9] N. Loganathan, K. Lakshmi, N. Chandrasekaran, S.R. Cibisakaravarthi and R. Hari Priyanga, "Smart Stick for Blind People", 2020 6th International Conference on Advanced Computing and Communication Systems (ICACCS), ISSN: 2469-5556.

[10] Vanitha Kunta, Charitha Tuniki and U. Sairam, "Multi-Functional Blind Stick for Visually Impaired People", 2020 5th International Conference on Communication and Electronics Systems (ICCES), ISBN: 978-1-7281-5372-8.

[11] M. d. Razu Miah and Md. Sanwar Hussain, "A Unique Smart Eye Glass for Visually Impaired People", 2018 International Conference on Advancement in Electrical and Electronic Engineering (ICAEEE), ISBN: 978-1-5386-8253-1.

[12] Saurav Mohapatra, Subham Rout and Tanish Saxena, "Smart Walking Stick for Blind Integrated with SOS Navigation System", 2018 2nd International Conference on Trends in Electronics and Informatics (ICOEI), ISBN: 978-1-5386-3571-1.

[13] Naiwrita Dey, Ankita Paul, Pritha Ghosh, Chandrama Mukherjee and Rahul De, "Ultrasonic Sensor Based Smart Blind Stick", Ultrasonic Sensor Based Smart Blind Stick, ISBN: 978-1-5386-3703-6.

[14] Rohit Agarwal, Nikhil Ladha, Mohit Agarwal, Kuntal Kr. Majee and Abhijit Das, "Low cost ultrasonic smart glasses for blind", 2017 8th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON), ISBN: 978-1-5386-3372-4.

[15] Shripad S. Bhatlawande, Jayant Mukhopadhyay and Manjunatha Mahadevappa, "Ultrasonic spectacles and waist-belt for visually impaired and blind person", 2012 National Conference on Communications (NCC), ISBN: 978-1-4673-0815-1.