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# Navigation Enabled Smart Walking Stick for Visually Impaired using IOT

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**ABSTRACT:** This paper states the study that helps visually-impaired people using assistive technology (Smart blind stick). The study hypothesizes that a Smart blind stick that alerts visually-impaired people over obstacles in front could help them in walking with more consciousness. Technologies are rapidly evolving, allowing people to live healthier and simpler lives. Sightless people are unable to carry out their everyday activities, such as walking down the street, visiting friends or relatives, or doing some other tasks. As a result, visually impaired is incomparable because they cannot adapt as well to the environment. Blind individuals struggle when travelling from place to place and rely on predefined and repetitive routes with minimum obstacles to lead them to their destinations without assistance. Therefore it is important to have navigation devices that allow visually impaired individuals to maneuver and be directed throughout their journey independently and inform their current location. The current aid present for the visually impaired is just a stick for navigation. The stick doesn't help in proper detection of objects. Even the concerned members of these users are unaware of the location and status of the user. It is a development of the Smart blind stick as it acts as a companion for the blind when walking by sending messages and current location to the concerned person through GPS-GSM. The ultrasonic sensor helps to find the object in front of the user and also the distance of the object from the user and further alerts the user by a buzzer. Gyroscope is used for accident detection.

**KEYWORDS:** Assistive technology, GPS, GSM, Ultrasonic Sensor, Arduino.

## I. INTRODUCTION

Recent statistics of the World Health Organization (WHO), published in October 2019, estimate that more than 253 million people worldwide suffer from visual impairment (VI) with 36 million of blinds and 217 million people with low vision [1]. The increasing number of people with disabilities that attracts the concern of researchers to invent various technologies, hoping that these technologies can assist the disabled people in carrying out their tasks in everyday life like normal people [2]. Blindness is a state of lack of visual perception due to physiological or neurological factors. Imagine that you are walking in an unfamiliar place [3]. The objective of the paper is to discuss the development work of a cane that could communicate with the users through voice alert and vibration. Blind people are members of society, and their diversity in the world and social situations has been restricted. Blind people's disadvantages should not be seen as an excuse to shorten their lives; rather, they should be used as motivation to persevere. As a result, anyone with visual impairments requires assistance in the form of replacements for their eye function, specifically the visual function. The ultrasonic sensor senses the presence of an obstruction and calculates the distance between the source and the target alerts the user with a buzzer, a water sensor is used to detect the presence of water. The GPS module tracks the location of the user and navigation for the user. Gyroscope is used for accident detection.

## II. RELATED WORK

This section is related to the development of smart canes and walking sticks for the visually-impaired: "Design and Development of a Smart Walking Stick for the Blind" by M. K. Bhuyan et al. (2018) - This paper describes the development of a smart walking stick that uses ultrasonic sensors, a GPS module, and a GSM module to provide obstacle detection, navigation, and communication features. "Smart Cane for the Blind Using Arduino and Ultrasonic Sensor" by A. Kumar et al. (2017) - This paper describes the development of a smart cane that uses an Arduino

microcontroller and ultrasonic sensors to detect obstacles and provide haptic feedback to the user. "Development of an IOT-based Smart Cane for the Visually Impaired" by N. Mishra et al. (2019) - This paper describes the development of a smart cane that uses an Internet of Things (IOT) platform and sensors to provide obstacle detection, location tracking, and emergency calling features. "Smart Cane for the Visually Impaired" by S. A. Sayed et al. (2018) - This paper describes the development of a smart cane that uses a microcontroller and ultrasonic sensors to detect obstacles and provide haptic feedback to the user. It also includes a mobile application that provides additional features such as GPS navigation and emergency calling. These works provide inspiration and insights for the development of smart canes and walking sticks for the visually-impaired, utilizing technologies such as sensors, microcontrollers, GPS, and IOT platforms.

### III. /METHODOLOGY

The Smart blind stick was developed using an Arduino board, an HC-SR04 Ultrasonic sensor, a Buzzer, GPS, GSM and a power source. The circuitry was connected according to the manufacturer's instructions and a program was written and uploaded to the Arduino board. The program instructed the device to send out a sound wave, measure the time it took for the wave to bounce back off an object, and trigger the buzzer if an object was detected within a certain range. The Arduino serial monitor was used to display real-time distance values in cm. In this way, the person can easily find his way without getting injured. You can also see the real-time values of the distance on the Arduino serial monitor. In addition if a visually impaired person is in danger he/she can press the button on the stick which would send the live location of them using GPS and GSM module to their emergency contact person. The smart blind stick utilizes the gyroscope to detect potential danger, sending alert to concerned person if it remains in horizontal position for certain amount of time.

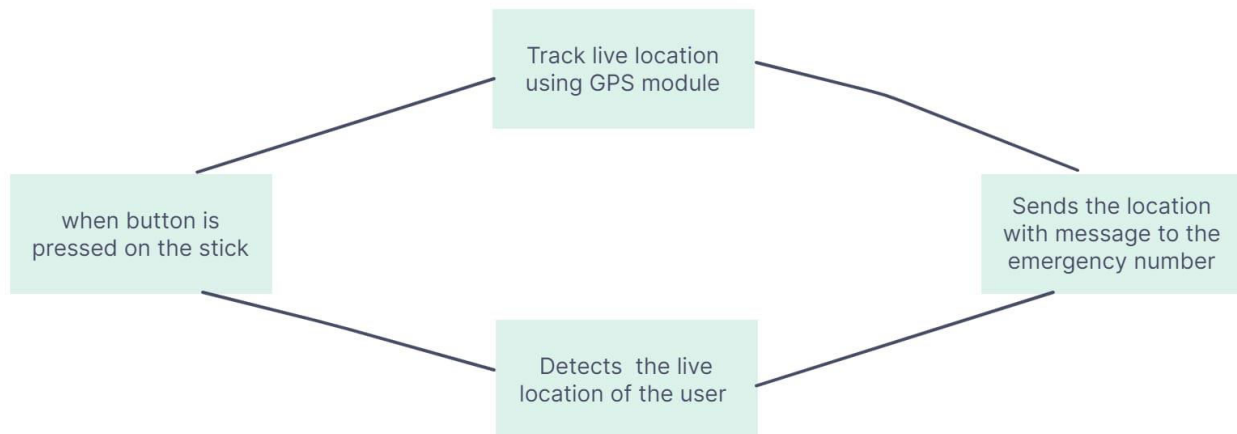


Fig.1.1 GPS-GSM Module Track

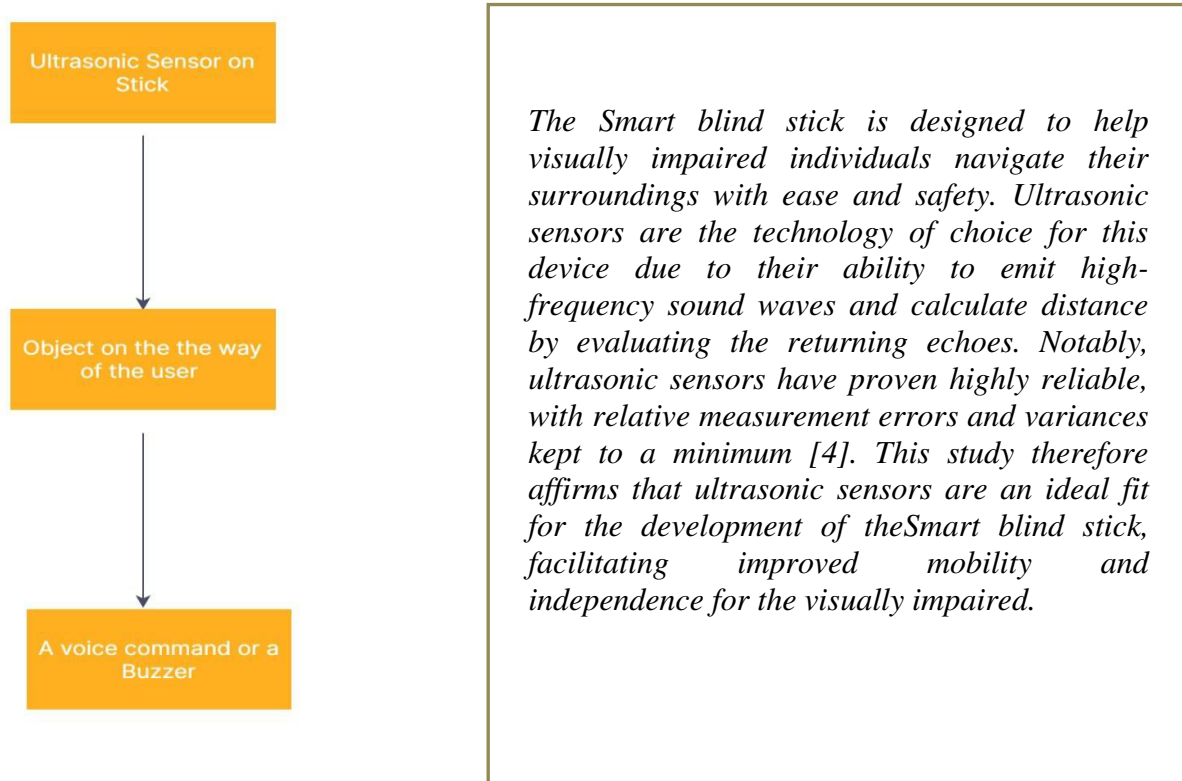


Fig.1.2 ultrasonic sensor with buzzer

#### IV. EXPERIMENTAL RESULTS

The Smart blind stick with GSM, GPS, and Ultrasonic sensor modules has undergone experimental testing to determine its effectiveness in aiding visually impaired individuals. The results of the experiment were highly encouraging. The GSM module enabled the device to send text messages to the designated emergency contacts, providing real-time updates on the user's location in case of an emergency. The GPS module was highly accurate in determining the user's location, facilitating easy navigation and helping the user to remain oriented. The ultrasonic sensor was highly effective in detecting obstacles and providing accurate distance measurements. The voice and vibration feedback provided by the device was highly intuitive and easy to understand, alerting the user to potential hazards and helping them navigate their surroundings with ease. Overall, the experimental results demonstrate that the Smart blind stick with GSM, GPS, and Ultrasonic sensor modules is a highly effective tool for visually impaired individuals, providing a high level of safety and mobility assistance. The smart blind stick effectively utilizes the gyroscope to detect potential danger. When the stick remains in horizontal position for certain amount of time, it successfully triggers an alert to the concerned person.

#### V. CONCLUSION

The primary aim of this research is to devise a cutting-edge prototype that effectively detects and alerts users of potential obstacles or objects in their path. The prototype is designed to relay warning messages through both voice and vibration feedback, while simultaneously providing live location updates to designated emergency contacts. The results from the trial conducted indicate that the prototype, known as the "Smart blind stick," has successfully met all of its objectives. To further enhance the performance of the Smart blind stick, this study recommends integrating a power supply meter to monitor its battery life, as well as implementing an alarm system that can be activated in densely crowded areas. Furthermore, replacing the PVC material with sturdy steel can significantly improve its durability and robustness. Finally, the addition of a buzzer timer feature would enable users to customize the duration for which the buzzer alert sounds. These improvements will ensure that the Smart blind stick continues to provide its users with an unparalleled level of safety and security while navigating their surroundings.





## REFERENCES

- [1] M. Chessa *et al.* "An integrated artificial vision framework for assisting visually impaired users" Comput. Vision Image Underst. (2016).
- [2] A. Nurulnadwan, M.R. Nur-Hazwani, and A.M. Ariffin, "Assistive Courseware for Visually-Impaired," (2009). in Proc. IVIC 2009, LNCS 5857, 2009, pp. 905-915.
- [3] S Romadhon, A K Husein," Smart Stick for the Blind Using Arduino", International Conference on Science and Technology 2019, doi:10.1088/1742-6596/1569/3/032088, 2019.
- [4] Han Y. and Hahn H., "Localization and Classification of Target Surface Using 2 Pairs Of Ultrasonic Sensors", IEEE International Conference on Robotic and Automation, Detroit Michigan, pp. 1-2, 22 May 1999
- [5] D. Dakopoulos *et al.* Wearable obstacle avoidance electronic travel aids for blind: a survey IEEE Trans. Syst. Man Cybern. Part C (Appl. Rev.)(2010)
- [6] Nurulnadwan Aziz, Nur Hazwani Mohamad Roseli, Erratul Shela Eshak, & Ariffin Abdul Mutalib. (2010). Assistive Courseware for the Visually Impaired based on Theory of Multiple Intelligence. In Proceedings of Knowledge Management International Conference 2010. UUM.
- [7] A. Nurulnadwan, M.R. Nur-Hazwani, E. Erratul-Shela, and A.M. Ariffin, "The Enhancement of Assistive Courseware for Visually Impaired Learners," in Proc. ITSIM. 2010.
- [8] Ariffin Abdul Mutalib & Faizah Maarof. (2010). Guidelines of Assistive Courseware (AC) for Hearing Impaired Students. In Proceedings of Knowledge Management International Conference 2010. UUM.
- [9] Chang C. C. and Song K. T, "Ultrasonic sensor data integrations and its Application to environment Perception", IEEE transaction on Ultrasonic, Vol. 1, pp. 3-5, 2000.
- [10] Borenstein J. And U Irich I. The GuideCane - Applying Mobile Robot Technologies to Assist the Visually Impaired, IEEE Transactions on Systems, Man, and Cybernetics, Part A: Systems and Humans, Vol. 31, No. 2, pp. 131-136, 2001.
- [11] Tirthasarathi Lodh, Ashish K. Paswan, Akshay Subramaniam and Vikram Singh, "Assistive device for indoor and outdoor mobility of the visually-impaired people." UNITES 2016, IARC Centre for UN, accepted and published on October 15, 2016.
- [12] Lakde, Chaitali Kishor, and Prakash S. Prasad. "Navigation system for visually impaired people." In Computation of Power, Energy Information and Communication (ICCPEIC), 2015 International Conference on, pp. 0093-0098. IEEE, 2015.



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