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# DESIGN AND CONSTRUCTION OF ARDUINO BASED AID FOR VISUALLY IMPAIRED PEOPLE

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**Abstract -** *Vision is one of the most important senses in the human body which helps in mobility and perception of human surrounding. People who suffer from blindness may face difficulties in self-reliability and navigation. Using IOT we are proposing a device which will detect obstacles and guide the visually impaired person to walk without constraint in close as well as open environment. We have used Ultrasonic Sensor and IR Obstacle Sensors to detect hurdles such as staircase, potholes and other barriers which will instantly signal the user through vibration and voice feedback. The stick also uses a Moisture Sensor which detects liquid obstacles and an LDR module for day and night detection. Arduino is the microcontroller used with a receiver which makes the interfacing of components easier. MQ2 Smoke Sensor in the device is useful for blind people to detect fire smoke or any other gas leakage which will protect them from future accidents. If the stick is misplaced a RF Tx/Rx module is used with a beeping system letting the user know its location and we have also added a GPS tracker which will track the live location of the user. We have included many features in the stick which is cost friendly and helps the blind person to easily confront with his day to day activities*

***Key Words***: Audio feedback mechanism, IoT (Internet of Things), IR Sensor, GPS Tracking, Arduino, MQ2 gas sensor.

## 1. INTRODUCTION

World Health Organization or WHO states that more than 2.2 billion people have some kind of visual impairment. Over 90% of these people live in either low- or middle-income countries. Preventive care education, curative services and quality rehabilitation is not yet available for everyone. Visually impaired people face problems with visualizing obstacles and objects that are crucial for generating a cognitive image of the environment around them. These challenges often lead to a fear of accidents, collision and disorientation. This can result in reduced mobility and restricted actions and later on social isolation for unsighted people. Around 30% visually impaired people never step outside their house without a companion. Non-sighted navigation requires more cognitive resources and planning and visually impaired people are at great threat of mobility related accidents, injuries and falls. With the increase in modern technology and IOT devices, Electronic Travel Aids (ETAs) are used to assist the blind. These devices aid the user by warning them with the help of signals like sound waves or through physical means. Our product design is based on a hardware stick unit which will help the blind to travel in any space, be it indoors or outdoors. Different sensors are also used for the convenience of the user and all these sensors will collect and send data to the Arduino which will then provide an automated Voice Feedback. Another feature of this system is a module integrated to help the blind find their stick if they misplace it. .To do this we use a wireless remote with RF Signals. When a dedicated button on this remote is pressed, the stick starts buzzing giving the user a audio feedback to locate the position of the stick. The stick will keep on buzzing if the remote is on until it is switched off. Tracking the blind is made easier by using a GPS module. In all the previously made Blind Stick the features were limited and not very efficient for the user to use. In this project, we aim to solve the many problems faced by the visually impaired so that accidents are avoided and can travel whenever they want on their own.

## 2. LITERATURE SURVEY

Nishajith.A, Nivedha.J, Shilpa Nair [2] proposed a Smart Cap-Wearable Visual Guidance System for Blind in 2017. Here the Smart cap is based on TensorFlow software library and text to speech synthesizer software. Using Raspberry Pi and NoIR camera object detecting cap is developed for blind. The main disadvantage is that this smart cap can help in detecting objects using previously trained model but cannot guide to walk through path having unknown obstacles which will confuse the user and will not guide through every obstacle efficiently. So, this system gives priority to only known hurdles. The Raspberry Pi and the camera module will make the stick bulky. Artificial Intelligence takes lot of time and data to collect and implement the required system. They have limitation on the range as well as only previously stored data of obstacle can be identified. This might be not be reliable for everyone to use due to the limited features and increased cost.

Swagat Das, Sonal Patro, Ritika das, Antara Mishra [3] proposed a system using Arduino based Safety Device for the Visually Challenged. The proposed system consists of a wearable band and uses vibrator motor and buzzer to signal the user. Ultrasonic sensor-HC SR04 is used for

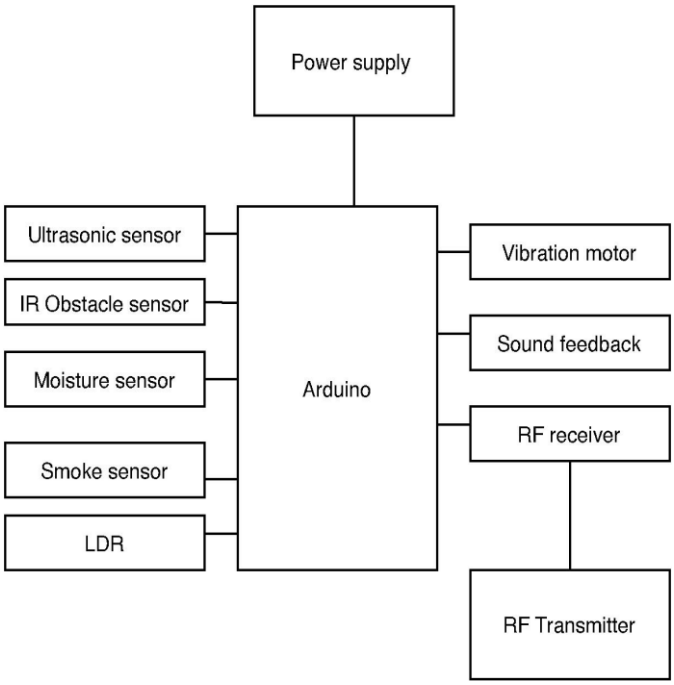
obstacle detection with the help of microcontroller Arduino Pro Mini. The main drawback of this system is that it doesn't provide Voice Feedback and so the user may not know the exact distance or direction of the obstacle.

N. Sathya, Mala, Sushmi Thushara, Sankarisubbiah [4] proposed a navigation gadget for visually impaired based on IOT. The walking stick is attached with GPS and Bluetooth headset along with sensors. It provides the location of the user and detects obstacles giving voice feedback through earphones. But the main disadvantages include its limited features and totally dependency on Ultrasonic Sensors for object detection. It doesn't have a backup plan if the sensor fails to detect an obstacle. To overcome the limitations of this system it should also contain the IR sensors and other sensing devices to give feedback at the time of emergency.

Mohd Helmy Abd, Wahab and Amirul A. Talibetal [5] developed a cane that could interact with the blind through a voice system and vibrations. They used Ultrasonic Sensors to detect because they are good in detecting obstacles which are a few meters away and this information was sent as audio. The audio reaches the user with the help of a speaker. Here blind people might find difficulty to travel without any emergency alert rather than having only Ultrasonic Sensors and it also doesn't track the location of the blind in case of emergency situation. If the stick is misplaced there is no way for it to be found without assistance which makes this proposed system not too efficient.

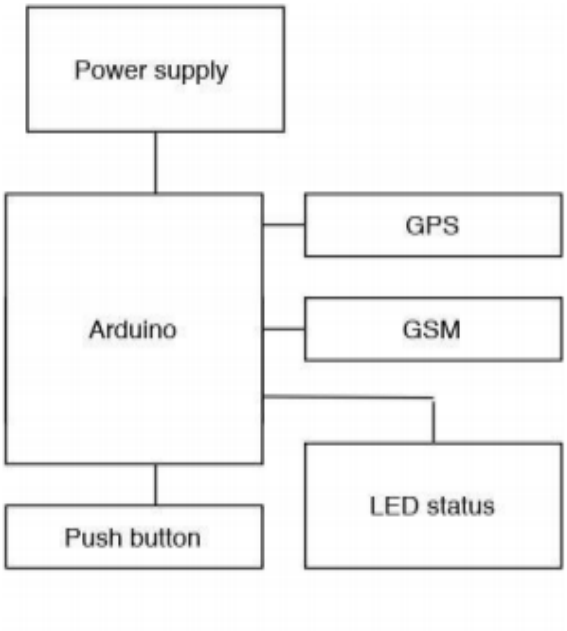
S. Gangwar [6] designed a smart stick for the visually impaired which could warnings of an obstruction earlier than a point of contact using IR sensors. Once the obstruction was detected, the stick could alert the user by using a vibration. But since the smart stick focused only the detection aspect of obstacles, it does not meet any emergency cases needed by the blind. Even the IR sensors do not show much efficiency since the range of detection is really short without any hints of direction. From our research we analyzed that even though there are systems which help the blind, there are still areas which are not yet solved to the fullest and idea of a smart cane could be totally enhanced to minimize most of the problems which a blind person could face during travel. In all the previous projects there are several problems that are identified. The existing technologies mostly use either IR Sensors or Ultrasonic sensors and both of them have their own pros and cons. When we talk about IR sensors, the range of detection is too less. They could at most detected objects which are really close and small like chairs, poles, parked vehicles, and such other obstacles. But in cases of vehicles approaching at a high speed it might end up in accidents. This shows the drawbacks of the stick design thereby not assisting the blind person during emergency situations. Some existing models require much complex and bulky components making the model more expensive and inadequate. Complex and dynamic algorithms make the Blind Stick slower and non-compatible to use in real-time. Previously, the system cannot detect both the direction and distance of the obstacle. One more drawback of the old blind stick projects is that if the stick is misplaced there is very less chance the user can find it on their own. Hence many features are not included in the stick along with GPS tracking and other sensors.

## 3. PROPOSED SYSTEM




We present a system for an electronic blind stick which overcomes the drawbacks over the existing blind sticks and increase the safety of the visually impaired. We have used two systems which include the Sensing and the Tracking Module. In the Sensing Module with Arduino as the microcontroller we have used Ultrasonic Sensor and IR Sensors at different positions so that it can properly detect the obstacles. Ultrasonic Sensors can sense even the farther objects along with the distance measurement. The IR Sensors are positioned in the front, left and right direction to gather information of obstacles present in any direction and revert back accordingly. Mud or water can be sensed with a moisture sensor and MQ2 Gas Sensor is used to detect any presence of smoke or gas in the surrounding, immediately informing the user regarding the forthcoming dangers. If any kind of barrier is sensed by whichever sensor, the sensor sends the data to the microcontroller unit or the Arduino. The microcontroller processes the information and informs the blind person about the threat which they may face by sending a signal through voice output based on previously recorded data. APR 33A3 Voice Recorder and playback IC is used for this

purpose and the voice feedback shall be given through earphones so that the blind person could properly listen and accordingly enact an action. This Voice Feedback Blind Stick is an innovative stick designed for visually disabled people for improved navigation. Vibration Motor vibrates if an obstacle is detected. A Light Dependent Resistor is used which changes with the light intensity that falls upon it. If the stick is misplaced then the stick could be easily found by pressing ON in the RF transmitter remote. The stick will contain the RF receiver and will keep buzzing until pressed OFF. Through the sound the user can track in which direction the stick is thus making things easier for the blind person to navigate with minimal assistance. In the tracking module we have used another Arduino with GPS and GSM Module with a Push button and a LED. If the user is in any kind of trouble, they have to just press the Push button. The button will activate the tracking system and the GSM will track the live location and send data to the microcontroller. The microcontroller will thereby send the exact location of google map with the statement, 'I am in trouble' through an SMS to the enlisted number of people. The LED Status will blink if the work is done and the Arduino will get a signal and the Tracking Module will be turned off.




## 4. CONCLUSION

The goal of our system is to help and guide visually challenged people and to reduce the complexities of their daily life. The various types of sensors used in our proposed device performs different applications which ensures the safety of visually impaired people. This system could be a very low-cost product to help the millions of blind people out there. The device is easy to use and handy. The Voice Feedback mechanism provided by the device gives instructions about gas leakage, wet floors, potholes, other obstacles and highly reduces the probability of accidents. In the future the proposed system can be modified by using Artificial Intelligence and Android Interface. This device can be used in hospitals for patients, in industries for blind workers and also in day to day life of visually impaired people to carry out with their normal life with minimal guidance.

## REFERENCES

[1] Article from the World Health Organization (WHO). http://www.who.int/mediacentre/factsheets/fs282 /en/

[2] Nishajith, A., et al. "Smart cap-wearable visual guidance system for blind." 2018 International Conference on Inventive Research in Computing Applications (ICIRCA). IEEE, 2018.

[3] Das, Swagat, et al. "Arduino based Safety Device for the Visually Challenged." 2019 International Conference on Communication and Signal Processing (ICCSP). IEEE, 2019.

[4] Mala, N. Sathya, S. Sushmi Thushara, and Sankari Subbiah. "Navigation gadget for visually impaired based on IoT." 2017 2nd International Conference on Computing and Communications Technologies (ICCCT). IEEE, 2017.

[5] Wahab, Mohd Helmy Abd, et al. "Smart cane: Assistive cane for visually-impaired people." arXiv preprint arXiv:1110.5156 (2011).

[6] Gangwar, Shantanu. "Smart stick for Blind." New Delhi, Sept 26 (2011).