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Design and modification of smart stick for visually impaired with stick finder

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ABSTRACT

To improve navigation of visually disabled people we have designed an innovative stick using Arduino. This stick uses advanced technology to navigate with ease. The stick which we have modified is lighter in weight, affordable and easy to handle. This stick first uses ultrasonic sensors and detects obstacles. On sensing obstacles, the sensor passes this data to Arduino. Arduino uses C programming. It then processes this data and calculates the distance of obstacles from the person. If an obstacle is not close to the person then the circuit stays steady. If the obstacle is close to the person then the circuit sends a signal to the sound buzzer and vibrator. As the distance between person and obstacle gets reduced the sound of buzzer and vibrator goes on increasing. This system even made for blind-deaf people as they have only sense as a way to understand any process with the help of vibration they can sense the obstacle. This system has one more feature i.e. A stick finder. This helps the blind person find the stick where they might have kept it with the help of a remote. Pressing the remote button sounds a buzzer on the stick which helps the person to find the stick. Thus, this system allows for obstacle detection as well as finding sticks misplaced by visually disabled people.

Keywords— Arduino, Ultrasonic sensor, C programming, Blind-Deaf

1. INTRODUCTION

The people who find it difficult to recognize the small detail with naked eyes are considered visually impaired. According to the survey done by WHO in 2011 it estimated that 1% of the human population are visually impaired and 10% are fully blind. The main difficulty with blind people is that they cannot move freely rather they need a person with them every time to guide them. They usually depend on their family for mobility and financial support. For them physical movement is a

challenge. They cannot interact with the people for social activity.

We have modified the stick so that blind people can move easily. Also, our design has a stick finder. The stick which we have modified is lighter in weight, affordable and easy to handle. The bulky design earlier made the user exhausted. The aim of this research work includes the design of stick as well as the remote i.e. stick finder which will help the blind person to relocate the stick.

1.1 Objective

The objective behind designing the stick is to help visually challenged people to navigate with ease using advanced technology. Also, another motive is to help blind-deaf people with this stick. There is also another modification i.e. stick finder or remote which will help people find the stick. This stick is not bulky, and the cost is also less which makes it affordable too. It is also user friendly.

1.2 Problem Definition

- Visual impairment can affect the quality of life of a person. It limits the ability of a person to perform any task.
- Barriers coming in their way like information and mobility can have a serious impact on their everyday life.
- They need a proper path for this so that their freedom is not affected, and they can explore places without any hesitation.

1.3 Literature Review

[1] **Implementation and Design of Smart Blind Stick for Obstacle Detection and Navigation System by K. S. Manikanta, T. S. S. Phani and A. Pravin Vol.8:[8]**. This system normally uses Ultrasonic Sensor and microcontroller. The sensor uses a light and water sensor. The system first senses data through the Ultrasonic Sensor then passes it to the

microcontroller. Microcontroller sends a signal to the buzzer. Any type of obstacle is sensed by this stick. This system uses GPS and GSM modules to locate the stick.

[2] **A Smart Stick for Assisting Blind People by Ashraf Anwar and Sultan Aljahdali Vol.19:[3].** This system has five sensors: Ultrasonic Sensor, IR sensor, Water sensor, Fire sensor and Light sensor. After sensing obstacles, the buzzer and vibrator start. It requires connectivity of GPS through mobile to guide the blind person. The blind person also has an earphone to listen to the navigation through the phone.

[3] **A sensor based smart stick was introduced by Gayathri in the year 2014.** A blind person is guided with the help of a GPS receiver, vibrator and a headphone to navigate. The device has some limitations mainly a water sensor which can detect if the water level is over 0.5 cm, the four types of obstacles (concrete wall, human body, plastic & cardboard box) could be detected by the stick and is not feasible to provide guidance at high discontinuities.

[4] **An ultrasonic sensor based smart stick with GPS system, vibrating motor and a buzzer proposed by Aggarwal and Kumar (2015).** According to the device description the stick seemed to be heavy as they failed to put forward the pictorial view of the stick. Also, there is no information regarding the ON condition of the two major components i.e. Buzzer and vibrator. It is also impossible to use the SMS feature by an illiterate blind person.

[5] **Smart walking stick - an electronic approach to assist visually disabled person by Mohammad Hazziz, Rana Saha, Sayemul Islam Vol 4, Issue 10, October 2013.** This design consists of a walking stick which is made by using various components such as microcontroller, ping sonar sensor, proximity sensor, wet detector and a micro pager motor. The design mentioned above has a microcontroller i.e. PIC16F690 and it produces pulses and on basis of this pulses the output is measured, and it operates the pager motor and drives the buzzer.

[6] **A survey of a voice aided electronic stick for visually impaired people by Gurubaran, Gowrishankar Kasilingam (2014).** The objective is to help the blind people by designing a stick which consists of a global positioning system and Global Messaging (GM). GPS helps to locate the blind person's location and it is sent to the GSM in the form of coordinates and this will be sent to the receiver from blind person's location.

1.4 Methodology

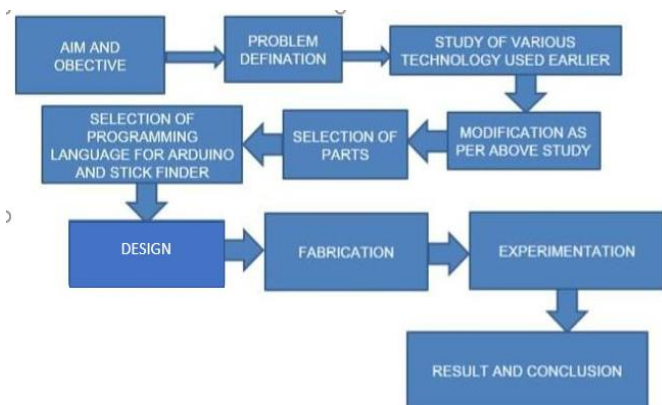


Fig. 1: Methodology

- **PHASE 1-Aim and Objective:** In this phase we have studied and discussed the aim and objective of our project and the further steps.
- **PHASE 2-Problem Definition:** Thrust areas were studied and problems existed and were marked out with proper survey.
- **PHASE 3-Study of Various Technology Used Before:** Earlier this project was made by using various components such as Raspberry Pi and microcontroller.
- **PHASE 4-Modification after Proper Study:** Going through the various research papers and references it was decided to modify the project. Thus, the design was changed with proper modification.
- **PHASE 5-Selection of Parts:** After various studies as the modification was decided simultaneously the parts required for the modification were also decided with proper survey.
- **PHASE 6-Selection of Programming Language for Arduino and Stick Finder/remote:** Here in our project we are using Arduino, it supports C and C++ language and C++ language for Arduino was finalized.
- **PHASE 7- Design:** Design of the stick is finalized.
- **PHASE 8- Fabrication:** With the proper analysed dimension, fabrication of complete stick will be done.
- **PHASE 9- Experimentation:** After the fabrication, experiment of the stick will be done.
- **PHASE 10- Result and Conclusion:** A proper conclusion will be done based on experiment.

1.5 Construction and Working

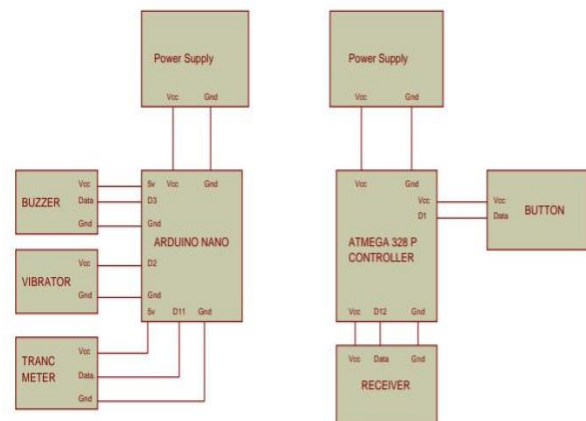


Fig. 1: Circuit Diagram

This smart stick for visually impaired requires two separate circuits. One is the main circuit which will be mounted on the blind man's stick. The other is for a remote which is used to locate the stick. Here, all the sensors are controlled by Arduino Nano. The 9V battery powers the complete board which is regulated to +5V using a 7805 Voltage regulator. The Echo pin is connected to Arduino nano pin 3 and 2 from RF receiver signal is read using ADC pin A0. To the pin 12 a buzzer is connected which gives the output.

RF Remote Circuit: Encoder and Decoder is required for 433 MHz module. The data pin of the receiver is given to the Arduino through an RC filter now whenever the button is pressed the receiver output sense value interruptedly. When button is not pressed this repetition cannot be seen. So, we have written the Arduino program to detect the stick for the blind person.

1.6 Expected Outcome

The aim of this study was to design and analyse a smart walking stick for the blind people which is successfully

accomplished. It is designed to be effective and affordable. This device helps in better detection of obstacles coming in the path of a blind. This system offers a reasonable cost, ease of handling, portable and is robust in nature for navigation with respect to time. The system is light in weight though it consists of sensors and other components. The device is constructed in such a manner that it can detect obstacles and find the lost stick. A vibrator and a buzzer provide the ease of use for a blind person.

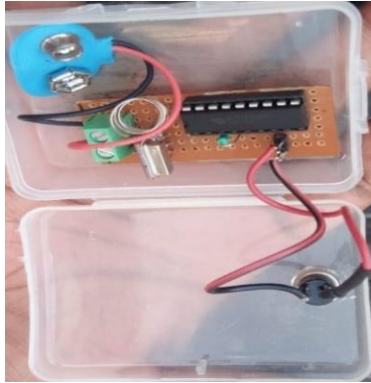


Fig. 2: Remote



Fig. 3: Transmitter and Receiver

2. CONCLUSION

We have successfully designed and modified the blind stick for visually impaired people. With the help of this stick blind person can navigate with ease. The obstacle detection of this stick is very quick and accurate as compared to the earlier designs. In this design as the person comes towards the obstacle the vibration and sound of the buzzer increases so even if the person is deaf, he can also easily navigate with the help of this stick. This stick allows the visually impaired to work easily in all types of environment. If the person loses the stick, then they can find it easily. The stick is easy to handle and affordable for all types of people. Our design is lighter in weight as compared to the earlier designs which have been made using the micro-controller.

3. REFERENCES

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