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BLIND GUIDE STICK USING GPS AND GSM MODULE

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Abstract - The innovative Blind stick system is capable of operating in user friendly manner, so that the blind person can walk independently without getting help from others. This system assists the blind to navigate on their own. in case of emergency situations such as high traffic density the location of the member is shared to the family members The prototype model consists of a stick and a hand cuff within built pulse detector. The stick with sensors deployed can detect the obstacles in front with sensors and it will produce various buzzer sounds depending upon the direction. The buzzer would alert the user. Furthermore, the Sensors on stick can detect the water and fire on ground and informed to the person by buzzer. The hand cuff is equipped with in built GPS , GSM and pulse detector equipments , so that if the member pulse falls below a threshold level then his location will be shared to his family. By trial and error method the system can detect obstacles such as pedestrians, objects, water and heat with greater

Key Words: GPS-GSM, smart cane, Blind Assistance, Embedded C, MPLAB

1. INTRODUCTION

The survey conducted by World Health Organization in 2017 estimates that there are 327 billion people in world with visual impairment, 36 billion of people are blind and 258 billion are with low vision, and around 24 million people are blind in India,. This system designs and develops a portable unit (stick) for the blind people for easy navigation in all places. The stick with long cane structure with some alteration at hand cuff parameter is used because it can feel the path nature and detect obstacles in the path of the blind person. Being an emerging area of research, a review of the most recent literature has been carried out.

2. LITERATURE SURVEY

Radhika, P. G. Pai, S. Rakshitha, Rampur Srinath, student information science and Engineering, NIE, Mysuru, India.
A smart stick has been built for the visually impaired people that help to detect obstacles with the use of infrared, ultrasonic and water sensors. GPS and GSM module helps them to navigate and reach his destination and also gives information to his guardian where he is located. The blind person can also send emergency message or make emergency call at times of risk, to his guardian through GSM module.

Olakanmi O. Oladayo Electrical and Electronics Engg, Technology drive, office 6, new faculty of Engineering building, University of Ibadan, Ibadan, Nigeria.
This is achieved through implementation of design for visually impaired, thus eliminating the problems associated with the existing solutions. This makes it know the exact location, altitude at any given moments and current orientation of obstacles. This magic wand is preloaded with map information of street, position of potential obstacles and landmark, doorways, staircase and dangerous obstacles. The performance and functionality are also improved.

Rohit Sheth, Surabhi Rajandekar, Shalaka Laddha, Rahul Chaudhari, Pune.
The idea behind the design of the stick was to keep it structurally similar i.e, their light weight and easy to handle. This smart blind stick uses ultrasonic sensors to detect obstacles, holes, pits, etc. The user is notified about the same by pre-recorded sound messages and in the form of vibrations. This audio feedback will keep user alert. The intensity of vibrations is an indications of closeness of an obstacles in the walking path of the user.

3. EXISTING SYSTEM

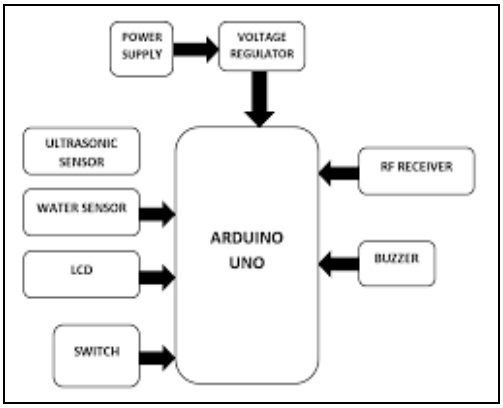
i. In the existing system the blind people are guided by just a stick which they tap on the floor as they walk.
ii. If there is any water in front of the person it cannot be detected by just the tap and the person steps on the water And may slip and fall.
iii. The blind person is guided by trained dogs to know their surrounding
iv. Cane provides the assistance for the blind. The device is totally operated with spring mechanical suspension to detect Obstacles on the ground, unbound surfaces, pit holes, steps with varying slopes

4. PROBLEM STATEMENT

For most of us, who are normal and healthy at least can reach the destination somehow but for some unfortunates like the blind people finding a location becomes an extremely tedious process. They will be in need of continuous help and companionship till they reach their desired destination.

Blind peoples having problem while travelling through bus or by any way. They don't understand about exact location, obstacles while travelling. By this the problem can be overcome by the blind stick and guiding spectacles.

5. BLOCK DIAGRAM



6. METHODOLOGY

The working behind this blind stick is that it is used for special purpose as a sensing device for the blind people. The circuit provides 5V power supply for the circuit and maintains its output of the power supply at constant level. It is used widely to detect objects using ultrasonic sensor and IR sensor. If any object is present, the ultrasonic sensor detects the object by measuring the distance between the object and the user and sends the data to the arduino UNO. To determine the distance of an object, calculate the distance between sending the signal and receiving back the signal. Distance=speed*time. The speed of the signal travelling through air is 341m/s. The Time is calculated between the sending and receiving back the signal. Since the distance travel by the signal is double, it is divided by two i.e., Distance=*Distance/2.IR sensor is placed at right and left of the stick to detect the object. Since, it is very small range, it detects the closer objects. Arduino processes with this data and calculates with the command conditions. If any object is found nearer, it sends the command to the user through the speaker or microphone. The command is already stored in the voice playback module which sends alert message to the user about the object.

The command condition is as follows:

[1] If the distance between the objects and the person is 30 inch, it will send the command as the obstacle is nearer to the person

[2] If the object is about 60-90 inch, it will send the command as the obstacle is just closer and reaching the person.

[3] If the object is about 90-120 inch, it will send the command as the object is far away from the person.

7. WORKING

The ultrasonic sensors emit sound scopes with frequency(>20KHZ)which is inaudible to human ears. The microcontroller then processes this data and calculates if the obstacles is close enough. If the obstacle is not close the circuit does nothing. If the obstacle is close microcontroller sent a signal to sound a buzzer. It also detects and sounds a different buzzer if it where detects water, the microcontroller reads the distance of the obstacles user sensor and also comments the buzzer. Light sensor gives the feedback about environment whether its dark or bright and alerts the blind through vibration or buzzer.

8. HARDWARE REQUIREMENTS

- Ultrasonic Sensor:
- ATMEGA – Arduino Uno
- GPS-GSM
- Vibration Motor
- Water Sensor:
- Infrared Sensor
- Buzzer

ULTRASONIC SENSOR: Ultrasonic sensor is used, as, it is less affected by target materials or by color, it is capable of detecting objects within a range of 4 meter. These ultrasonic sensors are designed to resist external disturbances such as vibration, infrared radiation, ambient noise, and EMI radiation. The sensor used is a SRF-04. It requires a short trigger pulse and it provides an echo pulse. Ultrasonic waves are emitted from the module and bounce back when hits an objects and obstructions in the path of the user. The output of the sensor provides change in voltage with respect to the distance of the obstacle. Also potholes can be detected using this system.

ATMEGA – Arduino Uno: The control sub-system consists of an Arduino Board having an ATMEGA328P microcontroller merged in it. Arduino is an open-source single board microcontroller, heir of the open-source Wiring platform, thus helping in designing electronics projects easily. The hardware consists of a simple open hardware design for the Arduino board with an Atmel AVR processor and on-board input/output support. The software consists of a standard programming language compiler and the boot loader that runs on the board. The sensor output is provided

to an Arduino which calculates the distance based on the program. The obtained value is compared with the fixed value and a vibratory pattern of different intensities is generated

GPS-GSM: When the GSM modem receives a message the microcontroller will process the message with the keyword Saved in it. Then, it will get the location of the stick from the GPS modem and transmit the location to the GSM modem in order to respond to the sender. In case of an emergency, the user of the stick can press the emergency button the microcontroller access the location from the GPS modem and transmit the location to the GSM modem which will send a SMS messages to the saved number in the system. The authors can acknowledge any person/authorities in this section. This is not mandatory.

VIBRATION MOTOR:A vibration motor is used in the system design, which vibrates with three different intensities depending on the Distance from the obstacle. If the obstacle is very near then Intensity of the vibration will be very high. Intensity of the Motor decreases as the distance of the obstacle increases.

WATER SENSOR: Water sensors available are used to detect water levels inside tanks and very expensive. Our objective is to detect water existence regardless its level. So we used a costless alternative. Three wire probes fit at the bottom of the stick to sense obstacle like water pits, puddles and water spread. Two wires are used to complete the circuit and another one wire is used to short circuit. Once wires touch water, the circuit is shorted, this interrupts the microcontroller, and beep sound is produced by the speaker to warn the blind person about the puddle

INFRARED SENSOR: Infrared sensor recognize small obstacle but with less accuracy than laser sensors. However using laser sensor is costly which contradicts to our aim in obtaining affordable aiding devices. Infrared sensor includes a transmitter and a receiver. The IR transmitter is an IR LED (Light Emitting Diode) and the receiver is an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, its resistance and correspondingly its output voltage change in proportion to the magnitude of the IR light received. This is the principle of working of Infrared sensors. It can detect obstacles in a range within 50 cm at an angle of +/- 45 degrees accurately.

BUZZER: A low frequency piezo buzzer is used to indicate that the obstacle is very close to the person and there might be a chance of collision. A buzzer is used along with the vibration motor as an alerting the user in crowded areas.

9. ADVANTAGES

1. Detection of Obstacles
The obstacle detection circuit consists of an ultrasonic sensor interfaced to the Arduino Uno Board. The sensor

detects the presence of obstacle in each direction and then the range of the obstacle is calculated. If the distance is within 70cm then vibration motor will be vibrating with highest intensity and also the buzzer will be on. If the distance is between 70cm and 150cm then the vibration motor will vibrate with medium intensity and if the distance is above 250cm then the intensity of the vibration motor will be less.

2. Detection of Potholes

The pothole detection system consists of an ultrasonic sensor and a buzzer interfaced with the Arduino Uno. The working of this circuit is based on the assumption that the height of the ultrasonic sensor mounted on the stick will remain constant in case of a plain path. But if there occurs any noticeable increase in its height from the ground above a certain threshold level then the buzzer will start buzzing. This will help the visually impaired person in detecting a pothole or a staircase ahead.

3. Emergency Calling

The GSM_GPS module is used in emergency situation. This module receives the information from the GPS satellite in NMEA format and transfers the latitude and longitude information as SMS message to a predefined mobile number in case of emergency.

10. FUTURE SCOPE

The future scope of the existing smart stick, guides the visually impaired person in his navigation independently in an efficient manner ensuring the person's safety.

a. The Braille input device gives the blind person an uncomplicated method to provide the destination address for navigation.

b. The programmable wheels would steer the stick away from the obstacles and also leading the blind person towards the destination.

c. Internet of Things is a trending concept which can increase the benefits of the smart stick by allowing one stick to communicate with another smart stick (or mobile , PCs) nearby to utilize the functionality of the other stick when one stick's functionality breaks down.

d. In order to run this integrated set of hardware we can use solar panels as an alternative to the battery. The use of solar panel occurs to be more advantageous as it uses sunlight, the easily available renewable resource of energy, to get recharged.

11. CONCLUSION

This paper presents the implementation of a smart stick that assists a visually impaired person to his destination safe and secure. We make use of various sensors to detect the obstacles ahead and warn the blind person about the obstacle through beep sound. The intensity of the beep sound increases as the person nears the obstacle which aid him to move aside of the obstacle. We take the benefits of GPS module and GSM/GPRS module, where GPS module helps to trace the blind person using the data collected by it. In case of dangerous circumstances the person whose phone number has been saved is notified that the blind person is at risk, along with the current location of the blind person. The smart stick also facilitates the blind person to make calls at times of emergency. All these features are beneficial in lending a hand to make the visually impaired people become self-reliant while navigating.

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