Hybrid Approach for Identification of Manhole and Staircase Using Image Processing

Jadala Sravani¹, Adigiri Vaishnavi², Peruri Sravani Durga³, Ashwani Kumar⁴

¹-⁴Department of Computer Science and Engineering, Sreyas Institute of Engineering and Technology, Hyderabad, India

⁴ashwani.kumarcse@gmail.com

Abstract. The main aim of this research paper is to provide multi security for the pedestrians/older using smart stick using IOT and GPS. This stick having IOT, voice module and attached with multiple sensors to provide high security to the blind peoples while walking. Now a day’s safety is main important cause to the peoples while walking or driving and many more places. This smart stick provides the high security and show way to walk, by using this system we can monitor the blind person position using web application/mobile application and also we can get emergency alert message along with exact location. This system has obstacle sensor, water sensor and MEMS sensors, so that it can detect obstacles sizes automatically and gives voice alert. By using water sensors, it can detect the floor condition is dry or wet and shows the way to walk. In case of any emergency person suddenly fall at floor/any place then this system immediately detects using MEMS tilt sensor and automatically send the message to respective numbers with location and also gives buzzer alarm continuously to alert the neighbours. So that this smart stick can be very useful to peoples to show correct path while walking on the floor or steps and many more places. In this paper, the system can be interconnected with the microcontroller and alert the respective persons when any emergency occurs. This tracking system is composed of a GPS receiver, Microcontroller. The Microcontroller processes this information and this processed information is sent to the respective numbers using web page.

1. Introduction
To find an object is very difficult to identify for the blind people while they are moving from place to place and also difficult to know present location the where they are. To visit any place they need to bring there family members/guardians to help the blind people. Since as they cannot see they have less interaction with the social activities [1]. In past the applications are developed to help the blind people but all have the limitations like the kit will work slow or else the GPS will not show the exact locations of the blind one or else the intimation to the blind person will be delayed. For that reason the researchers are started designing the new application for the blind people with intelligent and smart blind stick that is going to includes accurate alert system like voice modules and GPS location to know their present location of blind. From the previous decades the research has made on some devices to give the accurate results like to give the warnings to the blind person in the danger situations and all [2]. This smart blind stick especially developing for the blind people / elders to help in their daily activities by finding the every object which is coming opposite to them. The voice module gives the alert signals to the blind person, for different situations they get different sound and also a vibration will be there, for each situation it will going to give the different vibrations. Initially we need to train the blind person what does the vibration and voice means so that the blind person can get to the actual meaning of it and then he follow the device instructions while walking [3]. This application is based
on IoT project so proposed system are using the ultrasonic sensor to identify the obstacle, water moister sensor to identify that whether the floor is wet or dry gives the ultimate response back to the blind person and also to their guardians on the web page [4]. MEMS sensor is also used in our application which plays a major role when the person falls down using the tilt sensor identifies that the person has falls down and then give the intimation in 3 ways through voice module like person is in danger, LCD screen will display that the person is in danger to know there neighbours if they see this screen they come and help the blind person and last one is giving the GPS location on the blind person where he falls down and whether the floor is dry or wet and what is the status of the obstacle identification. Visually impaired people are the people who finds it difficult to recognize the smallest detail with healthy eyes. Blind person has trouble to maintain daily activity, lots of difficulties get raised while they’re travelling from one place to a different place[5-6]. The most important problem is detection of the obstacles when they are walking. Since they cannot see, they often get hit by objects in roads like poles, walls, cars, people etc. as a result they may severely injured. To navigate unknown place, he will bring a sighted family member or his friend for support. There are chances that they can get lost. In such cases, it is very difficult for their family members to find them. One of the troublesome problem is, they forget where they put their stick [7].

2. Literature Survey

Since the blind person cannot able to see, they always require somebody’s help and guide to them. So the Hybrid approach for identification of manhole and satircase application is makes them simple and easy way to walk on the road and water by using IoT [8-9]. As we have survey that most of the blind person need support from others. Our application is an IoT application in order to help the blind persons and also elders. Each and every sensor can do a particular task. S gangwar et. al., in the year 2011, he developed the smart blind stick to help the blind people by using the IR sensor to identify the obstacle in front of blind people. But this blind stick is to identify the obstacle but not for the purpose if there is any emergency situations [10-11]. Benjamin atal in the year 2011, developed the smart blind stick using laser sensor, As used the microphone to produce the sounds to alert the blind one [12]. But the problem here is no assistant to direct the blind people. Next S Chew in the year 2012, he developed the smart stick in this he developed this application along with the GPS navigation technology [13-16]. But here the problem is that the GPS is not providing the efficient. Mohd Helmyabd Wahab and Amirul A. Talibet al in the year 2012, they developed this smart blind stick for the blind people using the ultrasonic sensor. But here the problem with this system is that without any alert to the blind people how they can overcome with the danger situations.

3. Hybrid Approach for Identification of Manhole and Staircase

This is the most important stage which gives the users more confidence that the new system is feasible and efficient. This is the system which replaces existing one with only some minor changes. In implementation each and every program, computer system and its environment is tested independently at the time of development until the user gets satisfied. It involves a simple procedure so that the user can easily handle the system and can understand different types of functions easily and quickly. Hybrid approach for identification of obstacles is that it is used for specially for the blind people or elder purpose which includes of a sensing device. In proposed system, this blind stick have the capability to identify any kind of obstacles using ultrasonic sensors, detects water in front of the blind through vibration and buzzer alarm from multiple situations and updates it to IoT. Smart blind 4 stick device is designed in such a way that there is no requirement of manual attention to it. It can uses the Obstacle detection sensors to detect the obstacle present before the blind person and dynamically changes the trajectory to be followed. The system has the automatic voice announcement like buzzer and vibrations can produces based on the particular sensor activation.
Figure 1. Block diagram of implementation of blind stick.

Figure 2. Implementing arduino UNO with all sensors.
3.1 Interfacing Arduino Uno to Ultrasonic sensor:
With the help of this sensor we can detect obstacles and manholes hindrance with the distance that has been set.

3.2 Interfacing Arduino Uno to MEMS sensor:
If a person suddenly falls down that we can detect with the help of MEMS sensor.

3.3 Interfacing Arduino Uno to Soil Moisture sensor:
With the help of this sensor we can detect the water on the floor.

3.4 Interfacing Arduino Uno to GPS:
GPS navigation device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate

4. Implementation
Arduino/Genuino Uno is a microcontroller board with ATmega328P (datasheet). Arduino uno has totally 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It has everything which needed to support with the microcontroller; it just connect it to a computer with a 6 USB cable or power it with a AC-to-DC adapter or battery to get started. Firstly we need to configure the board, for that we use the Arduino IDE Software, and start tinker with coding and by using hardware devices required to it.

Figure 3. LCD screen for low vision person.  Figure 4. Distance of object.

Figure 5. Distance and with area.  Figure 6. Distance, area and person fall down.
Figure 7. Distance, area, and updating location

The above figures display the output after execution. It detects every person, each and every obstacle manhole and displays the distance with the help of ultrasonic sensor, along with latitude and longitude positions with the help of GPS. We can observe that in the figures it also displays the status of surrounding whether the ground is dry or wet.

Figure 8. Soil moisture sensor.  
Figure 9. Arduino uno/  
Figure 10. Web page notification.  
Figure 11. Location of blind person
The above figures show the entire component connections these are the sensors and voice modules which are used to detect objects and intimates the person with voice commands. The application is developed in such a way that the blind person can able to go any place without someone's help by using the smart blind stick. By using the ultrasonic sensor, soil moisture sensor and MEMS sensor the application can able to identify the objects, wet or dry, and also its quantity on the floor are also be identified, voice module is connected to arduino uno in order to provide the information through the voice signal to alert the blind person.

5. Conclusion
The blind stick is designed in order to help the blind person to do their daily activities without others help. This smart blind stick is going to help the blind people when they walk on the road by identifying the obstacles, water level on the floor and also it is going to detect the distance between the blind person and the object by calculating using the ultrasonic sensor. This application decreases others support to the blind by identifying every object and sending the voice messages to the blind. If the blind person suddenly falls down then the immediate information can be passed to the respective guardian and voice module is going to give the alert to blind person through the voice module and vibrations. Where the guardian can know the information about the blind person like whether the floor is dry or wet, whether the obstacle is detected or not and when there is an emergency like person fall down through the GPS navigator location the guardian can know the exact location of the blind person and the entire status can be displayed in web page.

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