Smart Walking Stick For Physically Disabled People

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Abstract- *Visually challenged folks facing several issues in their standard of living, typically have a tough time to navigate outside the surroundings. The worst downside is that police investigation object before of them so as to step ahead. This project presents a style and implementation of sensible walking stick that helps the blind folks to travel separately. The projected hardware system consists of Arduino Nano, IR sensor, voice playback module, GPS receiver module and also the GSM. The Detection of obstacles is finished mistreatment associate IR device. The IR device detects the presence of associate obstacle before of it and passes the information to Arduino Nano. The Arduino Nano method the information received and calculates whether or not the obstacle is shut enough or not. The processed information is fed to the voice playback module that provides voice help to the blind man through a speaker so as to avoid the collision between the obstacles.*

Keywords- GPS; GSM; Arduino Nano; IR sensor

I. INTRODUCTION

Visually disabled individuals have trouble communicating and understanding their surroundings. They have very little interaction with the surroundings. Active travel is a problem for visually disabled individuals, as it can be difficult to discern the objects that arise in front of them, so they cannot move from one position to another.They are relying on their families for independence and financial support. Their disability prohibits them from engaging with individuals and social interactions. In the past, various devices have been developed with drawbacks without a firm understanding of non-visual experience.Researchers have spent decades designing adaptive and clever sticks to support and alert visually disabled people to challenges and to provide knowledge on where they are locatedOver the last decades, modern technologies have been developed to provide a safe and effective method for visually disabled individuals to identify hazards and guide them to dangerous areas. Smart walking stick is specially designed to detect obstacles which may help the blind to navigate care-free. Audio alerts should keep the customer alert and greatly minimize injuries.Automatic voice switching allowed is also implemented to support them in private space as well. This program is designed to provide smart technological assistance for blind individuals, both in public and private spaces.The smart walking stick is a basic and strictly mechanical tool designed to detect obstacles on the ground. This system is lightweight and compact. Yet because of its own size, its range is limited. It provides the individual with the best travel assistance.

II. LITERATURE SURVEY

Today, the primary feature of the Internet of Things is the adaptive safety tracking system[1]. Likewise, other wearable apps are designed for visually disabled individuals. Several structures are being discussed here.In [2], the Sensor Assisted Stick for Blind People identifies a wearable device composed of a light weight blind stick and a sensor-based obstacle detector circuit. This is primarily intended to help the blind person travel easily from one position to another and to remove any barriers that could be encountered.The software senses all stationary and moving objects and can also help deter injuries. The key feature for the operation of this device is the infrared sensor, which is used to scan the specified region around the blind by emitting-reflecting waves.Reflected signals are obtained from objects and are used as inputs to the microcontroller and are then used to assess the position and distance of objects around the blind individual. The key purpose of this is to make an algorithm for blind people to detect obstacles in all ways, to find gaps and manholes on the ground so that they can walk easily. In[3], an revolutionary stick is designed for visually impaired people for quick navigation. The blind stick is capable of sensing water by means of an ultrasonic sensor. Ultrasonic sensors are used in this system to detect obstacles by using ultrasonic waves. The sensor transfers the obtained data to the microcontroller by detecting the obstacles.The microcontroller processes the data and determines whether the obstacle is close enough to the human. If the barrier is not next to the microcontroller, the circuit doesn't do anything about it. If the barrier is close enough to the microcontroller, the pulse is transmitted to the buzzer. The machine also senses water and provides various sounds and warns the blind user. In [4], the multitasking stick is intended to suggest a protected direction for visually disabled persons. The automatic hardware dependent micro-controller helps a blind person to sense obstacles in front of them. The hardware component consists of a microcontroller with an ultrasonic sensor, a voice playback module and other

equipment.Ultrasound waves are used to detect barriers. A temperature sensor is provided to detect a fire or a high temperature environment. The presence of water is sensed by the current sensing theory. Acknowledgement of the sensing barrier is obtained from a voice replay module.The machine is fitted with an RF module to locate the incorrect button. These features allow blind people to travel freely and quickly from one position to another. In [5], object identification for Markerless Augmentation using Haar Training deals with the provision of object recognition algorithms that will support and direct users of their respective devices by allowing them to obtain a deeper understanding of the unfamiliar system in order to set it up. Real-Time object detection and object recognition using the camera of the computer. Hair cascade classifier files have been generated by conducting hair training on the object and its ports photos for detection purposes. This research expands the Rapid Target Detection System of Viola Jones Algorithm in two important ways:Next, their simple and over-complete collection of hair-like features is improved by an powerful set of 45 ° rotational features that bring additional domain-knowledge to the learning system and is otherwise difficult to understand. Such novel features can be easily measured at all scales in constant time.Second, a new post-optimization technique for a boosted classifier that dramatically boosts its performance[6]. The software technology has been extended to a variety of practical implementations, such as image scanning, fast object recognition and virtual reality implementations. The software is an android framework intended to ensure greater portability.

III. EXISTING METHODOLOGY/BACKGROUND

The ultrasonic sensor is used in the proposed device to measure the hazard distance from the operator. The comparison distance will be used to determine whether or not the device should travel. Ultrasound sensors operate on the basis of vibration. The sound waves are sent from the sensors to the target, which can measure a distance of up to 12 feet with a resolution of 0.3 cm. The sensors are mounted in five positions in order to protect the most possible sides for the least use of the sensors. The sensors are positioned on the top, the right, the middle top, the middle right and the center. Generally, the blind person cannot see the things on the table. So the bottom sensor keeps track of the ground clearance providing the required safety steps. The suggested program is attempting to provide the consumer with a dream such that we do need to understand and interpret the picture ahead. The picture is measured using an image sensor (camera). The distortion of the picture here is performed in order to detect the obstacles that lie ahead and also to detect indoor objects. Raspberry pi holds an image repository composed of a number of samples obtained from the different obstacles.

The images received from the camera are compared to the images processed in the archive using the image processing. The picture is analyzed and categorized using the Hair Classifier. Hair Classifiers are object property files that define an object in the physical world.A Haar-like function considers neighboring rectangular regions to a particular location in the detection window, summarizes the pixel intensities in each region, and measures the difference between these numbers. The disparity is then used to categorize the image portions.The system consists of a walking stick, which includes a USB camera, an RF module, a Rain sensor, an Ultrasonic sensor, a Raspberry pi and a headphone attached to it. The raspberry pi is the system's main processor. The raspberry pi allows the ultrasonic sensor to constantly measure the distance between the barriers that come around it.The Ultrasonic sensor measures the distance by using the time taken for ultrasonic waves to penetrate and replicate the barrier. When the target is within 50 meters, the ultrasonic sensor sends a warning to the raspberry pi. Then the raspberry pi allows the USB wired webcam to be connected to it. Once the sensor is triggered, the picture emerges on the frame.Around the same time, the observed image is sent to the raspberry pi. Raspberry pi holds an image repository composed of a number of samples obtained from the various obstacles. The images received from the camera are compared to the images processed in the archive using the image processing. Segmentation in anatomy is used for image recognition.The headset is attached to the raspberry pi to provide the user a voice-based contact. When the contrast is effective in identifying the object, the feedback of the name of the object is supplied to the user as a voice via the headset.

The entire method is coded in the Python programming language. The RF module is attached to the stick to locate the incorrect piece. Rain sensor is used to sense water, when a rain sensor senses water, the buzzer is activated. Because of these features, blind persons may travel freely from one position to another.

The main advantage of the program is that it allows the blind in indoor and outdoor, carefree navigation. The tools put in the stick make it secure and simple to manage. The smart stick helps to identify obstacles set at a distance in front of the operator. The machine is ideal for both indoor and outdoor use.Barrier information is given by speech warnings, reducing the complexity of interpreting the sound signals used in earlier systems. The program is a low budget handheld navigation aid for visually disabled individuals.

IV. PROPOSED METHODOLOGY

Figure 1 displays the block diagram of the planned structure consisting of different hardware components that are placed on the board for the operation of the walking stick. Tools are Arduino Nano, a microcontroller, an IR proximity sensor, a voice retrieval module, a GSM modem, a GPS module, an LCD monitor. The short summary of all hardware components is as follows:

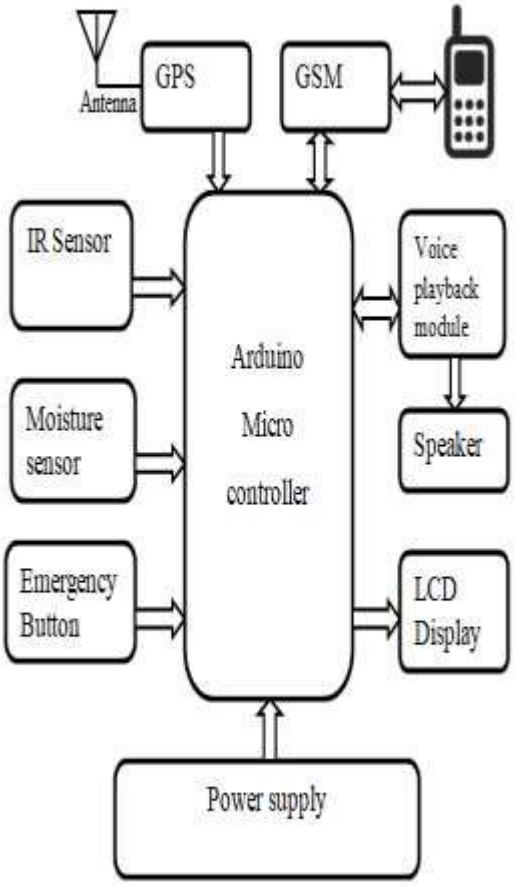

fig 1 Block diagram of proposed system

ATmega328 :

Microcontroller All devices used in this project are interfaced with the ATmega328 Microcontroller manufactured by Atmel belonging to the Mega AVR (Advanced Virtual RISC) range, which handles signals from various components or sensors. It's a chip mounted on the surface of Arduino Nano.It's open source hardware as well as software, and it's really close to a machine. It provides 8 bits of data and has 38 KB of read-and-write flash memory and also has EEPROM (Electrically Erasable Programmable Read-only Memory) and allows data to be stored even though the power supply is not supplied. High power demand for Advanced RISC Architecture.It has peripheral features that provide two 8-bit and one 16-bit timer with a separate oscillator. It also provides 23 general purpose I/O lines, 32 general purpose working registers.

IR Proximity Sensor:

The IR sensor is an object recognition sensor that comprises a pair of LED transmitters and a photodiode receiver. The transmitter releases infrared radiation on a continuous basis as the signals are emitted to the target from each of the rays reflected and obtained by the photodiode.The received continuous signals are fed to the positive input of comparator op-amp IC LM358 and are compared with the reference voltage at the other input. If the transmitter LED is high, more energy is provided by the photodiode, the voltage decreases across the photodiode, and the voltage of the positive input is greater than the negative input of the comparator, so the output is high and the LED is ON, signaling the presence of the device.Similarly when there is emission of IR rays towards photodiode then the output of comparator is LOW and led turns OFF which indicates the absence of an object.

Moisture sensor:

The humidity sensor is a basic humidity discovery circuit consisting of two probes that allow the current to flow through the soil and then obtain a resistance value to determine the moisture content. The performance turns out to be high while the input is low, which is why it is known as an IC inverter.At the point where there is no moisture in soil probe 1 of IC7404, the outcome of this yield stick 2 is small. At the stage where there is an appropriate measure of water, it will end up damp and stick 1 of IC7404 will go up, which will make stick 2 of IC7404 low.

APR33a3 Voice Playback Module:

APR33a3 voice record and playback board is used as a voice communication device for a blind person who is interfaced with a microcontroller; it warns a blind person via a speaker or a microphone when an object is detected by an IR sensor. This has 8 channels each with a total length of 1.3 minutes.The APR33a3 series is an analog-to-digital converter that transforms the voice signals picked up by the microphone to a digital signal and transmits the same to the APR33a3 IC where the voice signals are processed in a non-volatile flash memory. As a result, APR33a3 is a good speech processor. The APR33a3 series is a vertically integrated system providing high performance and unprecedented convergence

of analog data, digital processing and analog output capabilities.

GPS module:

GPS stands for Global Positioning System, which offers positioning information to the GPS receiver everywhere in the world. This is a standardized radio navigation system developed by the U.S. Department of Defense (DOD) to provide information on the position for military use. Signals from one or more radio navigation aids enable a person to measure their location.Hence we are using GPS module in this project to get the location information of blind person.

GSM module:

GSM acronym stands for the Global Mobile Communication Service, which serves as a direct channel between a blind person and another person whose phone number is connected to the GSM network. For this unit, we are using the SIM900 GSM module designed with the dual-band GSM / GPRS engine-SIM900A running at a frequency of 850/900/1800/1900MHz. This module can be attached to a microcontroller that enables the GSM module to communicate with a cell network by transmitting or receiving messages. For this mission, the GSM is used to transmit an SMS of location information to parents using the expanded AT command package. The location message will be transmitted via the module by attaching Tx, Rx and GND to the microcontroller.When an emergency switch is pressed by the blind person the location message will be sent to the predefined contact number.

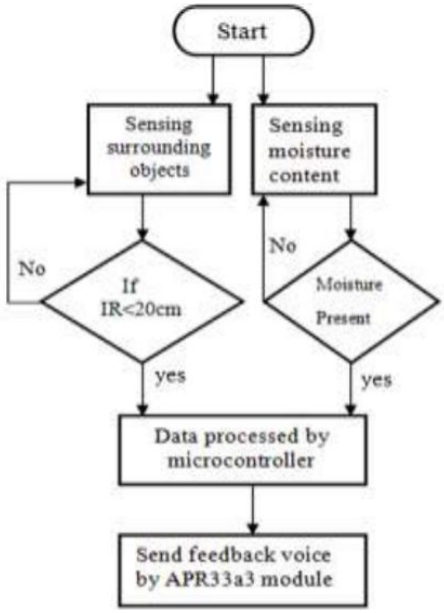

Figure 2 flow of object detection and voice segment

LCD:

In this project, Liquid Crystal Display is used to show outputs of each module operated by a microcontroller. We use 16×2 LCD to write 16 characters in 2 rows. It helps to find and disable troubleshooting module wise in case of device malfunction.

Emergency Switch:

Switch is given to be used while the user is in danger. Location details sent to parents via GSM when the user clicks the Emergency Button.

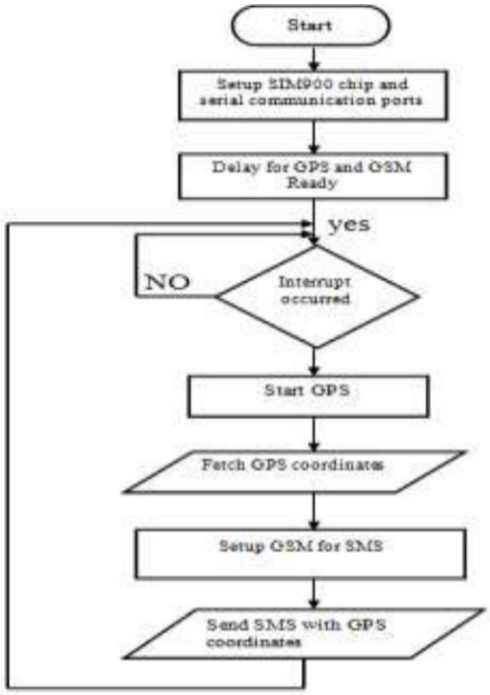

Figure 3 flow of location finding and emergency segment

V. COMPARISON OF PROPOSED METHODOLOGY WITH EXISTING METHODOLOGY

Present hardware consists of a raspberry pi, a USB camera, an IR sensor, an Ultra Sonic monitor. This technique does not offer safe protection for the user, it rather gives assistance to the user who directs and navigates without the aid of something. Previous technique only directs the user by providing a buzzer when an item is in front of the individual.Existing technologies doesn't know something for water artifacts in front of them. Existing technology becomes very complex for difficult python systems and raspberry pi and can't be supported by reasonable individuals. This doesn't comprise about security considerations such as the precise position of a individual because he's missing anywhere else.

IR tracker, GPS, Ultra Sonic tracker, GSM, voice monitor, humidity sensor, emergency switch, Arduino nano are included in the proposed technique. All the modules are attached to the Arduino and the power supply is controlled. When the device is switched on, the sensors get the power supply from the controlled power supply.If the sensors detect every thing they send to the Arduino nano, which is already a dumped file, they respond according to the software. If there is an emergency, if we push the button, the GPS activates and GSM delivers the precise location to the cell number given.Objects can be detected by cameras, liquids can be detected by a moisture sensor, and measures can also be detected by an Ultrasonic sensor. Those are all the benefits of the current technique. Use nano is a very small weighted stick to bring with us.The entire system is designed is to be small and easy to use.

If it comes to the drawbacks that fire protection systems do not have, long-range objects can not be identified by the system. If the individual is unable to push the emergency button, he will also be unable to provide assistance.

The key use of the stick is for the blind to navigate without the aid of another human or guide dog.

VI. CONCLUSION AND FUTURE DIRECTION

The main goal of our work is to include a smart walking stick for blinds to explore the world without any contact with sighted people, and this will be very cost-effective and easy to use. The hardware built using Arduino Nano is therefore low in size and easy to bring along.The speech recognition module is confident providing commands in any language so that the device can be used worldwide. The GPS and GSM systems can be worked successfully by transmitting the SMS location within 2 minutes, which is why the message transmission testing has been successfully completed.

The machine can be changed by installing a flame detector to warn them to escape from fire incidents. Radar definitions can be used to track long-range reference objectsWhen recognizing the colour of the pill box a blind person may take the pill for his or her health issues, which can be done when introducing the Colour Recognition Sensor technique so that the visually impaired opioid problem can be prevented.

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