Smart Walking Stick For Elderly, Diseased, And Blind People – A Conceptual Study

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Abstract

The smart stick is a device designed to assist blind and elderly individuals with mobility and navigation. It utilizes advanced sensors and technology to detect obstacles, provide audio cues and vibrational feedback, and offer GPS-based navigation. The compact and ergonomic design of the stick allows for easy and comfortable use, improving the independence and safety of the user. The smart stick enhances the daily lives of those with visual or physical impairments by providing real-time information about the environment and guiding the user toward their destination.

Keywords

Smart walking stick, Elderly, Blind, Deaf, study.

Introduction

A smart stick for blind and deaf people is a device that is designed to assist individuals who have both visual and auditory impairments. It typically uses a combination of technologies such as GPS, sensors, and haptic feedback to provide information about the

environment to the user. For example, the device may use GPS to provide the user with information about their location haptic feedback to alert the user to obstacles in their path. Additionally, it may also include features such as text-to-speech and voice recognition to assist with communication. The goal of a smart stick for blind and deaf people is to provide them with increased independence and mobility by helping them navigate their environment more safely and efficiently.

Purpose of the study

The purpose of a study for a smart stick for blind and deaf people is to evaluate the effectiveness and usability of the device in assisting individuals with both visual and auditory impairments. This can include evaluating how well the device provides information about the environment to the user, such as through GPS and sensors, and how well the user is able to navigate and interact with their environment using the device. The study may also assess theuser's level of satisfaction with the device.

Review of literature

The smart stick is designed for blind people that can give early warning of an obstacle using infrared (ir) sensors. After identifying the obstacles, the stick alerts the visually impaired people using vibration signals. However, the smart stick focuses only on obstacle detection but it is not assisting with emergency purposes needed by the blind. And also the ir sensors are not really efficient enough because they can detect only the nearest obstacle at a short distance. S.chew (2012) proposed the smart white cane, called blind spot that combines GPS technology, social networking, and ultrasonic sensors to help visually impaired people to navigate public spaces. The GPS detects the location of the obstacle and alerts the blind to avoid them hitting the obstacle using ultrasonic sensors. But GPS did not show efficiency in tracing the location of the obstacles since ultra-sonic tells the distance of the obstacle. Obstacle detection was signalized by a high pitch “beep” using a microphone. The design of the laser cane is very simple and intuitive. The stick can only detect obstacles, but can not provide cognitive and psychological support. There exists only a beep sound that triggers anyobstacle and there is no assistance to direct them.[1]

The stick is about designing and implementing a smart stick for blind people to help them move around their surroundings without bumping into obstacles the smart stick will be

Used to detect the obstacle so that the user can avoid them beforehand. The basics for Making a blind stick use components like sensors that detect motion from almost every Side. The technology used in this project is the microcontroller technology and the use of

Arduino Nano along with raspberry pi to develop it. The components that are used to detect the obstacles are the three ultrasonic sensors for 3 sides (left, right, front) and also an ir sensor along with a water sensor where these sensors help blind people who suffer from the lack of ability to do their activities. Finally, there is an alarm system that helps the person to notice any obstacles in his/her path. To alert the user, a buzzer that makes a beeping sound, and a vibration motor installed for this purpose. The protease software program helps to implement the project by designing the product in more than one dimension. When the switch on the top of the stick is clicked; the ultrasonic immediately sends the signal from the transmitter however when the signal impacts the level surface, it reflects the sensor`s receiver meaning the microcontroller will send a pulse to the

actuators.[2].

The approach suggested for use of a blind bright stick without eyes: danger identification, artificial vision, and GPS real-time support. This system works with GPS, an artificial intelligence tool, danger recognition, and an audio circuit. The reference stick is used for the indoor and outdoor use of the blind person. In addition, the GPS navigation system has an obstacle detection system. The GPS navigation system is ready to help people on their way. Hazard identification and GPS navigation programs are processed using raspberry pi. Audio feedback is provided to the consumer for navigation and obstacle detection [3].

The smart stick is a system that aims to help people with visual impairments, specifically by creating an automated walking stick that is easy to use, maintain, and affordable. The Stick is equipped with a circuit board that includes a microcontroller, led, and sensors, which work together to help the user navigate their surroundings. The microcontroller and the sensor data are used to produce a PWM, signal to operate the pager motor. The goal is to make the stick user-friendly, reliable, and secure in order to improve the independence and quality of life of people with visual impairments. The paper proposes the design and architecture of a smarter smart walking stick for blind and disabled people. The device Provides artificial vision, obstacle and hollow detection, and feedback to make navigation more precise, safe, and secure. The cost-effective and lightweight design can be mounted on an ordinary white cane or blind stick. The combination of sub-systems makes a time- Efficient system that monitors the environment.[4]

A review of various smart blind sticks that have been developed to help visually impaired individuals navigate is presented. These sticks use various technologies such as GPS,

Ultrasonic sensors, proximity sensors, stereo cameras, and infrared sensors to detect Obstacles and provide directions to the user. However, each of these systems has its own drawbacks such as high cost, difficulty in design, lack of indoor functionality, and sensitivity to environmental noise. The proposed design aims to overcome these drawbacks by using a less sensitive technology that is inexpensive and small enough to be accommodated on a walking stick. The design and implementation of a smart blind stick that uses ultrasonic sensors to help blind people navigate. The stick sounds an alarm when it detects an obstacle in the user's path and can detect obstacles within a range of 5- 35cm. The authors

Suggest that the system could be further improved by increasing its obstacle detection range and adding GPS and voice guidance features.[5]

Objectives

- Light sensor is used to detect the presence or absence of light.
- Water sensor is used to detect the presence of water.
- Anti theft protection.
- Warning through voice and vibration.

Methodology

We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor along with light and water sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the Arduino Uno. The Arduino Uno then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the Arduino Uno sends a warning in the form of voice. It also detects and sounds a different buzzer if it detects water and alerts the blind. The stick also includes the vibrator. If the obstacle is close the Arduino Uno sends a warning through vibration. Water detection is done by water sensor. One more feature is that it allows the blind to detect if there is light or darkness in the room. The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept it. A wireless RF based remote is used for this purpose. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick.

Interpretation

The Smart Stick is a stick that can assist a person in walking safely without fear of colliding with another person or solid objects which is proposed as a solution to this major issue. This system functions similarly to a white cane in that it assists blind people in scanning their surroundings for obstacles or orientation marks. This system will be mounted on a white cane with an ultrasonic sensor, and a water sensor to detect changes in the environment. Ultrasonic sensors detect obstacles in front of it using ultrasonic wave reflection, water detection sensors detect whether there is a puddle. Blind people can't easily recognize obstacles or stairs while using normal blind stick. The blind traveler should depend on any other guide like blind cane, people information, trained dogs, etc. About the 90% of the worlds visually impaired live in developing countries. Visually impaired persons have difficulty interacting and feel their environment. Physical movement is a challenge for visually impaired persons, because it can become tricky to distinguish obstacles appearing in front of them, and they are not able to move from one place to another. In the past, different systems were

designed with limitations without a solid understanding of the non-visual perception. Researchers have spent decades researching new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at danger places. It's mainly designed to detect the obstacles that can be a huge disadvantage for blind and disabled people and can help them to navigate care- free. The audio messages will keep the user alert and considerably reduce accidents which can be a serious issue for people like them. A voice enabled automatic switching is also incorporated to help them in private space as well. This system presents a concept to provide a smart electronic aid for blind and disabled people, both in public and private space in real life and the stick measures the distance between the object and the stick by using an ultrasonic sensor which is practically the most beneficial and required feature of this product and our product is different from another market products because it includes evaluating how well this device is which provides information about the environment to the user such as through GPS and sensors and the most important sensor is Ultrasonic sensor and it tells how well the user is able to interact and navigate with the environment and surroundings nearby using this beneficial and helpful device. The study also tells us about the particular user's level of satisfaction with the device and their perception of the device's impact on their lives and about its features and qualities and performances such as the accuracy of the GPS, about it's battery life and the ease of the use of the device's interface and due to these results it helps to improve the design and functionality of the device. The main feature which is the Ultrasonic sensor is used to detect the presence of obstacle and it calculates the distance between the source and destination and there many more features to it which makes our product even more useful and compatible like light sensor which is used to detect the presence of absence of light which is beneficial and mandatory for a blind or disabled person and more features like water sensor to detect the presence of water,Anti theft protection and warning though voice and vibration.

Discussion

A Smart Stick for Blind and Deaf People is a device that uses GPS, sensors, and haptic feedback to assist individuals with visual and auditory impairments navigate their environment more safely and efficiently. The device provides information about the user's location, alerts the user to obstacles in their path, and may include features such as text-to-speech and voice recognition to assist with communication. The goal is to increase independence and mobility for individuals with visual and auditory impairments. Most of the devices created in the past have had major drawbacks like lack of accurate sensors, heavy-weight and expensive. With the help of reviewing past models, we have set an optimum standard for the upcoming models. They can learn from the failure of other products and incorporate crucial features that might make their model a more reliable product. This will prove to be beneficial for the safety of the elderly and physically and mentally abled people, and also make them more independent.

Practical implications

The future implications of smart sticks for blind and deaf people could include a continued focus on improving the technology and design of these devices to make them more user-friendly and accessible for individuals with both visual and auditory impairments. Some potential advancementsthat could be made include

- Integration of more advanced sensors and technologies such as computer vision, artificial intelligence, and machine learning to improve the accuracy and reliability of the device in providing information about the environment.
- Development of more intuitive and user-friendly interfaces to make it easier for individuals with both visual and auditory impairments to use the device.
- Integration of wireless communication technologies such as Bluetooth, Wi-Fi, and cellular networks to allow for real-time communication between the device and other devices such as smartphones, tablets, and smart speakers.
- Development of additional features such as voice recognition and text-to-speech to allow for more seamless communication and interaction with the device for individuals who aredeafblind.
- Improvements in the battery life and durability of the device to make it more reliable and durable for long-term use.
- Development of more affordable and accessible options for the target population.

Overall, the future of smart sticks for blind and deaf people could see a continued focus on making these devices more advanced, user-friendly, and accessible for individuals with both visual and auditory impairments, which could help to improve their independence, mobility, and overall quality of life.

Results and conclusion

The presented system is designed and configured for practical use. The system is able to handle seven states that may face the blind people. The system will respond to each state according to a specific program which is coded and installed in the Arduino microcontroller.

- When an obstacle is detected by the ultrasonic sensor in the left, right and front side of the stick, then Arduino sends the message to the blind through buzzer and vibrator and also send the voice message through earphones.

- The light sensor is used to detect presence or absence of light, if there is no light then the buzzer will be on, warning through vibration and voice message on earphones.

- A water sensor is used to detect the presence of water and send the message to the blind person through buzzer, vibrator and also through a voice message.

A simple, cheap, configurable, easy to handle electronic guidance system is proposed to provide constructive assistance and support for blind and visually impaired persons. The system is designed, implemented, tested, and verified. The real-time results of the system are encouraging; it revealed an accuracy of 93% in detecting distances. The results indicate that the system is efficient and unique in its capability in specifying the source and distance of the objects that may encounter the blind. It is able to scan areas left, right, and in front of the blind person regardless of its height or depth. Therefore, it was favored by those who participated in the test. The ultrasonic sensor has been fully utilized in order to advance the mobility of the blind and visually impaired people in a safeand independent way.

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