Smart Walking Stick For Physically Challenged And Elderly People

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Abstract :- People who have difficulty in walking or are old often use walking sticks, which also make it easier and more comfortable for them to carry out their daily responsibilities. In a typical situation, you would utilize the walking stick to locate the obstructions. Yet, it is ineffective for persons who have physical disabilities or who are old. The biggest drawback of using a walking stick is that the user needs to go very near to a barrier to pinpoint its exact position. This is the single most important requirement for using a walking stick. We came up with a novel idea for a walking stick that assists persons who are unable to walk alone or who are old in navigating challenging environments while also providing information about their current state of health. As part of our research, we made use of a variety of sensors that were attached on a walking stick. These sensors will assist a user in navigating both indoor and outdoor environments. We make use of an ultrasonic sensor, which is used to detect the objects, a temperature sensor, which is used to monitor the body temperature, a GSR sensor, which is used to monitor the skin response, a GPS module, which is used to track the location of the user, and a GSM module, which is used to send a message to the concerned person in order to notify him about the user's condition.

Keywords: Galvanic Skin Response, Heartbeat, Smart Stick, Ultrasonic Sensor

I.INTRODUCTION

The World Health Organization estimates that there are now 290 million individuals living on the planet who suffer from some kind of vision impairment. It is estimated that there are 50 million senior persons who need independent mobility to continue working or walking outdoors. The former method of using a cane has significant challenges, since it requires the subject to be in close contact to the impediment to detect its position. When he is using the stick to sense barriers, he runs the risk of colliding with additional obstacles that are in the area. Stick is unable to provide any information on the nearby barrier. The developed smart walking stick is fitted with a variety of sensors that will sound an a la rm when they detect any number of potential hazards. This health monitoring may be accomplished with the help of this intelligent walking stick. These health monitoring tools allow the user to examine their own pulse rate as well as their body temperature and their skin reaction. Stick comes integrated with GPS and GSM components, allowing it to monitor the position of the user and communicate that information to another person. The user will be provided with a buzzer alarm if there is an obstruction, pit, or health concern. Since the blind person will become more aware because of hearing the buzzer warnings, this will make it easier for them to move about. These qualities of a smart walking stick are useful in helping users who are physically challenged or elderly in their movement and in preventing accidents. The user of this technologically advanced walking stick will be able to navigate difficult terrain with ease and comfort without needing the assistance of another person.

II.LITERATURE SURVEY

There is a wide variety of health monitoring technology available for persons who are old or have physical disabilities. The most common types of sensors are infrared sensors, ultrasonic sensors, water sensors, and so on. The descriptions of the two technologies are shown down below. According to the research presented in article [1] on smart belts for the blind, this belt can identify obstructions. The ultrasonic sensor and buzzer are both included inside this belt. A connection has been made between the ultrasonic sensor and the embedded system, which can identify any obstructions. When an impediment is identified, the buzzer is activated to provide a vibration. Nevertheless, the primary purpose of this belt is to measure the distance between the various barriers. After the distance was determined, an audio message was played for the victim.

It is used for the purpose of issue identification for visually impaired individuals. They use a camera for the purpose of detection, a camera that can capture 15 frames per second; using the picture, they locate the chunk holes; in addition, they have sensors that may be attached to a victim. Nevertheless, there are some drawbacks to the technology, such as the fact that it uses cameras, which makes it more costly and results in many images.

Thus, they must meet more stringent memory requirements. In the publication [3], a novel cane for those who are blind or have low vision. Buzzer, ultrasonic sensor, and microcontroller are the components that make it up. Ultrasonic sensors are used in this procedure for the purpose of locating any potential obstructions. They analyse the data and send it to the microcontroller. The microcontroller then calculates the distance to determine whether the item in question belongs to the victim. If the obstacle in question is not located where the victim is, the microcontroller does not take any action. This piece of technology provides a solution to the issue at hand for those who are visually impaired in the form of a smart stick [4]. The sensors, including ultrasonic sensors and water sensors, are used in this way. These are all sensors that are used to identify obstacles, and this sensor also delivers information about when the obstacles are discovered. This technique does not include any means or methods of detection.

The laser cane serves the purpose of locating potential hazards, [5]. These laser diodes and these three photo diodes make up the whole thing. The laser cane's functioning concept is based on the existence of pulses. The angle of the stick should remain at fifty degrees, the laser should identify any obstructions, and they should compute the distance. The article "sensor aided stick for the visually impaired person" discusses a piece of wearable equipment that comprises of a lightweight blind walking stick and an obstacle detection system that is based on a sensor. The article is titled "sensor assisted stick for the visually impaired person." It is designed to assist the blind person in moving about without the assistance of others in a secure manner so that they may avoid getting into any minor mishaps. Since it can detect, the gadget might potentially assist in preventing accidents. The infrared (IR) sensor is the most important part of this system's operation. This sensor is responsible for scanning the environment surrounding a blind person by producing reflecting waves, and it is the primary factor in the system's success. The reflected signals that are received from the barriers are used as inputs to the microcontroller, which are then used for the purpose of estimating the distance between the blind person and the items that are in their immediate environment. The primary objective of this is to assist blind individuals in locating impediments in a variety of directions, as well as locating holes and pits in the ground, so that they are more at ease when walking.

III.PROPOSED WORK

The process was designed with the intention of producing a smart electronic stick that has a variety of functions. It is essential that new technology improves upon the traditional way to help physically challenged individuals and elderly people live more comfortable lives. Figure 1 shows smart walking stick.

Figure 1 Smart Walking Stick

This may be accomplished by offering them the highest level of safety and security possible at all times and in all locations. Users who are blind or elderly will be provided monitoring for their health and any minor accidents that may occur as a result of using this technology. Because of this, we have developed a high-tech walking stick that incorporates electrical components and enables its users to stroll freely and with self-assurance. LCD module is used to provide the user with information regarding the user's current condition, buzzer is used to alert the user in the event of an emergency, GPS module is used to track the user's location, and GSM module is used to send messages to other users. Figure 2 shows proposed framework of the smart walking stick.

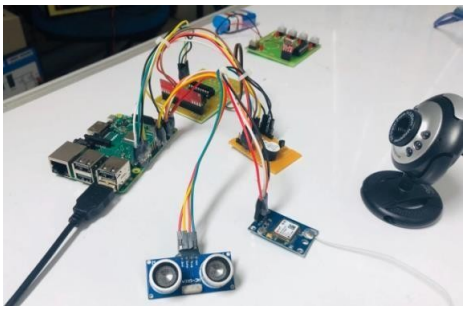

Figure 2 Proposed Framework

Ultrasonic sensor is used to detect obstacles in front of the user; GSR sensor is used to monitor he skin response of the user; heartbeat sensor is used to detect the pulse rate of the user; temperature sensor is used to detect the use Those who are physically challenged or old may use this stick to support themselves in terms of their health, and it allows them to continually check their pulse rate and body temperature. There is a panic button on the walking stick that the user can press in the event of an emergency. If the user presses the panic button, an alert message including the user's location is sent to the person who is concerned about them. The walking stick has an alert button for users who are concerned about their health. The primary objective of this strategy is to assist people who have physical limitations by enhancing the approaches that have been employed in the past. This will allow these individuals to live their lives with self-assurance and comfort, independent of any other dependencies. They will have a sense of well-being and emancipation, and they will constantly have the impression that they are linked to a person with whom they would want to be associated in the event of an emergency. In order to build an electronic walking stick, we had to include all of the essential answers into a single walking stick in order to address the problematical difficulties that arise in the daily lives of elderly and physically challenged users.

3.1Methodology

The electronic circuit of a smart walking stick designed for people who have physical disabilities includes a supporting rod with a handle structure, a handle structure that contains a battery, different sensors, a control box, and an alarm system, and a control box. Walking stick fitted with a variety of sensors, each of which may be positioned anywhere along the length of the stick in accordance with the requirements. A smart walking stick may be used to identify potential hazards and alert the user to a variety of health monitoring concerns. This stick has a higher level of subsystem integration. The GPS and GSM modules, as well as the power supply, the microprocessor, the ultrasonic sensor, the GSR sensor, the heart beat sensor, the temperature sensor, the LCD display, and the audio module are all incorporated within the stick. Arduino UNO, which is an integral part of the system and is responsible for its operation, is also included. When the smart electronic stick is first activated, it will activate all of the associated health monitoring sensors as well as the sensors that identify adjacent obstacles. If an obstacle is detected ahead within a specific amount of distance, the ultrasonic sensor will sound a buzzer warning to notify the user that the object is close by and will show the obstacle's distance on an LCD display.

Figure 3 shows illustration of smart walking stick in realtime.

3.1.1Heart Beat Sensor

The Heart Beat Sensor offers a straightforward method for investigating the workings of the heart. The movement of blood via the ear lobe is being tracked by this sensor. The volume of blood found in the ear is subject to fluctuate over time due to the action of the heart, which pumps blood via the blood vessels found in

the ear lobe. The light that is transmitted through the ear is measured by the sensor, which does this by shining a light lobe (a tiny incandescent bulb) into the ear. It is also possible to utilize the clip on the skin that is found between the thumb and index finger, as well as on the tip of a finger. Inside the box, the signal is amplified, then reversed, and finally filtered. The patient's heart rate may be calculated using the graph of this signal. Figure 4 shows heart beat sensor.

Figure 4 Heart Beat Sensor Ultrasonic Sensor

Ultrasonic sensors (also known as transceivers when they both transmit and receive) function on a concept that is similar to that of radar and sonar, both of which assess characteristics of a target by interpreting the echoes that are produced by radio waves and sound waves, respectively. Ultrasonic sensors are capable of producing sound waves with a high frequency and analyzing the echo that is returned to the sensor by the object being monitored. In order for sensors to measure the distance to an object, they compute the amount of time that elapses between transmitting the signal and getting the echo. Figure 5 shows Ultrasonic sensor.

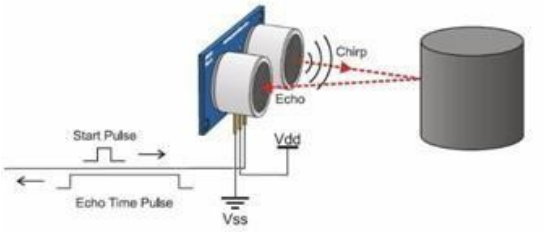

Figure 5 Ultrasonic Sensor

3.1.2Temperature Sensor (LM35)

The LM35 integrated circuit is a precise temperature sensor, and the output of the sensor is proportional to the temperature. Since the sensor circuitry is hermetically sealed, it is protected from oxidation and any other processes that may affect it. In comparison to a thermistor, the LM35 is capable of producing more precise temperature readings. It also has a modest self-heating potential and does not induce a temperature increase in still air that is more than 0.1 degrees Celsius. Figure 6 shows Temperature sensor.

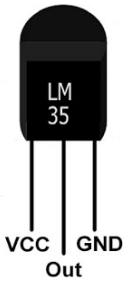

Figure 6 Temperature Sensor (LM35)

The LM35 series of temperature sensors are integrated into the temperature functional module that we designed and built. The LM35 family of temperature sensors is precision integrated-circuit devices. The output voltage of these sensors is directly proportional to the temperature in Fahrenheit. The user does not need to deduct a significant constant voltage from the output of the LM35 in order to suitable Fahrenheit scaling, giving it an advantage over linear temperature sensors that are calibrated in degrees.

3.1.3Galvanic Skin Response (GSR)

The GSR sensor is responsible for measuring the fluctuating degrees of the skin's ability to conduct electric current. Figure 7 shows galvanic skin response.

Figure 7 Galvanic Skin Response (GSR)

Higher levels of perspiration on the skin lead to a greater conductance of electrical currents. Because of this, an increase in the conductivity of the skin after an incident might be perceived as either a good or negative emotional arousal.

IV.RESULT

The Smart Sensor Based Electronic Walking Stick was put through its paces in both a realistic and challenging setting during the assessment of the design and development of the product. In addition to that, physically challenged and elderly people provide their opinions on it. The performance is being evaluated over a variety of distinct routes, each of which presents its own unique set of variables. As a kind of competition in the numbers, we have used dummies in the form of walls. The older individual who had physical limitations did not know her way around this location. At the beginning, those who were physically challenged or old utilised the white cane to navigate this path, and the performance with the white can was compared. Whenever physically challenged and elderly people utilised smart sticks, they were able to travel a greater distance than with white canes, and they did so without encountering any difficulties. The comparison between the "Smart walking stick" and the "white cane" reveals that the former has superior performance. The health monitoring sensor provides accurate readings of the physical condition of elderly people and those with physical disabilities.

If a person who is physically challenged or old is out of the house for a stroll and his health takes a sudden turn for the worse, or if he gets the sense that it will be difficult for him to return home, he may send a message to a member of his family to let them know about the situation. On the walking stick is a buzzer button, and when this button is hit, it communicates the coordinate of the stick to a previously saved mobile number through GSM module and SMS. The GPS module is responsible for determining the user's position in terms of both latitude and longitude.

V.CONCLUSION

The electronic walking cane with the smart technology is more advanced, simple to maintain, and long-lasting than the traditional cane. Those who are physically challenged and old may gain greater speed with the assistance of a smart walking stick, avoid small collisions, ensure that they do not lose their route, raise their sense of safety, and also boost their confidence. Users who are old or have physical disabilities are able to move freely without the assistance of another person. The user will feel safer while using this technologically advanced walking stick. This stick is more useful in preventing accidents of a less serious kind. If there is a problem, an emergency alert that includes information about the user's health concerns and his present location will be sent to the relevant person. So, this refers to those who are physically challenged as well as senior citizens in terms of health monitoring and travel safety. The performance of the walking stick might be enhanced in future work by including health monitoring elements. This would be part of the future development. Since diabetes is one of the most common problems experienced by senior people, we may include a monitoring element in walking sticks for the condition. Improving the will be the primary focus of work to be done in the functionality of the system as well as decreasing the stress on the user by the addition of the camera that is used to precisely assist those who are physically handicapped. The images obtained by employing many types of cameras, including smart cameras. A physically challenged person or an older person might benefit from a notion of safe route identification that is based on neural networks. This could be part of the new scope.

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