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Smart third eye for the blind

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Abstract

This system is for tracking and identifying the environment, so it is equipped with a smart phone and circuit. A software is installed in the phone to identify the location of the destination through the voice command and draw a route from the current location to the desired destination. The sensors are connected to the micro controller circuit and provide information about the obstacles in the range. The micro controller timer module is used to determine the output of these sensors and send them to the phone via Bluetooth. The purpose of this research is an intelligent and low-cost system to guide blind or visually impaired people by providing environmental information, static and dynamic objects around them. The current method of statistical community research is sampling and virtual space tools, validation and final review and diagnostic analysis, the findings include related works, system architecture, hardware components, software and research explanations of the third eye of the blind. The results are as follows. which are basic goals. including identifying obstacles, providing the shortest route to the destination with voice command, the possibility of identifying obstacles, small objects and holes and notifying the user.

Keywords: Blindness, smart, detector, recognition, warning

Introduction

problem statement

The main function of this system is to track and detect the environment. This system is equipped with a smart phone and a small embedded circuit. A software is developed in the smartphone to detect the destination location through voice command and plot a route from the current position to the desired destination. Ultrasonic sensors provide information about obstacles if they are in range. The ultrasonic sensors are connected to the micro controller[2] circuit and the timer module of the micro controller is used to determine the output of these sensors and send them to the smartphone via Bluetooth [1].

The importance of the subject

In this system, software is developed in the smartphone to recognize the destination location through voice command and draw a path from the current location to the desired destination. Ultrasonic sensors provide information about obstacles if they are within range [1].

Research objectives and hypotheses

The goal of the project is to develop a cheap blind guidance system for developing countries. The purpose of this paper is to develop a low-cost intelligent system to guide blind or visually impaired people by providing information about the environmental scenario, static and dynamic objects around them [1].

Literature and history

Mobility of the blind is one of the main challenges facing scientists around the world. The number of visually impaired people is about 285 million, of which 39 million are blind. According to the World Health Organization, 90% of blind people live in developing countries Since blind support devices are expensive and many blind people cannot afford them. The goal of the project is to develop a cheap blind guidance system for developing countries. The aim of this paper is to develop a low-cost intelligent system to guide blind or visually impaired people by providing information about the environmental scenario, static and dynamic objects around them [1].

research method

The current method of statistical population research is sampling and virtual space tools, validation and final review, and diagnostic analysis that deals with the research of the third intelligent eye for the spatial analysis of the blind, which is considered as a practical method as well as a basic method. Method. Research tools include Windows Linux, Word 2021, Photo shop 2023, Adobe PDF 2021, Internet search engines, scientific sites in the media space[1].

findings

Related work

Existing technologies include the smart cane with obstacle detection, sonar vision glasses that provide obstacle detection, GPS navigation systems that provide directions, some devices such as the head-mounted audio guide (1974) and the K.A.S.P.A system exist to assist blind people. A researcher has built a device that captures depth data using Microsoft's wand sensor. In this research, neural network is used for obstacle detection [2]. The obstacle avoidance system of the advanced time-moving robot is used to provide assistance to visually impaired people. The nav belt helps the user to choose the path [3]. A device is made for blind people to walk independently with speech

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[2] It is a type of microprocessor that has random access memory (RAM) and read-only memory (ROM), timer, input and output ports (I/O) and serial port (Serial Port) inside the chip itself, and it can control other devices by itself. slow control

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guidance in the current location. Provides navigation information to reach a specific destination. A system introduces an approach using only the vision system and calculates the pre - stored image and real scene [4]. Bluetooth technology applications have also been implemented An audio system with GPS and ultrasonic sensor has been developed to help blind people [5].

System architecture

As shown in Figure 1, the system architecture mainly consists of five parts: ultrasonic sensor arrays, Bluetooth module, micro controller board, smart phone (in this project a WINDOWS 8 phone from NOKIA is used) and a headphone. Ultrasonic sensors are included to detect obstacles GPS sensors are used for navigation purposes [7]. PIC16F877A micro controller is used to send signals to various ultrasonic sensors and then read them [6].

Output (echo) from different sensors, from this output, the PIC16F877A measures the distances of the respective obstacles with separate sensors. The PIC16F877A then transmits these distance values from the various sensors to the smartphone via a Bluetooth device [7].

Hardware parts

The entire system is completely implemented using cost-effective assistive technologies to provide blind people with a greater degree of independence in their daily life. Each unit in the system undertakes a specific job and can be explained as follows: A micro controller is a computer-on-chip used to control electronic device. PIC 16F877A micro controller is used for driving the sensor modules & extracting the dis tance from the output signal of the sensor module[8].

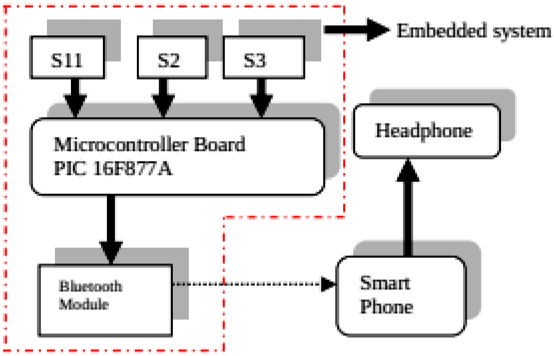

Fig.1: System block diagram

A Bluetooth device is used to transfer distance data from the user's phone to the microcontroller. UART communication protocols are used here for data transfer. A 9V 7000 m Ah battery (nickel metal hydride) to power the device. Ultrasonic electronic[3] eye telemeter module, HCSR04 ultrasonic sensor that performs detection Obstacle sensors are able to transmit data to a pulse of different widths using a computer microcontroller that processes the ultrasonic signals emitted by a transmitter, which is carried by the affected user, and provides real-time information about the distance from the obstacle. Gives. The microcontroller sends it via bluetooth. The HCSR04 ultrasonic sensor module consists of 2 signal conditioning pins and an echo pin. To detect the obstacle and measure the pin and pin distance of the ultrasonic sensor, the echo sensor must be connected to the microcontroller. The IO (input/output) trigger pin of the microcontroller must send a high-level signal for at least 10 us. The module then automatically broadcasts the 40kHz ultrasonic sound at 40kHz and boosts its volume. The microcontroller calculates the time interval between sending and receiving the trigger signal [8].

The echo signal measurement range is 0.03m to 4m, the processing power and battery that the Bluetooth module needs to work is very low. The probability of network interference is very low. Bluetooth works at a distance of less than 100 meters but requires no line of sight and is cable-free.[9].

[3] The waves are emitted by the transmitter and the reflected waves are received by the receiver. The intensity and quality of reflected waves depends on parameters such as the type of obstacle and its distance from the transmitter

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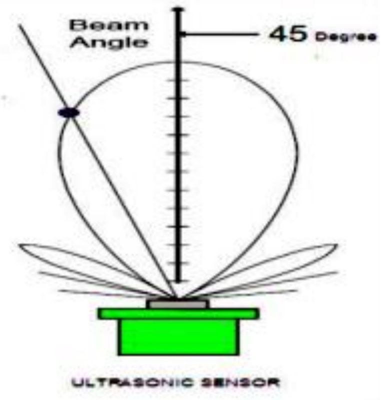

Fig.2: Sonar radiation Angle

Detection of obstacles and distances Measurement method

This device has three sensors on the user's body, one on the palm of the user, one on the forehead, and one under the knee on the leg. The arrangement of the sensors is shown in Figure 4. Now a visually impaired person can detect any kind of obstacle around him and recognize potholes and stairs by these sensors. Sensor 1 and sensor 3 are used for obstacle detection [9].

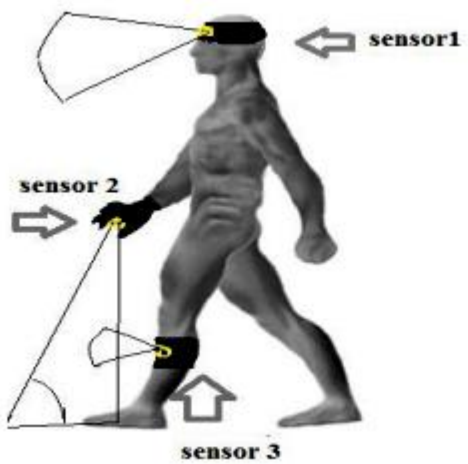

Fig.3: Sensor's placement

This third sensor is used to detect small obstacles (below knee level) and stairs. As humans can turn their neck around 180 degrees, any obstacle can be detected in front of the user. Sensor 2 is used to find holes on the surface. At first, when the user starts this application from the smart phone, it asks the user to extend his hand at a 45-degree angle and takes the distance value as a reference. When the hole is placed in front of user sensor 2, its data goes above the reference value. Therefore, the software detects the hole and the user using voice instructions. It will work as a virtual cane for the user [9].

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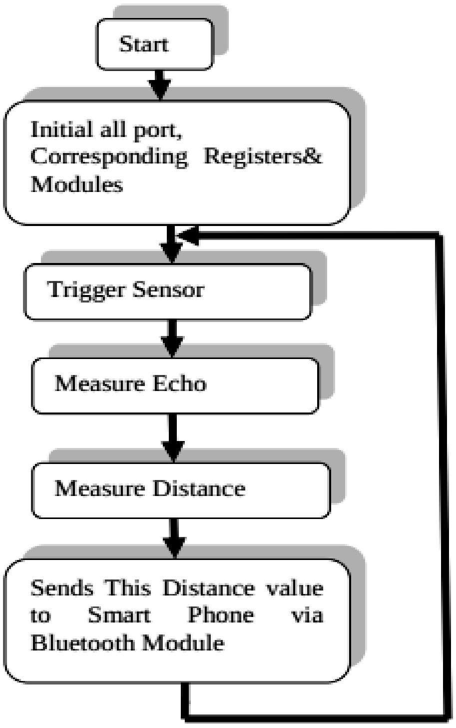

Fig4: Program modeling diagram

All 3 sensor modules are driven and the distance data is calculated by the single micro controller. which is developed for the embedded system using the program modeling diagram of Figure 4. This process is continuously repeated three times one after the other to measure and detect obstacles from each sensor [9].

Software description

When the software starts, it asks the user whether it is normal mode or blind mode, and it starts. If the blind mode user is blind, it tells the user to open their right hand to calibrate the reference value. The reference value is the distance from the user's palm to the ground, which is provided by sensor 2 on the right side of the user. After this session, the software asks the user for the destination. The user can select the destination by voice. To support speech recognition, Windows Phone 8 includes a speech run time, recognition AP Is (application programming interfaces) for run time programming, a ready-to-use grammar and web search, and a graphical user interface (GUI) that It helps users discover and use speech recognition features. So by using this API we can get the name of the destination easily [9]..

In the background, our apps find the user's current location via the phone's GPS. This is an asynchronous operation. For this purpose, the location API for Windows Phone 8 is used. Here, the developed software continuously tracks the user's current location. First, the user's satisfaction status is checked in the settings dictionary (software). If the status value is false, the method exits. Once the user's consent is confirmed, the method initializes the locator object and sets the desired [9].

The accuracy in meters feature receives the geographic location.

Asynchronous method is called which obtains the phone stream. It is done asynchronously. The await operator is used to place code after an asynchronous call to be executed after the call ends. This method should be announced asynchronously [9].

After receiving the destination address, our programs draw the shortest route between the user's current location and the destination using a map from Microsoft. First, the destination address is converted to geographic coordinates. By creating a new Route Query object and storing the coordinates of the current location and the specified destination in the Way points property. From Route Query. When our apps track the current position, they check the shortest route points and give directions via voice instructions. For this purpose, we use the Windows Phone Speech Synthesis API. Here we use a simple geometric equation to determine whether the next point is to the left or right of the current point. We calculate the area using the previous point, the current point and the next point. If the calculated result is greater than zero from our next position to the left of the current point, whether the positive result indicates the correct direction. If the result is zero, it indicates the straight direction [10].

If we consider three points P (xp, yp), C (xc, yc) and N (xn, yn), the area

It is like the formula below.

ΔPCN is xp (yc-yn) - xc(yp-yn) +xn (yp-yc) (1)

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Since the Bluetooth connection is app-to-device, the Bluetooth module is first paired with the Windows Phone 8. After a certain period of time, our embedded device sends the surrounding information from phone to phone. Upon receiving this information, our applications provide the necessary instructions to the user through voice instructions. Our sensor continuously sends data to the device after a certain period of time. We need to compare this data with our stored data. If the current data is less than the stored data, there is an obstacle in front of the user. If The current distance from sensor 2 is greater than the reference value, then there is a hole in front of the user. By comparison, our apps inform the user about the surroundings through voice command. When the user reaches the destination point, the software notifies the user. During the trip, if the user encounters any danger during the tour, shaking the phone will send a nuisance call to a pre-set mobile number [10].

the experiment

The developed system has been evaluated with two main experiments. In the first experiment, we examine and show the functioning of the ultrasonic sensor. The experimental range from HCSR04 to be 0.05 meter to 3.95 meter and the signal covers an angle of 45 degree (approximately) as measured [10].

The developed system has been evaluated with two main experiments. In the first experiment, we examine show the ultrasonic sensor functioning. The experime ntalrange from HCSR04 to be 0.05 meter to 3.95 meter and the signal covers an angle of 45 degree (approximately) asmeasured.n the second experiment, the developed software istasted on the following sequence [10].

- Connect to the external hardware (with Bluetooth module HC-06).
- Calibrating the short range detector (Receiving reference value from sensor 2)
- Submitting destination via user's voice
- Drawing route to shortest distance.
- Following route through audio directions.

Some outputs from this software are shown below [10].

Fig5: Program modeling diagram (a)

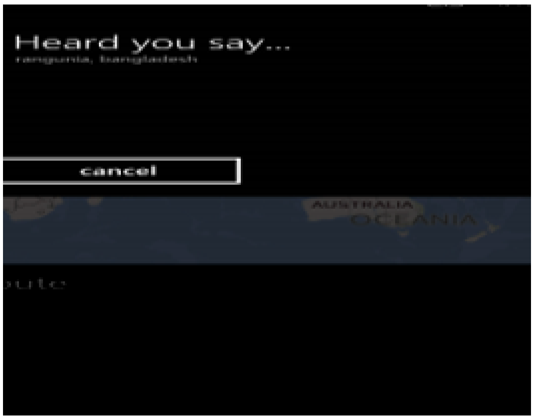

Fig5: Program modeling diagram (b)

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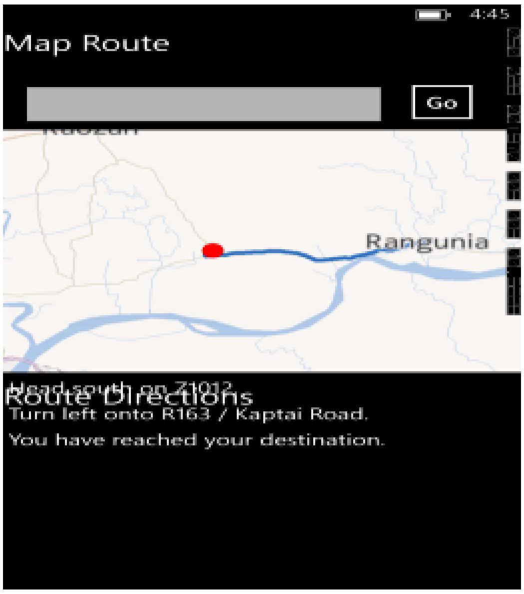

Fig5: Program modeling diagram (c)

Software output (a) asks for destination (b) received destination (c) Draw route (red mark is the current position &blue colored curve is the route) [10].

The results

Conclusion and discussion

This project has a satisfactory result in terms of basic objectives. such as obstacle detection and offering the shortest route to the destination with voice command. It is possible to detect obstacles, small objects and holes, and the user is notified. Meanwhile, there are areas to improve the tour navigation system, such as more powerful sensors that can be incorporated into the project to provide obstacle detection in a wider range, combine proximity sensors for high sensitivity, launch phone software via voice command. . In the experiment, it was found that the route should be precisely defined by GPS coordinates. But if the user deviates one or two steps from the right path, the GPS coordinates will not change, This project targets one of the most prominent problems of our current society. So far, this problem has not been properly addressed, and visually impaired people continue to suffer from a lack of physical freedom. Our motivation is to reduce their difficulties and make the world easier for them. More sensors can be used to accurately detect different obstacle shapes. This system can work in indoor and outdoor environment, Effectively, the experimental results have shown that by using this device hole, the obstacle is detected and the user is successfully alarmed. This project is consistent with my research and does not have much difference, but due to GPS positions, blind people are less able to see it. to trust Therefore, it should be used as a tool to better understand the environment

Proposals

More sensors can be used to accurately detect different obstacle shapes, making it more intelligent, and more space recognition for that exponential definition.

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