Guideline System for Blind using GPS and Fingerprint Scanner

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Abstract: ***'****Good vision is a most precious gift', but sadly loss of vision is increasing now a days. This may be a result of some disorder, injury, or other conditions that limit vision. Also blindness may be from the birth.Many visually impaired people navigate with the help of dogs guiding them. Our system aim at making such people independent and impart confidence in them. Our system uses GPS for providing navigation for blind people. In this blind people issues the commands with the help of finger print sensor. GPS receiver is used to receive the values of the latitude and longitude continuously. Ultrasonic sensors coupled with this system, provides obstacle data to the blind person through voice message. Thus the system provides complete guidance and protection to a blind person under various circumstances*

Keywords- *Fingerprint scanner, ultrasonic sensor, matching algorithm, variation in latitude and longitude, LDR*

I. INTRODUCTION

Generally human path finding consists of two main components: sensing of the immediate environment for hindrance or obstruction and navigating to remote destinations beyond the immediately perceptible surrounding. Navigation, also involves updating one's position and orientation during entire journey with respect to the planned route or final destination and, in the event of becoming lost, reorienting and reestablishing the travel once again toward the destination[1].The blind people are at a considerable disadvantage, for they often lack the information which is necessary for avoiding obstacles and have relatively very small data about landmarks, heading, and self velocity, who have knowledge of these environments or who are navigating through unfamiliar environments on the basis of external maps and verbal directions.

Firstly here we are using ultrasonic sensor for informing the blind person about the obstacles in the way. Also a led is used so the presence of the blind person can be easily sensed by any one in dark. For this purpose we are using a LDR circuit coupled with the led. Ultrasonic Sensor senses the obstacles in its way by continuously sending the ultrasonic waves. Whenever there is an obstacle present then the transmitted waves gets reflected back to the system immediately. Thus ultrasonic receiver senses these reflected ultrasonic waves. These waves are analyzed by the microcontroller and then it alerts the blind person using this system through voice signal.

Second, GPS is used to gather the information about the position which is in terms of latitude and longitude values [1]-[3].Micro-controller analyses this information and guide the person to its using voice playback system. For receiving commands from the blind person, finger print scanner is used. Depending upon which finger is scanned, a predefined path is selected (every finger has a unique print, even from the same person). Finger print scanner enables the person to enter appropriate input as well as authentication is achieved which make the system more secured.

II. METHODOLOGY

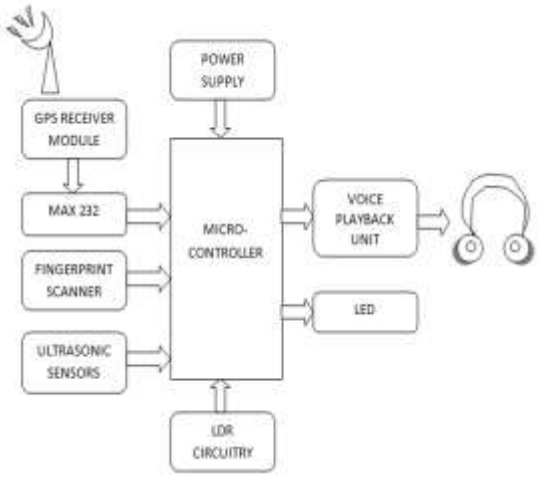


Figure: 1

Block format of our system is shown in fig: 1. Here ATMega328P-PU Micro-controller is used, to control the whole operation. The information gathered from the GPS receiver (in the form of latitude and longitude of the location) is compared and analyzed by the micro controller. Fingerprint sensor act as a medium for interaction between user and micro controller. Here three Ultrasonic sensors HC-SR04 are used for detecting obstacles during the

journey. An LDR circuitry along with LED is used. [3][2]Voice playback system is used for directing the user through voice commands which are already being stored.

WORKING:

Initially to start the system for navigation a security arrangement is done in our system. Here the system required a valid thumb print to start the operation. The user will have to select a path from various predefined path stored. This is done by comparing valid fingerprint assigned for that path. User's fingerprint acts as a trigger to select one of the previously stored destination options.

Figure: 2

This unit works according to the algorithm called matching algorithm, which is used to compare previously-stored templates of finger prints (each assigned to a specific path) against the user's finger print.(as shown in figure 2)For example, middle finger may be assign for the selection of route from home to office.

The co-ordinates from GPS receiver is continuously monitored and compare with the co-ordinates and accordingly analyzed to direct the user. For this purpose, the property of variation in latitude and longitudes are being used (as shown in the figure 3).

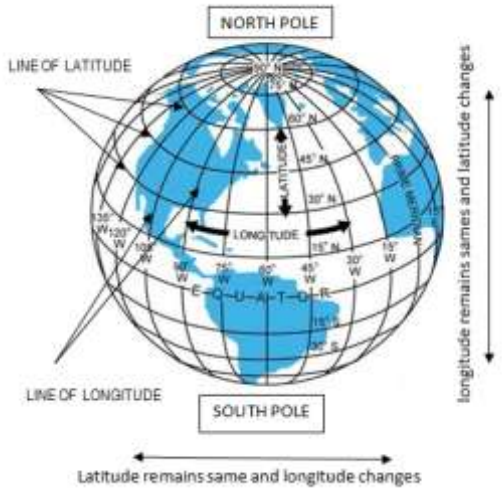


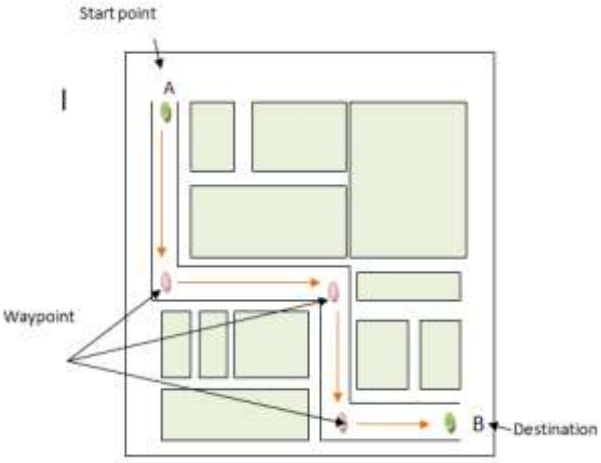
Figure: 3

For this purpose, the property of variation in latitude and longitudes are being used (as shown in the figure 3). For example, if the user is in northern hemisphere and moving along the north direction, then its longitude remains same whereas its north latitude increases changes.

[1]-[3]The voice playback system accordingly plays the voice commands, through speaker. Along with this ultrasonic sensors continuously check for any obstacles. Ultrasonic sensor continuously transmits ultrasonic waves, which gets reflected from the obstacles if any. Here three ultrasonic sensors are being used among which one is use for front direction and other two for left and right. They are placed at the handheld stick of the user. Micro-controller sends a trigger pulse to the sensor which accordingly generates an ultrasonic wave. The echo received by sensor is send to the micro-controller which analyzed it for detection of obstacles.

Figure: 4 -predefined path using waypoints (references points)

A LDR circuitry (Light dependent register) is being used to glow the LED whenever there is darkness around. LED gives an indication of



presence of blind persons.[4]

III. HARDWARE DESCRIPTION:

1. Microcontroller:

In our system Atmega328p is been used. It is an high-performance Microchip, 8-bit microcontroller combines 32KB ISP flash memory with read-while-write capabilities. Also 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, as well as three flexible timer/counters are some of the features of this microcontroller. It requires dc power supply between 1.8-5.5 volts for smooth operation.

2. GPS receiver:

The GPS receiver (GPS module EM406A) used is an low power consumption, high sensitivity unit with built-in antenna and memory back-up. It requires 5V dc power supply and TTL level output voltage is between 0-2.85V. It also includes high precision mount technology which thereby provides high accuracy and reduction in the space requirement. The unit is a good medium for navigation applications.

3. Ultrasonic sensors:

HC-SR04 (Ultrasonic sensor) is used here. It includes an ultrasonic transmitter, a receiver and a control circuitry along with four pins: VCC (POWER), TRIG (TRIGGER), ECHO (RECEIVE) and GND. It requires a dc voltage of 5V a with operating current 15mA.ranging distance for this sensor is 2cm-4m with an measure angle of 15°.

4. **Finger print scanner:**

The finger print sensor module R305 has URAT interfaced with direct connections to the microcontroller. The finger print data can be stored in the module and using the 'Tx' and 'Rx' pin of the sensor the data can be access and analyzed by the user. Main advantage of this module is low power consumption, low cost and high performance.

5. **LDR (light dependent resistor):**

It is an electronic device whose resistance depends on the amount of light falling on it. The light resistance of LDR (CDR) is measured at 10 Lux with standard light 'A' (2854K-color temperature) and 2hr. Pre-illumination at 400-600 Lux prior testing and dark resistance is measured at 10th seconds after closing 10 Lux. This LDR is characterised by features such as quick response, good characteristic of spectrum and reliable performance.

6. Voice playback IC (APR33A3):

The APR33A3 is a 680 sec (11 Minutes at 8 KHz Sampling rate) recording and playback IC. It is a low cost, high performance IC with operating voltage range between 3-6.5V. It is also featured with non-volatile flash memory technology with no battery backup requirement as well as very low standby current around 1uA and low power-down current around 15uA.

IV. CONCLUSIONS:

As we have discussed earlier that loss of vision affects the navigating ability of the person, our system becomes a good helping hand for such people. The use of fingerprint scanner to take inputs from the user makes the system more user-friendly as well as authentication is achieved automatically. The use of three different ultrasonic sensors proves to be a good medium for obstacle detection but cannot give an identification for which type of obstacle is present. Also the use of LDR circuitry makes other people aware about the presence of blind person in dark, reducing the risk for any accidents.GPS acts as a good medium for getting the information about position of the user but limits its use for indoors (as GPS signal cannot be received indoor). Overall our system proves to be a good portable system for blind navigation.

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