Navigation System for Blind People

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Abstract— The aim of this paper is to investigate the development of a navigation aid for blind and visually impaired People. It is based on microcontroller with synthetic speech output. This aid is portable and gives information to the user about urban walking routes to point out what decisions to make. On the other hand, and in order to reduce navigation difficulties of the blind, an obstacle detection system using ultrasounds and vibrators is added to this device. The proposed system detects the nearest obstacle via stereoscopic sonar system and sends back vibro-tactile feedback to inform the blind about its localization. This blind guidance system is safe, reliable and cost effective.

Keywords: Navigation System, Blind People

I. Introduction

A navigation system for a person with visual impairment involves identifying the layout of the 3D space around them and then helping them negotiate their way around obstacles *en route* to their destination. 285 million people are estimated to be visually impaired worldwide: 39 million are blind and 246 have low vision. About 90% of the world's visually impaired live in low-income settings. 82% of people living with blindness are aged 50 and above. For these people, previous research has focused on using distance sensors for real-time spatial exploration. The well-known algorithm has been implemented with LIDAR, but this way is too expensive. To overcome this kind of problems a new device, based on the same principle will be presented in this paper. Many people with disabilities need help in order to achieve everything they propose. It's important for them to continue their professional, social or educational development. A minimal system has been designed and implemented in order to demonstrate the proposed solution validity. The system is designed around a microcontroller and it includes vibration motors for user alerting and guiding.

Blind challenged persons face constrains in independent mobility and navigation. Mobility means the possibility of liberally moving, without support of any supplementary person, at home and unfamiliar scenarios. People with visual impairment tackle enormous limitations in terms of mobility. A system which guide or assist people with vision loss, ranging from partially sight to totally blind, by means of sound commands is referred as Navigation System for Blind People. This project is solution for blind people. Using this proposed system, the blind people can move easily in different areas independently. The proposed system is one module which consist of:-

a) Ultrasonic Sensor for obstacle detection.
b) Voice module for give voice information of navigation.
c) GPS/GSM for in case of miss guide of people for give information of location.

Thus, the system provides complete guidance and protection to a blind person under various circumstances.

II. Literature Review

1) A.Sangami et al. Have designed a system for help the blinds. It's developed more than the traditional long cane, that help the blind and visual impaired without the need to help from the sighted person. The system consists of sonar sensor to aid the blind to avoid obstacle, GPS module to identify the location of the blind person, RFID is used in indoor since GPS can't be used in indoor and it can be installed in public building and integrated into blind person walking stick and every tag will be equipped with as much information concerning direction and location, GSM to send alert message to other people who responsible for the blind.
2) Kher Chaitrali S et al. have suggested proposed navigation device which is focused on providing voice output for obstacle and the blind location. They are used an infrared sensor, RFID, and android device. The device is connected to android phone through Bluetooth. The system consists of hardware and software. In hardware have PCB unit and RFID sensor. In the PCB unit, there are (microcontroller, ADC converter, IR sensor, Bluetooth is used for wireless communication between PCB unit and android phone). In the software, there are blind user and monitoring user android application. The details in an application are IP address of the servers, contact number.

III. Block Diagram

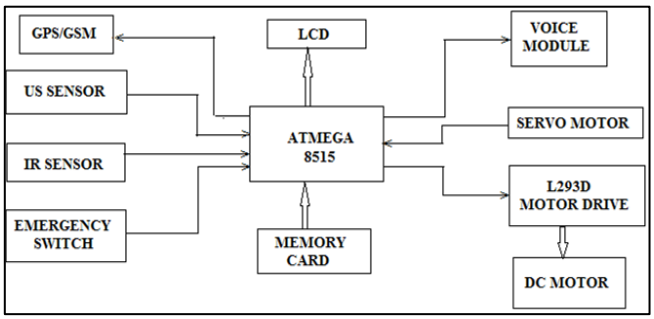

Fig. 1: Block Diagram

The block diagram below depicts the proposed design of an embedded smart guiding system. The system elements consist of various subsystems. The sensor based circuitry consists of sensors such as smoke sensor, water sensor, ultrasonic sensors, and GSM module. Vibratory circuitry consists of an array of vibrators with logic designed to obtain different vibratory patterns. The proposed system can be designed to take form of a detachable and portable device, which can be unconditionally mounted on a simple hand belt or blind guiding system. This requires a clear vision of the desired system goals. Various system

parameters are thus needed to be evaluated based on the design to be practically implementable.

IV. SYSTEM DESIGN

A. Ultrasonic Sensor

Supply voltage 5 v global current consumption 15 mA ultrasonic frequency 40k Hz maximal range 400 cm minimal range 3 cm resolution 1 cm trigger pulse width 10 µs outline dimension 43x20x15 mm seed ultrasonic sensor is non-contact distance measurement module, which is also compatible with electronic brick. Us sensor are used to detect front and side obstacle and distances .this signal is given to the controller.

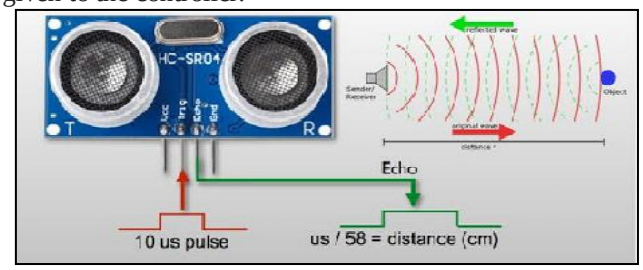

Fig. 2: Ultrasonic Sensor

B. Mp3 Module

The audio data is sorted by folder, supports up to 100 folders, folders can be assigned to every 255 Tracks. 30 level adjustable volumes, six adjustable EQ. Fully supports FAT16, FAT32 file system, maximum support 32G TF card, support U disk to 32G, 64M bytes NORFLASH. A variety of control modes are available. IO control, serial port, AD button control mode. Signal from sensors are given to the controller then voice module generate a predefine voice. The blind person will get direction from voice module and get instructed.

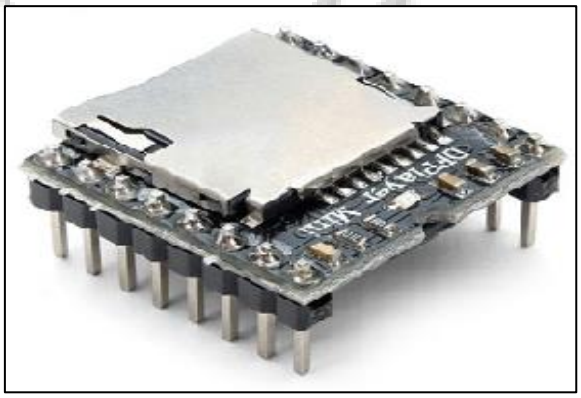

Fig. 3: Mp3 Module

C. AVR ATMEGA 8515

ATmega8515 AVR controller which has high performance low-power 8-bit microcontroller which is RISC architecture 130 powerful instructions most single clock cycle execution 32 x 8 general purpose working registers are fully static operation up to 16 MIPS throughput at 16 MHz – on-chip 2-cycle multiplier peripheral features one 8-bit timer/counter with separate prescaler and compare mode one 16-bit timer/counter with separate prescaler, compare mode, and capture mode three PWM channels programmable serial USART master/slave SPI serial interface programmable watchdog timer with separate on-chip oscillator on-chip analog comparator .

D. GPS & GSM MODULE

1) GPS

The Global Positioning System (GPS) was an important invention in the United States of America that gives best positioning, navigation, and timing services to users on a complete worldwide basis which is available to all free of cost. For anyone with a GPS receiver, the system will provide location with time. GPS gives unambiguous location and time data for an unlimited number of people in all climates, day and night, anywhere in the world.

2) GSM:

The Global System for Mobile Communications (GSM) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets. This system is comprises of GSM Module. The microcontroller is the heart of the device. It gathers the data of the current location which it is presented from the GPS system. It can make use of the data stored and can send location in form of latitude and longitude to the user. Guardian of blind person can trace the location with the help of GPS. Sometime misguide of blind person guardian will get a message from GSM and get that person location. By this it can trace out the distance from the destination. SIM808 module is a four Band GSM or GPRS module which is a combination of GPS technology for satellite navigation. SIM 808 is of utmost importance in this unit. It is acting like a GPS in this system.

Fig. 5:

V. WORKING PRINCIPLE

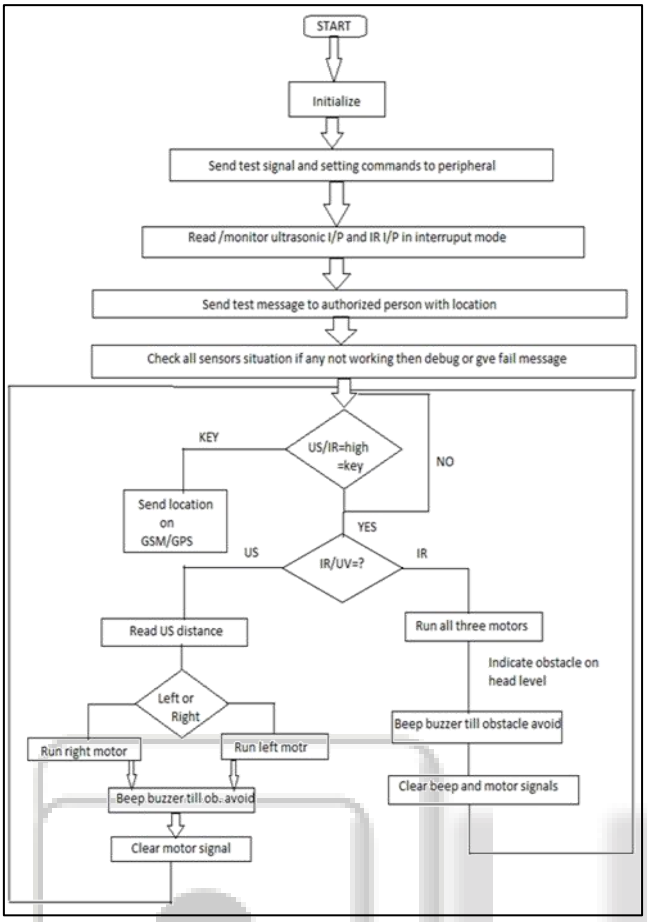

Fig. 6: Working Principle

Design of AVR ATMEGA 8515 controller module we interfaced with various components such as follows:

1) Direction detection using Ultrasonic Sensor.
2) Obstacles detection using IR Sensor.
3) To find location using GPS/GSM module.
4) DC /Servo motor.
5) Voice module.

Proposed system is consisting of ATMEGA16 controller to which components are interfaced like Ultrasonic sensor, IR sensor, GSM and GPS etc. The sensors, senses the parameters like obstacles, direction and location.

VI. CONCLUSION

The project proposed the design of a new concepts of Navigation System for Blind People. The advantages of the system lies in the fact that it can prove to be a low cost solution of blind person worldwide. The proposed combination of various working units makes a real-time system that monitors position of the user and provides feedback making navigation more safe and secure. It can further improved to have more decision taking capabilities by employing varied types of sensors like Ultrasonic and IR sensors and thus could be used for different applications. So, it aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety.

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