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Orientation System for Blind Person

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***Abstract*—** This paper is intended to provide a model for object detection and assistance system via Global Positioning System (GPS).This paper provide the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path. This ETA is fixed to the wheel chair. When the object is detected near to the blind it alerts them with the help of voice play talk kit to which speakers are connected . Ultrasonic sensors are used to evaluate distance of the objects around the blind person and to guide the user towards the secure path. The hardware of entire system contains ARM7 (LPC2148),ultrasonic sensors and voice input kit, speakers, Global positioning system (GPS) module and Global System for Mobile (GSM) module

Keywords-*ARM7, ultrasonic sensors, GPS, GSM.*

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I. INTRODUCTION

Mobility is the main problem usually faced by blind people. About 90% of the blind person find difficulty in navigating on their own. This people require some kind of navigational help. This method propose such a navigational aid to help the blind person to travel around easily. There are various navigational aids which are already in existence. These are white canes, guide dogs etc. Long white cane is a traditional tool used to detect obstacles in the path of the blind person. The guide dogs are assistance dogs, trained to lead the visually impaired around obstacles. The use of white canes depends on the surrounding situation and also on the user. Guide dogs are also limited in their usage as training a guide dog is time intensive.

The distance of obstacle activity to be through numerous strategies. Like laser, ultrasonic, Infrared, international Positioning (GPS) and frequency Identification (RFID), etc..These methods are available to measure the distance of obstacle from blind person. One of the methods is by means of ultrasonic sensor. Many applications are available in the field of robotics and self -propelling vehicles. Self propelling vehicles are very much used in industries that are totally dependent on automatic machines.

15 million blind people are from India and 37 million across the globe. There should be a system which would make life of blind people much easier. The main objective of this project is to provide guidance to the visually impaired person and also gives location of blind person to his parent and track him if some problem aries. In this way the visually impaired and blind people can live an independent life.

II. DEVELOPMENT OF SYSTEM

A simple and low-cost proposed system for obstacle detection is shown in fig. 1. The LPC2148 Microcontroller is employed for the information systems and management systems. it\'s associate sixty four pin twin package IC factory-made by chip with serial I/O to the pc compatibility. The microcontroller receives the unhearable device signalling with pulse dimension modulation. And additionally its initiate the temperature device for the redundancy, means that of at the low worth distance measured obstacle or the ETA problems. The voice recorder associated reproduce device is employed to administer alerts to the visually handicapped person through an speaker. . MAX 232 is employed to covert this serial knowledge from microcontroller to computer.

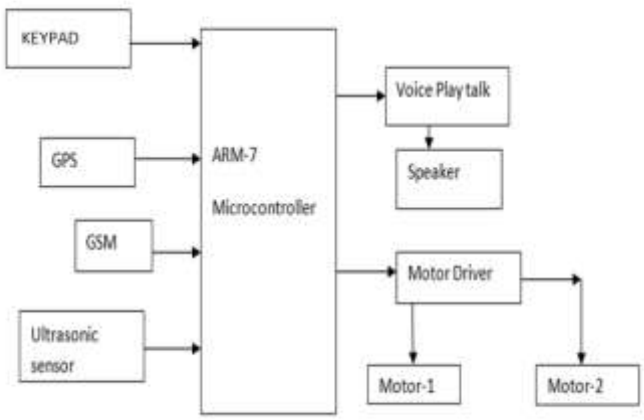


Fig1. Block Diagram of System

A. ARM CONTROLLER

The ARM processor core is a key component of many successful 32-bit embedded systems. The LPC2148microcontrollers are based on a 32bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory of 512 kB. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to its tiny size and low power consumption, LPC2148 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTs, SPI, SSP to I2Cs, and on-chip SRAM of 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems

The programmer's model of the ARM 7 consists of 15 user registers, as shown in Fig. 2 whereR15 is used as the Program Counter (PC). As the ARM 7 has a load-and-store architecture, a user program must load data from memory into the CPU registers, process this data and then store the result back into memory. Unlike other processors no memory to memory instructions are available.

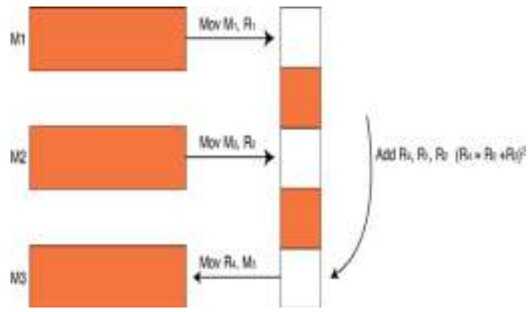


Fig 2. Programmer Model

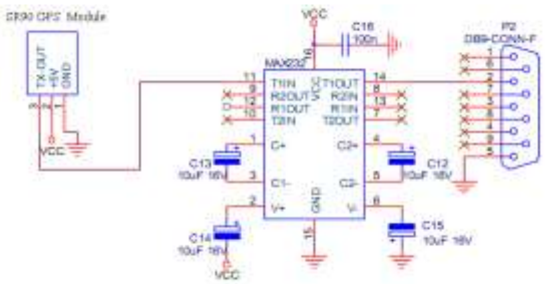
As stated R15 is the Program Counter. R13 is used as the stack pointer, which is defined as a programming convention. As the ARM instruction set do not have PUSH and POP instructions so stack handling is done via a set of instructions that allow loading and storing of multiple registers in a single operation. Thus it is possible to PUSH or POP the entire register set onto the stack in a single instruction. R14 has special significance and is called the "link register". When a call is made to a procedure, the return address is automatically placed into R14, rather than onto a stack, as might be expected. A return can then be implemented by moving the contents of R14 into R15, the PC. For multiple calling trees, the contents of R14 (the link register) must be placed onto the stack.

B. ULTRASONIC SENSOR

Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensors. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. Ultrasonic is like an infrared where it will reflect on a surface in any shape. However, the ultrasonic has a better range detection compared to infrared. Magori and Walker state that the endurance and accuracy of the sensor is not affected by physical contact. Comparing with other sensors, the ultrasonic is more accurate. Han and Hahn have proven that the distance and angle measurements of ultrasonic are highly reliable by proving that the relative errors and variances of the measurements are within a reasonably small range. These discussions explain that the ultrasonic is suitable for developing system.

In Ultrasonic sensors, signal measurement is independent of material and color of obstacles. It works in all light conditions - bright, dark, glaring or dim. Suspended particles like dust, steam, smoke does not affect the measurements. HC-SR04 Ultrasonic Distance Sensor is a popular and low cost solution for non-contact distance measurement function. It is able to measure distances from 2cm to 400cm with an accuracy of about 3mm.

C *GPS RECEIVER INTERFACING*



GPS receiver module has embedded antenna and tiny form factor 22.0 x 22.0mm x 8mm. The GPS receiver provides very fast TTFF together with market leading weak signal acquisition and tracking sensitivity figures. The module supports enhanced navigation accuracy by utilizing WAAS/EGNOS corrections, which may be enabled via NMEA command. The module provides complete signal processing from internal antenna to serial data output in NMEA messages. The module requires a power supply VDD and a backup supply VDD_B voltage for non-volatile RTC & RAM blocks. There is a variant of the module available with on-board backup battery, which will eliminate the need for external backup voltage source. PPS signal output is available for accurate timing applications.

The output is serial data of 9600 baud rate which is standard NMEA 0183 v3.0 protocol. NMEA 0183 is a simple, yet comprehensive ASCII protocol which defines both the

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431 - 434

communication interface and the data format. The standard NMEA output only messages are: GGA, GLL, GSA, GSV, RMC, VTC, and ZDA. Time, position and fix related data for a GPS receiver.

Structure:
$GPGGA,hhmmss.sss,ddmm.mmmm,a,dddmm.mmmm,a,x,xx,x.x,x.x,M,,,,xxxx*hh<CR><LF>

D. GSM Modem

Supports 900/1800/1900 MHz GSM Tri band GSM modem is connected to the microcontroller/processor by serial cable. Supports AT Command Set AT+CMGS – to send SMS

Syntax:
AT+CMGS="mobile no." press "Enter "
Type text and press "ctrl + z "

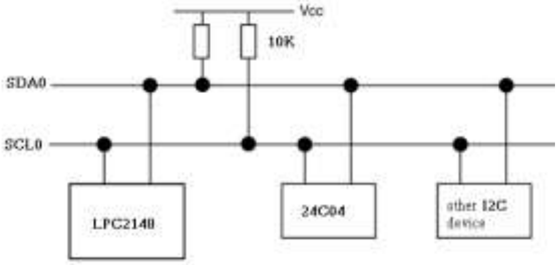
UART1 is configured to send the ASCII data to the module.

E. UART0

Looks for serial data pattern as above and saves the ddmm.mmmm,a,dddmm.mmmm,a field which is nothing but location information. The below code sample configures UART0 to interface to a Terminal program running on a host machine (maybe Tera Term Or HyperTerminal) at a baud rate of 9600. The code simply prints "Philips LPC" on the host machine terminal program forever since it is included in a while (1) loop. VPB Divider value is at its reset settings and hence the peripheral clock is one fourth of the system clock. The VPB clock would then be 2.5MHz. Steps on calculating the divisor value are shown below.
Required baud rate= VPB clock/ (16 * Divisor value)
Calculating Baud rate
Baud rate is calculated using the following formula:
9600 = 2.5MHz /16 * x
x = 16.2
= 0x10(after discarding the decimal part)

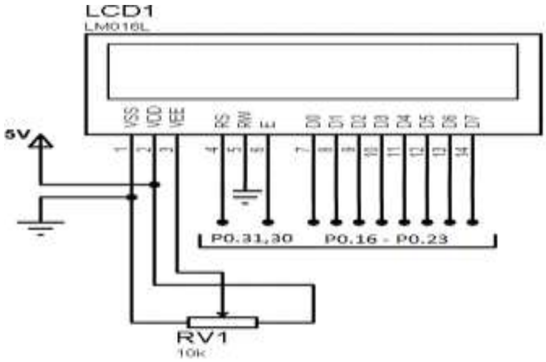
F. I2C

For storing non-volatile data (user phone no. PIN) on 24c04 EEPROM,I2C0 of LPC2148 is used.

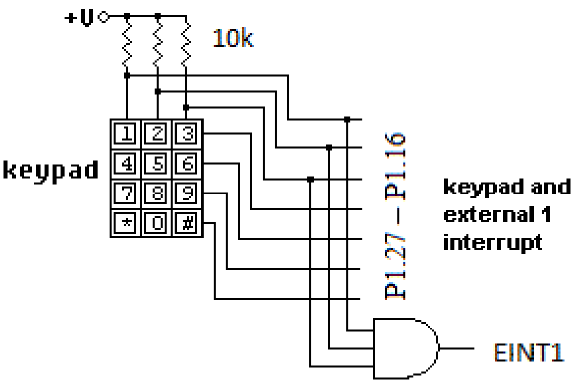


G. GPIO

LCD interfacing in 8 bit mode



4*3 KEYPAD INTERFACING



UART0	to receive GPS data from GPS module RxD0 of LPC2148 is connected to TxD of GPS module SR90
UART1	to send location data and other car status to the GSM modem to be sent as SMS
I2C0	connected to 24C04 EEPROM for saving PIN and user phone number
GPIO	P0.23 - P0.16 (8 bit) , P0.30-31 for 16x2 LCD module, P1 for keyboard input and outputs such as buzzer.
External interrupt	EINT1 for keyboard interrupt
ADC0	for Ultrasonic sensor
Timer0/1	seconds timer used for timed PIN input

III. APPLICATIONS

- This system might scale back and useful for the blind man struggle less navigation for the blind man i.e. Navigation singly.
- This system may be utilized in automatic robots, self propellant vehicles in automatic production factories etc.
- The distance activity and obstacle detection system may be utilized in places wherever correct distance activity is needed.

IV. CONCLUSION

After successful testing of this System it is found that it can send the position of Blind person in the form of longitude and latitude which interns with the help of Google map like applications can give location information on Mobile.

It also detect the obstacle and give alert to the blind person that the obstscle is detected through the speaker. The motor which are attached to the wheel chair will stop moving as obstacle is detected .With these system blind person will enter the destination location where he want to travel with the help of GPS motor attached to wheel chair will start moving as the destination is reached motor will stop rotating and give alert to blind person that reached destination

With connections of certain sensors to the system, it can also record the vehicle speed, weight and type of fuel used.

The 16*2 LCD display can be replaced by bigger size display, to view the large amount of data.The external memory can be increased as per the requirement **.**

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