Embedded Based Vehicle Control

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Abstract: The measurement of distance and control the vehicle is an important process in transportation. The developed distance measurement with ultrasonic sensor was implemented and the results are evaluated. The results are in good agreement as compared with the standard values. The developed prototype system is working properly and it is simple, portable and low cost..

Keywords: LCD Display , Microcontroller**,** Ultrasonic sensor.

1. Introduction

The measurement of distance and control the vehicle is an important process in transportation. In spite of having different methods to complete this task, non-proximity type methods have its own significant features. In this regard we made an attempt to control vehicle using ultrasonic sensor. Ultrasonic level sensor works on the "time of flight" principle using the speed of sound in terms of time. The developed distance measurement with ultrasonic sensor was implemented and the results are evaluated.

2. Procedure

In order to adequacy and meticulous apply ultrasonic measurement technology to the fields such as industry, materials and liquid levels to realize the factual measurements of measured objects, the present measuring technology based on ultrasonic waves is analyzed and researched [2]. The measurement principles, hardware selection calibration, data transmission and acquisition of the ultrasonic waves are introduced in seriatim. By adopting the ultrasonic measurement technology to descry and analyze the distance, the results show that the ultrasonic measurement technology has the characteristics of high measuring accuracy, safe and reliable operation, low cost, etc [1].

3. Hardware

The block diagram of a microcontroller based level measurement using ultrasonic is shown in figure 1 [4], its schematic diagram in figure 2 consists the following units. They are

- Ultrasonic sensor (HCSR04)
- Microcontroller P89v51Rd2FN
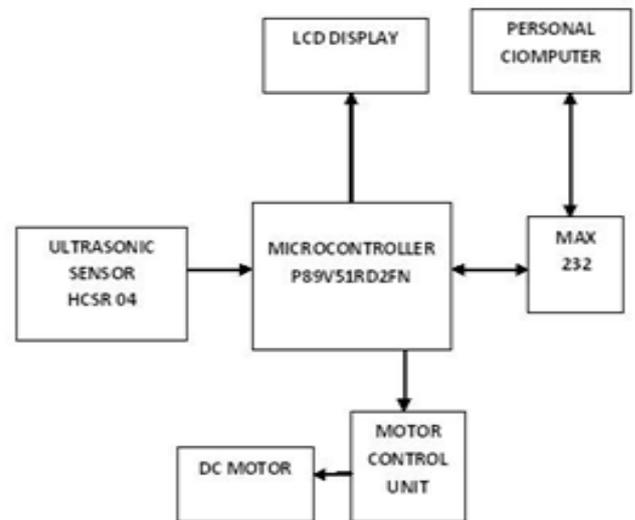- LCD display
- MAX 232
- Personal computer

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Figure 1: *Block Diagram of Distance Measurement and Vehicle Control using Ultrasonic Sensor*
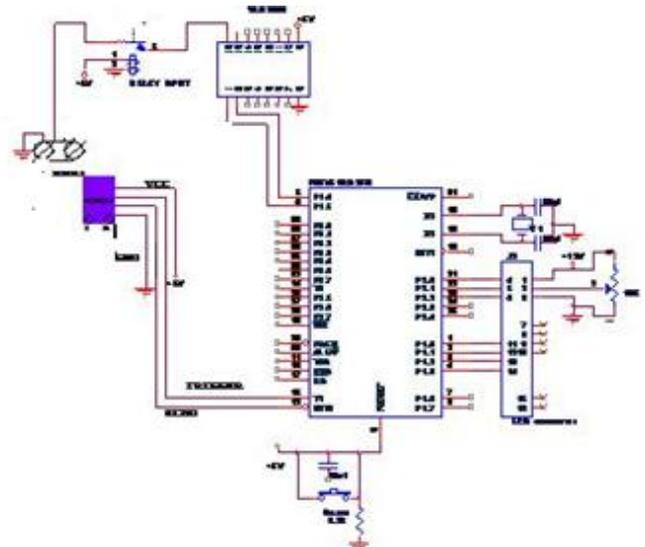

Figure 2: *Circuit Diagram of Distance Measurement and Vehicle Control using Ultrasonic Sensor*

3.1 Ultrasonic Sensor(HCSR04)

Ultrasonic level sensor works on the "time of flight" principle using the speed of sound. The sensor emits a high-frequency pulse, generally in the 20 kHz to 200 kHz range, and then listens for the echo. The pulse is transmitted in a cone, usually about 6° at the apex. The pulse impacts the level surface and is reflected back to the sensor, now acting as a receiver and then to the transmitter for signal processing. Basically, the transmitter divides the time between the pulse and its echo by two [5] [6], and that is the distance to the surface of the material. The transmitter is designed to listen to the highest amplitude return pulse (the echo) and mask out all the other ultrasonic signals in the container.

3.2 Microcontroller P89V51RD2FN

Microcontrollers are widely used in many commercial and industrial applications. High level programs are used for most popular microcontrollers and this makes the program development and subsistence (maintaining) a much easier task. It is 5V Operating voltage with frequency 11.0592MHz crystal. The output data of microcontroller which is in digital form i.e., level of liquid displays on the LCD display. The digital data lines D0-D7 are connected to Port1 of the microcontroller. The operation of the level measurement system is very simple [7].The time duration for receiving of echo is sensed by the ultrasonic type level sensor. This time is then converted in to distance format by using the formula distance=(velocity/time)/2.trigger pulse and echo signal lines of ultrasonic sensor are assigned to P3.2,P3.5 respectively and time as output is stored in register, it is send through port P0 of microcontroller. The microcontroller receives this data and displays the distance on LCD display, the above course of is oftentimes(repeated) continuously.LCD display data D4-D7 are assigned to P1.0-P1.3 pins [8],The RS,R/W,EN are assigned to P2.0, P2.1,P2.2 respectively. It receives the liquid level in digital form, processes this data and then displays the level on LCD display.

3.3 DC Motor

The DC motors is used in the present work operates with +12V/1A power supply. It maintains the distance by motor controlled with microcontroller P1.4 through relay using ULN2003 driver circuit.

3.4 MAX232

The application software for the present work for developed through communication interface of MAX232 with PC developed in Keil environment using C language with It converts the RS232 voltage levels to TTL voltage levels and vice versa. The main advantage of it is its operating voltage +5V same as microcontroller and it has two sets of line drivers for transferring and receiving data.

3.5 LCD Display

A 16x2 LCD means it can display 16characters per line and there are 2 such lines in thisLCD each character is displayed in 5x7matrix This LCD has two registers namely command register and data register. The command register stores the command instruction. A command is an instruction given to LCD to do a ascertain task like initializing, Clearing its screen, setting the cursor position, controlling display etc., the data register stores the data to be displayed on the LCD.

4 Software

The **μ**Keil version 4 used for the development of application program of level measurement using ultrasonic level sensor. It provides facilities for source code editing, program debugging and complete simulation in one powerful environment. The micro version development platform is easy to use and helping to quickly create embedded programs that work. The micro version editor and debugger are integrated in a single application that provides an embedded project development environment.The algorithm for distance measurement and vehicle control is given below.

4.1 Algorithm
- Initialize
- Send the trigger pulse of 1μsec time
- Initialize the timer of microcontroller.
- Wait till echo will be reached.
- Timer is off.
- Calculate distance d = Speed*time/2.
- By using Relay through ULN2003 driver control the motors for controlling the vehicle.
- If limited distance of the abstract is reached set point the motor will be on.
- If the distance of abstract is greater than the set point, then the motor will be oin ON condition.

5 Conclusion

The development system is satisfactory, working within the standard limits for the extension, the system may be interfaced with personal computer via serial port for implementing the remote measurement and control using advance technology like GPS/GPRS, WI-FI and web based technology. Theinstrument providing an actual measurement and control with an accuracy of □ 0.03cm height with reliable and low cost.

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Author Profile

Dr.G.Prathyusha received M.Sc and P.hd degrees from the Department of Instrumentation and USIC, SriKrishna Devaraya university ,Anantapur. She having eight years of teaching experience. Her area of interest are Network and Mobile Communications, network security systems, and embedded systems.