



Automatic Milk Measurement and Flow Control by using Embedded System

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Abstract: This paper focused on system to automate the process of measuring milk in tank and flow control of water. In milk measuring system we use Ultrasonic sensor to sense level of milk and microcontroller to calculate the distance between milk level and receiver by time of span method. LCD is used to display the milk level in terms of liters and percentage. If the milk level is above the specific level of milk tank then control valve is OFF so stop the milk entering. If the milk level is below the specific level of milk tank then control valve is ON. In water flow control, we use capacitive proximity sensor. It can sense not only conductor or metallic material but also non-conductor. The sensing distance depends upon distance. In this flow control system, if the milk can is present in front of pipe or tap of water, then motor is ON by changing the capacitance value and if milk can is not present then motor is OFF.

Keywords: Ultrasonic sensor, Infrared sensor, 0AT89C51 Microcontroller, LCD display, Motor.

I. INTRODUCTION

Now days, the India is moving towards the "Digital India". Automation plays a vital role in industry. Automation is necessary for industry to reduce human efforts to save time and to increase the product ability in more efficient way.

An India ranks first in milk production accounting to 18.5 percent of world production. But still in milk industry for milk measurement purpose traditional methods are used.

One of the method is labeling, in this method labels are printed inside the tank but after some time labeling become fade. So, the approximately measurement are taken by worker which is not accurate.

In milk industry to provide accurate measurement of milk with the help of Ultrasonic sensor. In industry there are many methods are used for level measuring that are floating buffer method, guide tube method. But here we use Ultrasonic system this gives accurate measurement without contact of milk so it is dose not effects on milk.

In milk industry, milk cans are clean at a time. Cans are clean by using motor. If milk can be not present, then also motor is continuously ON in this way more water is waste. To overcome this problem, we use IR sensor system, in this method if can is present then IR sensor detect the milk can [5] then motor is ON and vice versa.

II. BLOCK DIAGRAM

The block diagram for automatic milk measurement system using Ultrasonic sensor and control of water using IR sensor is as shown in fig.1.

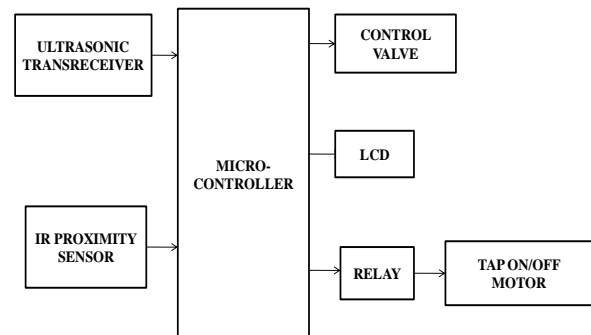


Fig.1. Block diagram

In milk measurement system, we use Ultrasonic sensor. Ultrasonic is a transceiver sensor. In that system, Ultrasonic transmitter transmits the ultrasonic waves towards the level of milk (target) then echo is present at receiver side. Then by using Microcontroller calculate the distance by using time of span method. The result is display on LCD in terms of liters and percentage. And when the milk level is above the particular level at that time control valve is OFF.

In milk industry to flow control of water we use capacitive proximity sensor. It senses the presence of milk can.

III. WORKING

In milk measurement system, Ultrasonic sensor is used, ultrasonic frequency is above the 20 KHz. In that system is initiate by using interrupt 1 (INT1). When the interrupt INT1 is ON at that time Timer 1 is start so that it generates the burst of pulses of 40 KHz frequency. These pulses are amplifying and strike on milk level and reflected back towards the receiver and again amplify this signal.

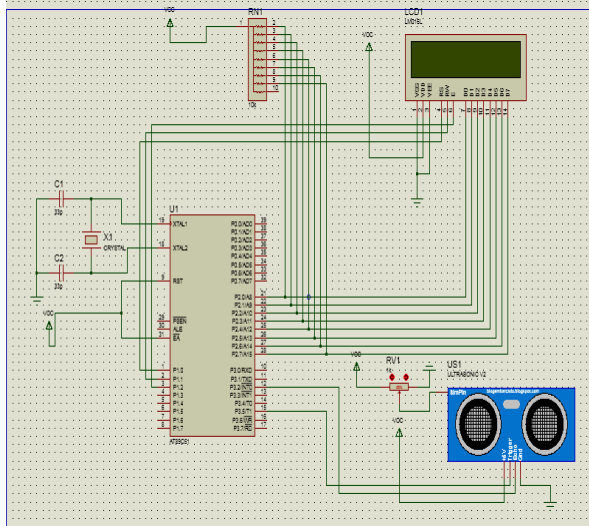


Fig.2. Circuit Simulation

Then INT2 is generate at that time Timer 1 is OFF and Microcontroller calculate the distance according to following formula,

$$D = v * t/2$$

And according to formula of volume we can calculate how much milk is present for 1cm. In this way, we calculate milk in terms of liters and display on LCD. [4] In milk industry there is lots of water waste during can clean process.

Here we use capacitive proximity sensor. This sensor needs 5V AC voltage to ON the sensor. This sensor works on by sensing the change in dielectric constants of capacitor. If any can close to sensor, then change the dielectric constants of capacitor so capacitance will change.

Changing capacitance gives the indication that can is present. Then this output of sensor is given to input of the microcontroller to control the motor by using instruction. Motor cannot operate at low voltage so we use relay. [3]

IV. BASIC COMPONENTS

A. Ultrasonic Sensor

Ultrasonic sensor is also known as transceiver device. Ultrasonic sensor generates high frequency sound waves and it works by transmitting an ultrasonic burst and providing an output pulse that corresponds to the time required for the burst echo to return to the sensor. By measuring echo pulse width, the distance to target can easily be calculated. It is very easy to connect to microcontroller.[4]

B. AT89C51Microcontroller

Microcontroller is a complete computer system manufactured on a single chip. So, it is also called as microcomputer. It is an 8-bit microcontroller.

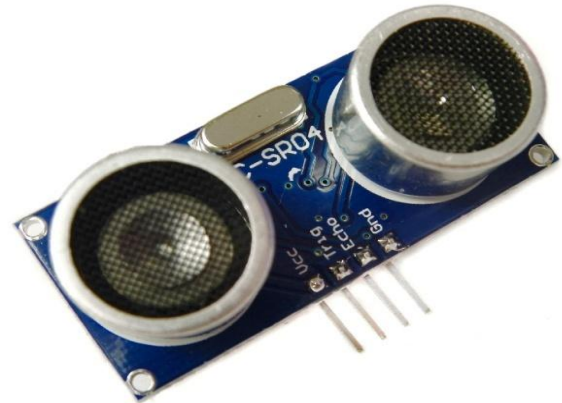


Fig.3. Ultrasonic Sensor

Microcontroller has following components-

1. ALU – It perform arithmetic and logical operations.
2. Program counter – It is 16-bit register. It holds the address of next instruction.
3. Register – It has 2 registers and it is used to store output.
4. Timer and counter – It is used for generating the pulses and counter. It also provides synchronization using clock circuit.
5. ROM – It is 4K Byte non-volatile memory.
6. RAM – It is 128 Byte volatile memory. It is divided into 32 working registers.
7. Ports –Ports are used as input/output port.

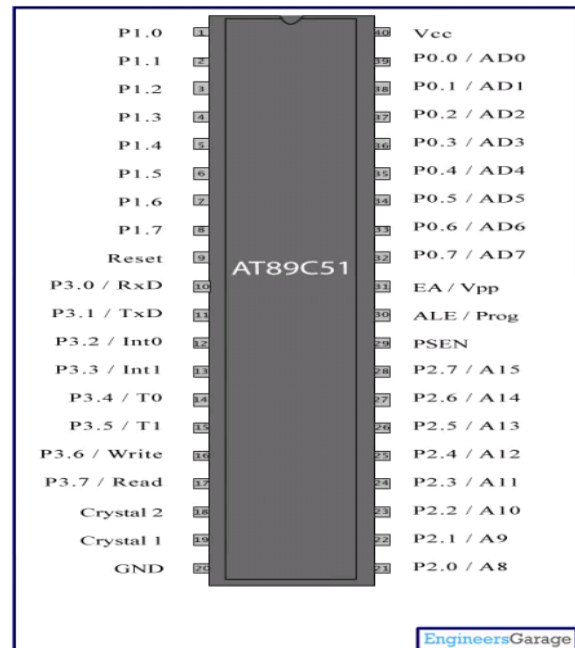


Fig.4. Microcontroller

8. Interrupt control – It generates the interrupt to perform subroutine program.
9. Serial data – It is used for serial data transmission.
10. PSW – It holds the program information and monitors the status of program which is to be executed.



11. Data Pointer – It is 16-bit register used for the storing the memory address.

12. Stack Pointer – To access the stack.

13. Data and Address Bus – Bus is used to transfer from one place to another.

In this project microcontroller is used for pulse generation by using timer and calculation purpose. [2]

C. Liquid Crystal Display

LCD is a combination of two states solid and liquid. It uses liquid crystal to produce visible image. It is combination of several layers which include two polarized panel filters and electrodes. LCD is either made up of an active or passive grid. LCD can be control by changing by applied current. LCD screen is an electronic display module and find a wide range of applications. In this project, we use a 16*2 LCD display and a 16*2 LCD display means it can display 16 characters per line and there are 2 such lines. In this LCD, each character is displayed in 5x7 pixel matrix. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. We use the LCD display for displaying the result in terms of liters and percentage. [1]

D. Control Valve

The solenoid control valve is an ON/OFF control valve that either opens or closes upon receiving an electrical signal to the solenoid pilot control. It is furnished either normally opens or normally closed. Industrial uses for accurate control of process water of batching, mixing, washing, blending or other on/off type uses.

E. IR Proximity Sensor

For our project requirement, we use capacitive proximity sensor because it will sense metal as well as non-metallic materials like plastic, paper etc.

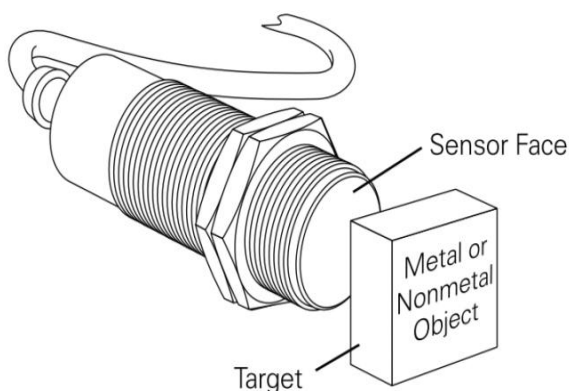


Fig.5. Capacitive Proximity Sensor

The sensing surface of this sensor is form by to concentrically shaped metal electrodes of an unwound capacitor. When an object comes near the sensing surface it enters in the electrostatic field of electrode and changes the capacitance in an oscillator circuit. As a result,

oscillator starts oscillating. The trigger circuit reads the oscillator's amplitude and when it reaches a specific level the output state of the sensor change. When the target is away from sensor the capacitance decreases. [6]

V. CONCLUSION

In this project, we will measure and control the milk stored in a tank by using ultrasonic sensor system. The result is display on LCD screen.

In save water system we use IR proximity sensor for detecting the milk can. When can is present the motor is ON otherwise OFF.

VI. ADVANTAGES

1. Provide a non-contact measurement-eliminates compatibility concerns.
2. Used for measuring level of viscous fluid.
3. Accurate liquid level measurement in industry.
4. To save the time of work.

VII. APPLICATIONS

1. It is used in chemical industry to measure solvents like paints, carbonic acid, water, crude oil, epoxy resin, lime slurry and wax.
2. Used in petroleum industry for measurement.
3. IR sensor is used in industry for detect the faulty materials.
4. IR sensor used in TV remote.

REFERENCES

- [1] Sneha Punia "Drip Irrigation System using Embedded Systems : An Initiative of Saving Water", International Journal of Research in Engineering and Technology Vol.04 May 2015.
- [2] K.Y.Rokade, Dr.P.B.Dahikar, Dr.M.J.Hedau, S.S.Shende "An Eembedded System for Measurement of Ultrasonic Distance Meter for Biomedical Applications", International Journal of Science and Research ISSN 2015.
- [3] Prakash Shrivastav, Praveen Kumar, Ankit Tiwari "Project Review on Ultrasonic Distance Measurement ", National Conference on Synergetic Trends in Engineering and Technology STET-2014.
- [4] Siti Asmah Daud, NasrulHumaimi Mahmood, Pei LingLeow, FauzanKhairiChe Harun "Infrared Sensor Rigin Detecting Various Object shapes", International Journal of Advance Research in Electrical, Electronics and Instrumentation Engineering Vol.2 Issue 10 Oct 2013.
- [5] A.K. Shrivastava, A. Verma, S.P.Singh "Distance Measurement of an Object or Obstacle by Ultrasound Sensor using P89C51RD2", International Journal of Computer Theory and Engineering, Vol.2.No.1Feb, 2010.
- [6] Vidyadhar Kamble, Dipesh Makwana, C.Chandramouli "Ultrasonic Based Distance Measurement System", EE616 Electronic Design Lab Project Report, EE Dept, IIT Bombay, November 2007.
- [7] Tanushree Agarwal, Pooja Yadav, Akash Gupta "AVR Microcontroller Based Automated Liquid Fuel Level Sensing and Controlling", PISER Vol.2 Biomonthly Internatinal Journal July 2006.
- [8] Kenneth Ayala, "The 8051 microcontroller".
- [9] Mohammad Ali Mazidi, rolin D McKinley, "The 8051 Microcontroller and Embedded System".
- [10] www.katallax.com "Basics of Industrial Automation Sensors".