

Welcome to our final project presentation



EXCELLENCE IN LEADERSHIP

AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)

Presentation *on* **Design and Implementation of Water pump automation system**



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A Project submitted

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Introduction

- **Water pump automation system is the technology of automatically collecting status data from the water tank metering devices and transferring that data to a water pump controlling system. Which will turn the motor on or off depending upon the water level in the tank.**
- **This technology mainly saves the hassle to physically check the water tank on our roof-top and turn the water-pump on/off , which in addition helps us avoid wastage of water.**



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Why Automation?

Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories and other applications with minimal or reduced human intervention.

- The biggest benefit of automation is that it saves labor.
- It is used to save energy and materials .
- To improve quality, accuracy and precision.



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Project Aims

- Design and implementation of automated water level control system.
- Microcontroller operated.
- To implement extra functionality using sensors i.e. Ultrasonic Distance Sensor.
- Upgradation of typical water pumping system.
- cost effective and a reliable system.



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BENEFITS

The benefits of this projects are –

- Saves water
- Saves time
- No need of any human intervention for a long time after the installation
- Saves Electricity by switching the motor off at the correct time
- Helps preventing a mess by stopping the overflow of water



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Lecture 1

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BASIC PRINCIPLE OF THE PROJECT AND DESIGN

- In our project the inbuilt automated water height measuring system powered by ultrasonic distance sensor monitors the water height in the tank.
- The Microcontroller displays the water height (In Inches) in the LCD and while the water height changes in the tank it then displays the water height in percentage also.
- According to this percentage value of the height of the water, the Microcontroller drives the motor on/off through a relay.

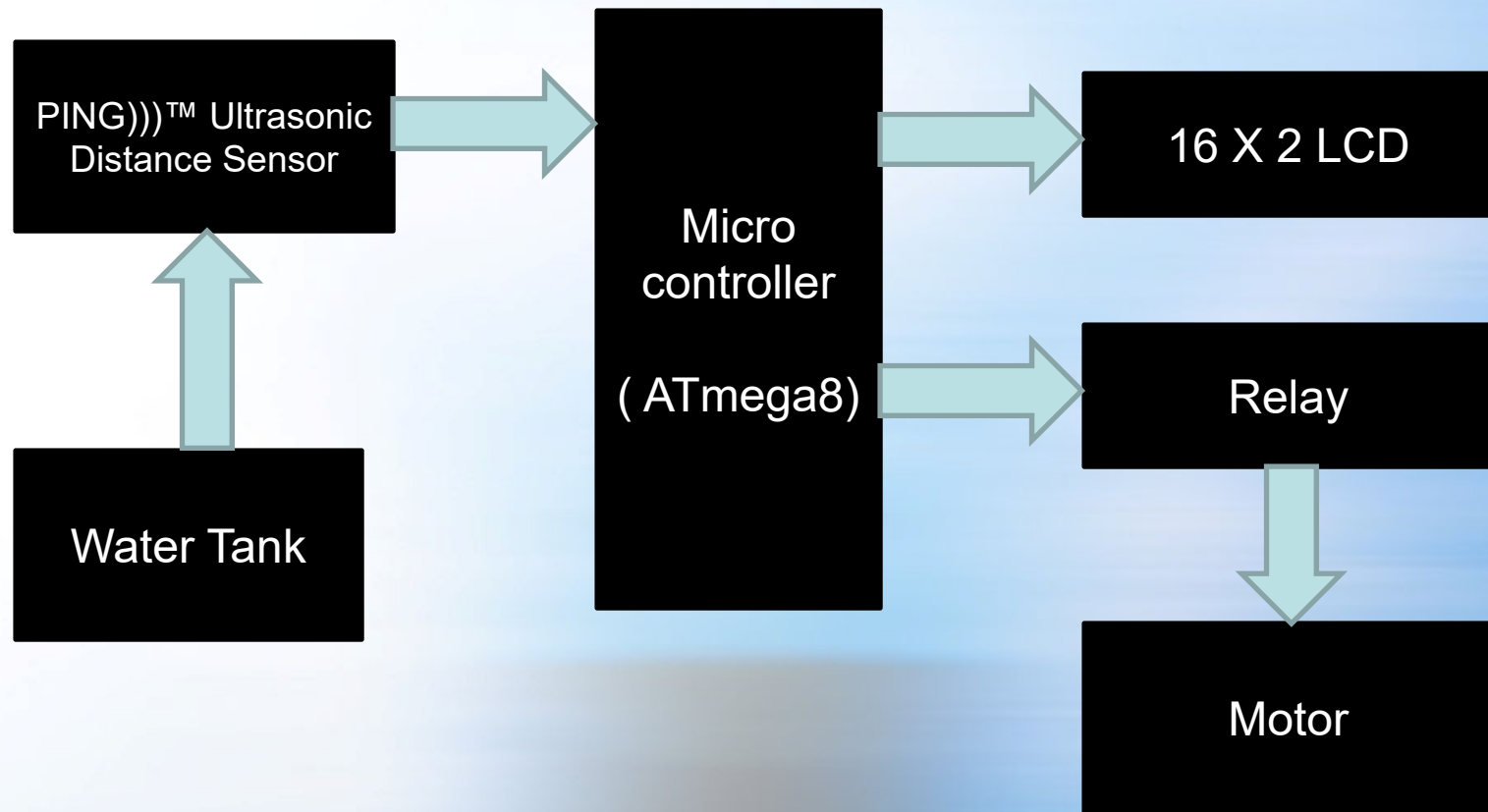


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Lecture 1

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Block Diagram of Water pump automation system

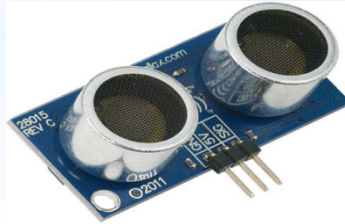


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Main hardware parts

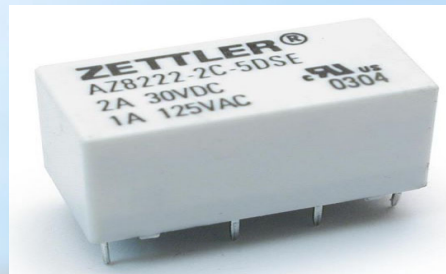
- **PING)))™ Ultrasonic Distance Sensor (#28015)**



- **Microcontroller (ATmega8)**



- **Relay**



- **16x2 LCD**



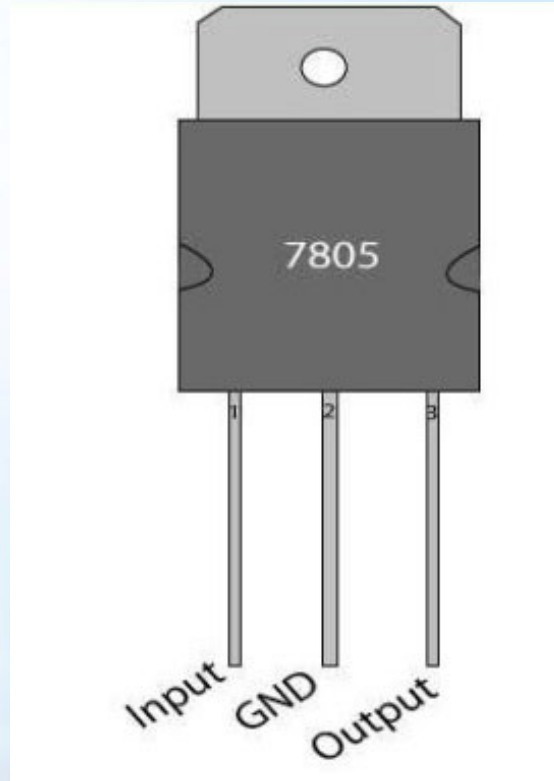
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Miscellaneous Components Used



Battery - 9V



Linear Regulator IC 7805



LED

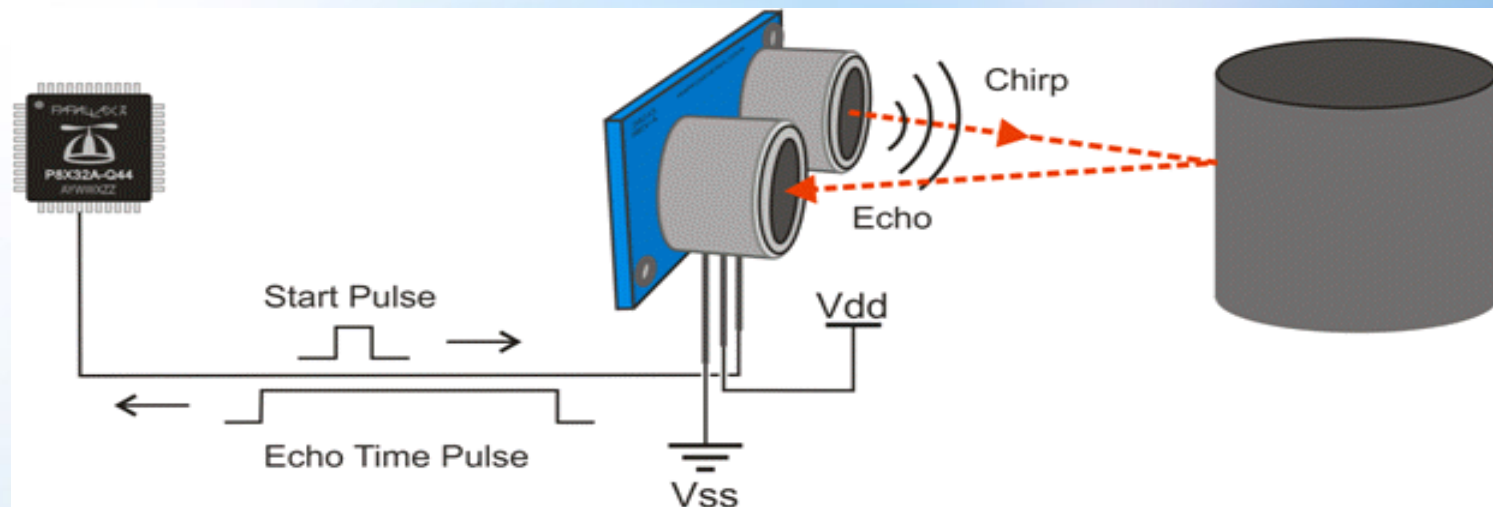


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PING)))™ Ultrasonic Distance Sensor (#28015)

- The Parallax PING))) ultrasonic distance sensor provides precise, non-contact distance measurements from about 2 cm (0.8 inches) to 3 meters (3.3 yards).
- The PING))) sensor detects objects by emitting a short ultrasonic burst and then "listening" for the echo. Under control of a host microcontroller (trigger pulse), the sensor emits a short 40 kHz (ultrasonic) burst.



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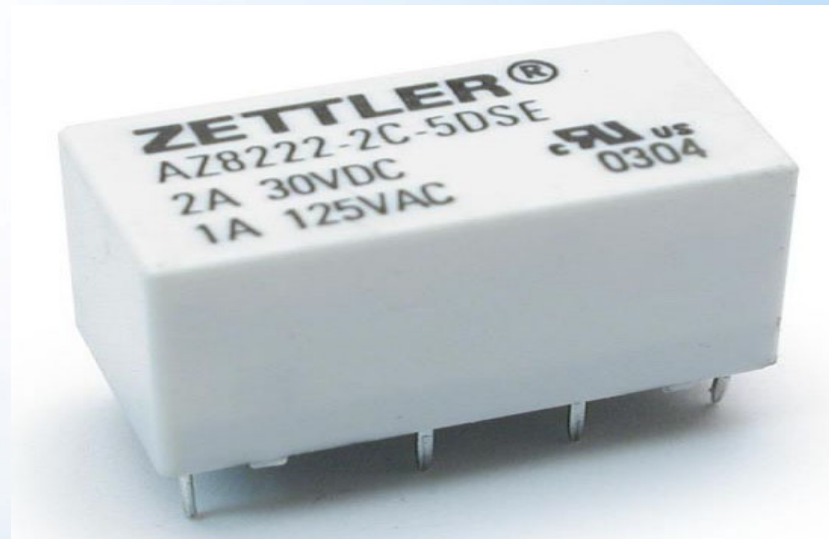
Microcontroller

- A microcontroller (sometimes abbreviated μC , uC or MCU) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals.
- The ATmega8 is a low-power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega8 achieves throughputs approaching 1 MIPS per MHz, allowing the system designer to optimize power consumption versus processing speed.



Relay

- A relay is an electrically operated switch. relays use an electromagnet to operate a switching mechanism mechanically .Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.



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16x2 LCD

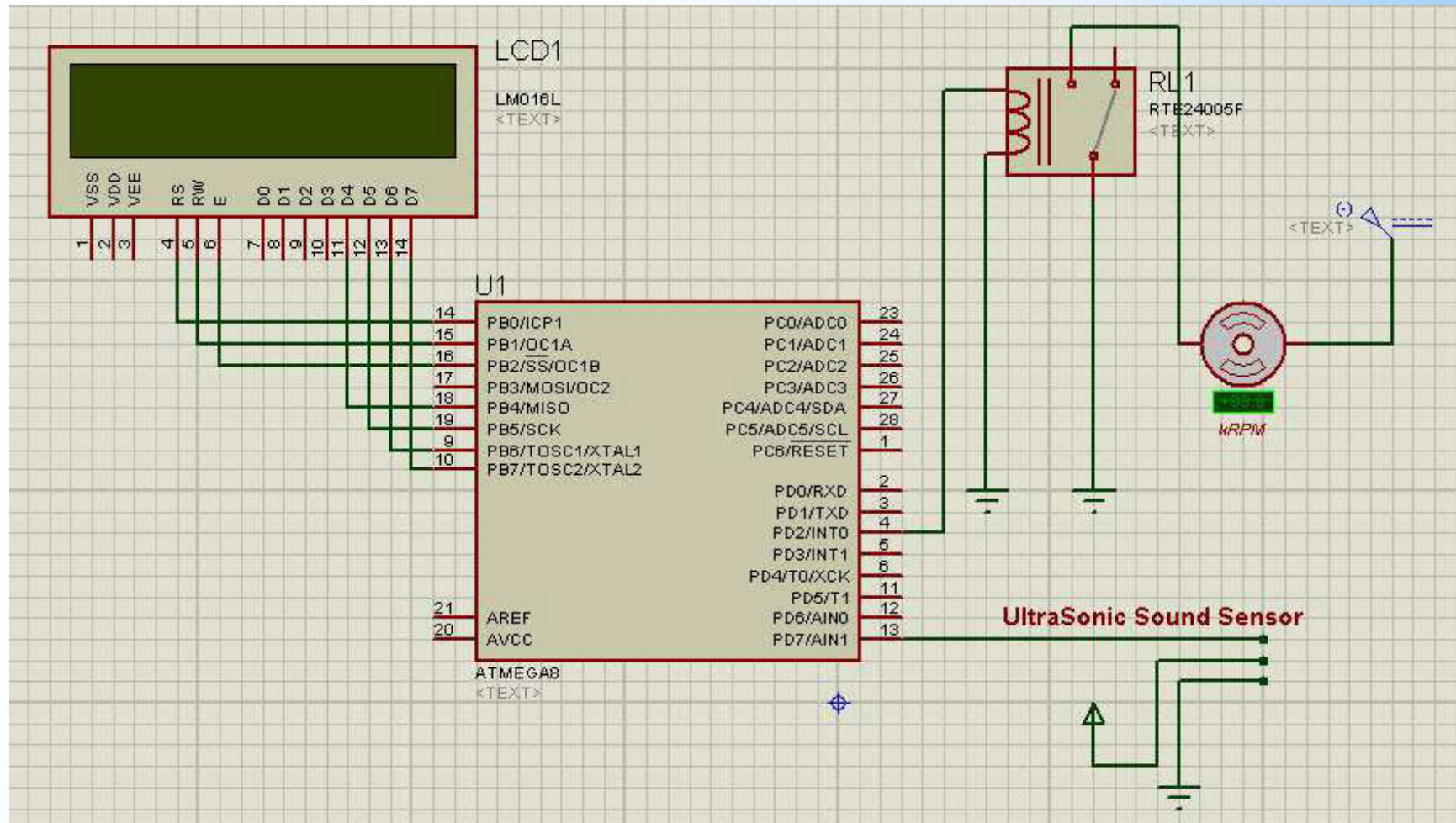
- LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications.
- A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x8 pixel matrix.
- The command register stores the command instructions given to the LCD
- The data register stores the data to be displayed on the LCD.



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Circuit Diagram of Water pump automation system



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Working Principle

Measuring the height

- When the sensor starts transmitting then the sonar sensor sends a “high” to the microcontroller
- the ultrasonic wave is bounced back to the receiver part of the sonar sensor then the sensor makes this “high” signal into a “low” one
- The microcontroller calculates the time between this one high and low pulse



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Working Principle

Setting up the project for one particular water tank

- When we are done with measuring the tank height then we will save this value onto an EEPROM by pressing the store button.
- the LCD will display the sentence “Data Stored”.
- We can use one set of this project in many water tanks , but at first we have to do the measuring and saving the empty water tank height to the EEPROM first.

Making the relay on/off

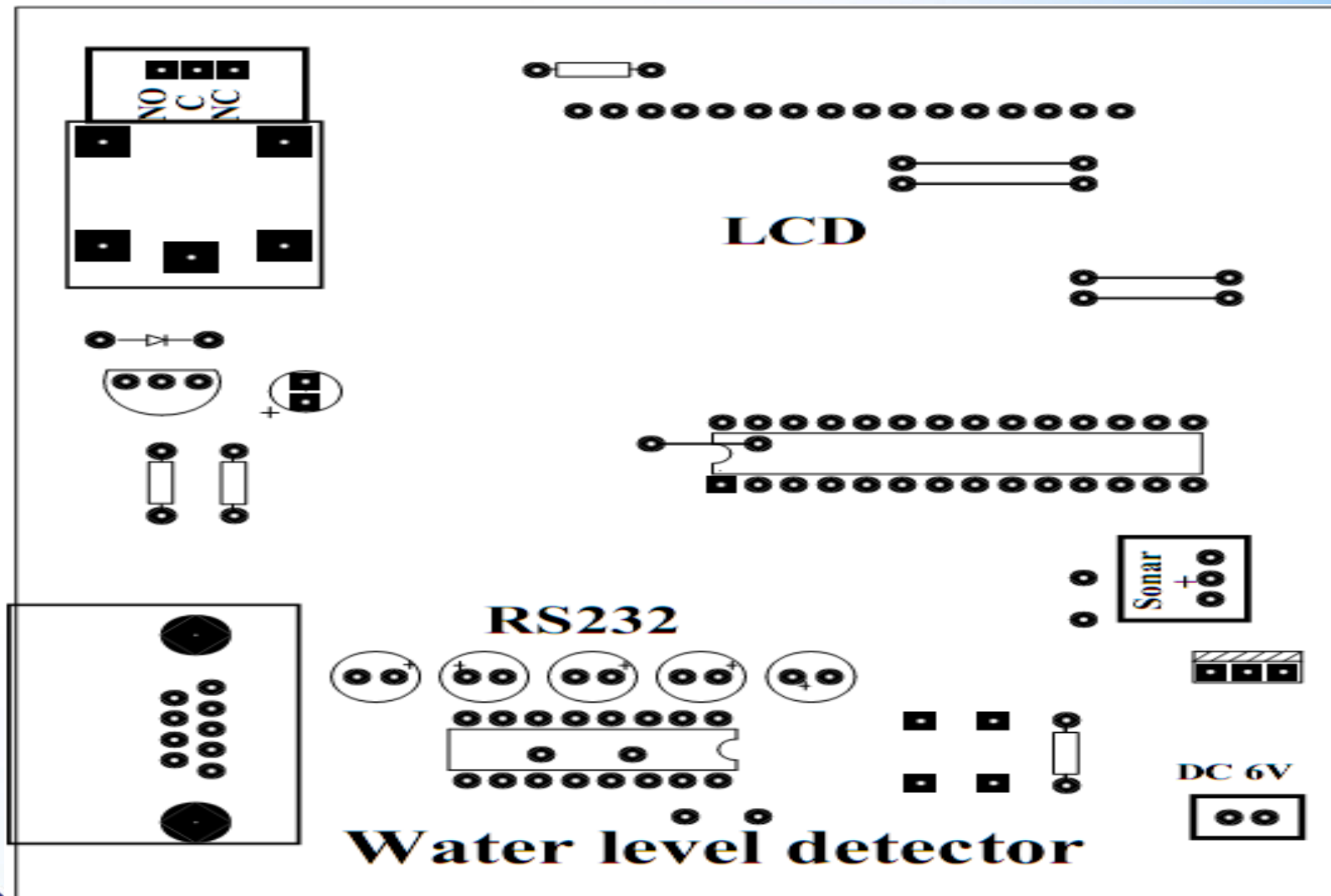
- relay on when the water height goes down below 10% and relay off when the water height is above 90%.



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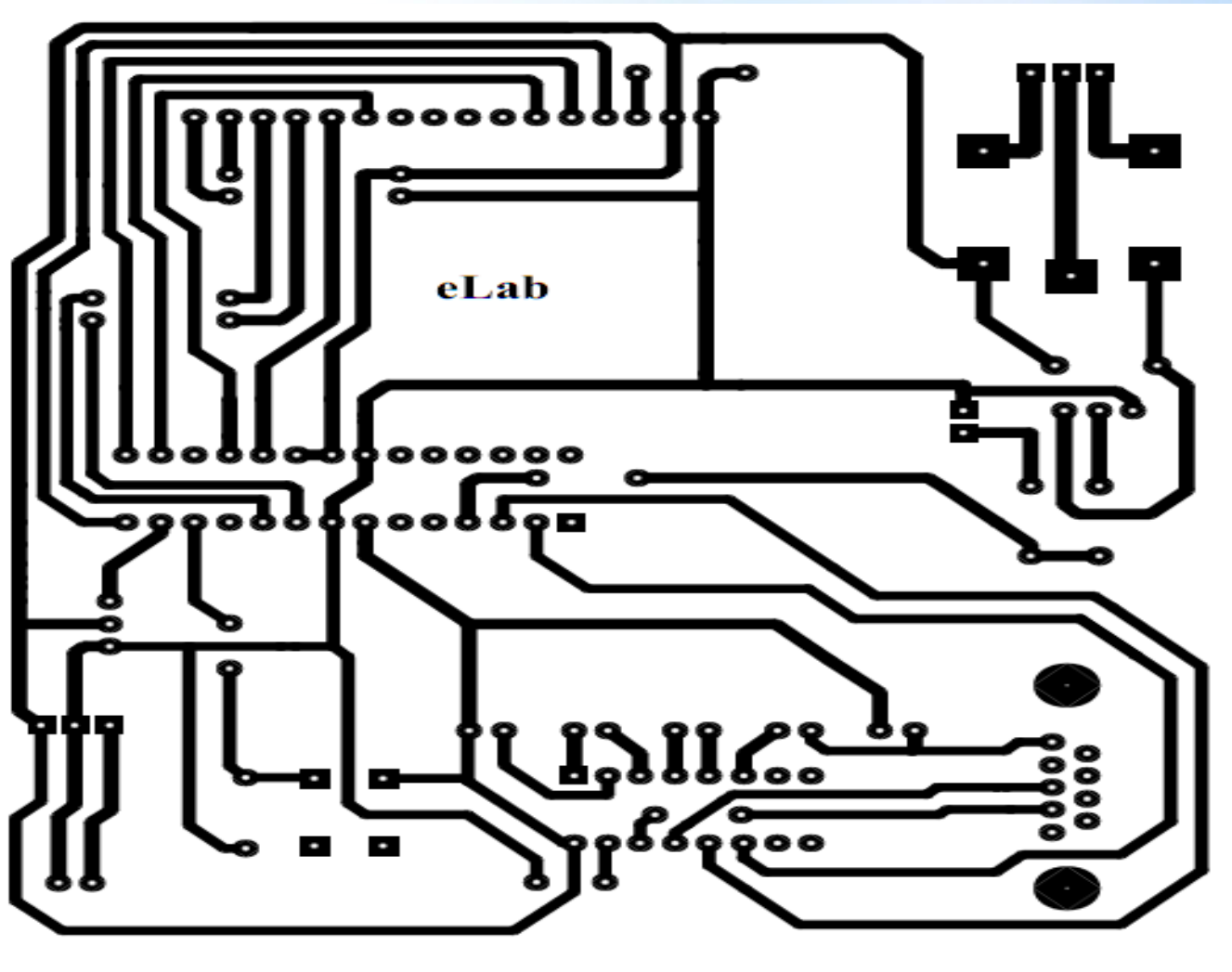
PCB Circuit Design(Top part)



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PCB Circuit Design(Bottom part)



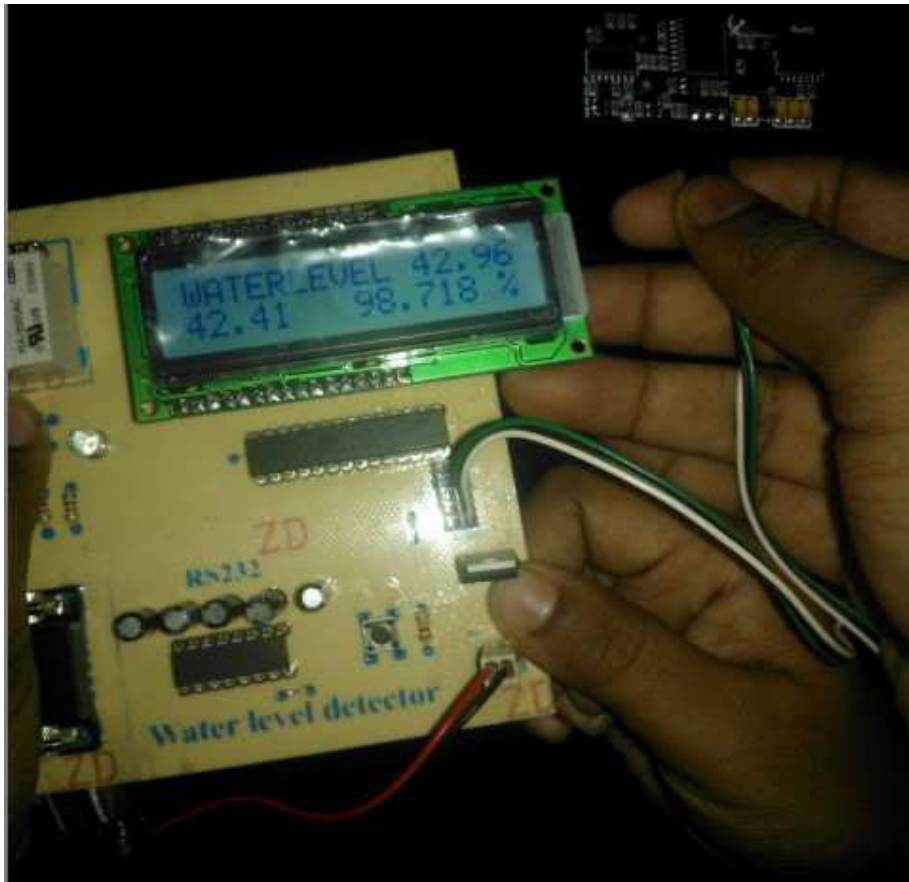
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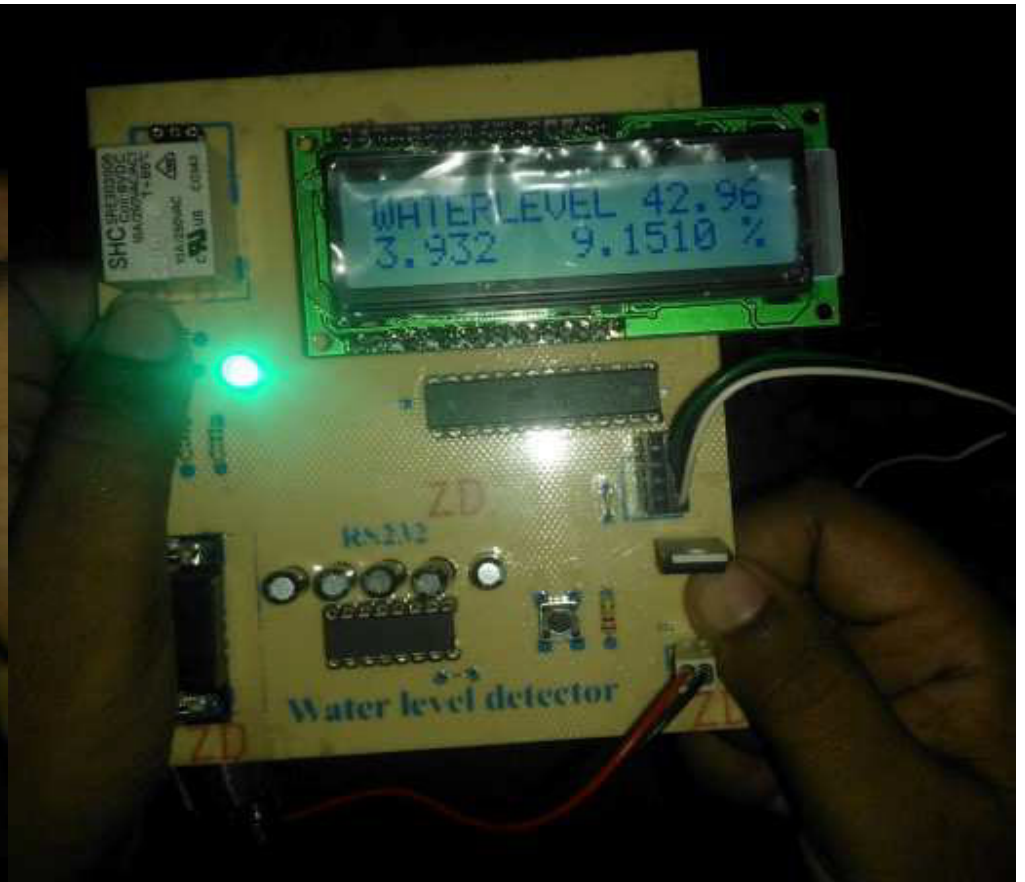
RESULT ANALYSIS

- We tested the project in rooftop water tanks and it worked just fine. Here is a demonstration of the project on a plain floor, which will represent the water surface in the water tank.

	Tank Height (Inch)	Current height value (Inch)	Water Height (Tank Height – Current value) (Inch)	Percentage value (How much of the tank is empty)	Machine ON or OFF
1	42.96	42.41	0.55	98.718%	ON
2	42.96	27.52	15.44	64.050%	ON
3	42.96	3.932	39.028	9.1510%	OFF



An almost empty Water tank



An almost filled Water tank



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Extension of the Project

- **As an extension of the project we have added a feature through which the water level can be observed on User's PC through the USB Serial port via a PC Program written exclusively for this project on C#**



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Future Work

- **Auto & Manual Start**
- **Wireless Sensor**
- **For reserve tank or Multiple tanks**
- **For Multiple Motors**



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CONCLUSION

Water is one of the most important basic needs for all living beings. But unfortunately a huge amount of water is being wasted by uncontrolled use. Some other automated water level monitoring system is also offered so far but most of the method has some shortness in practice

We have successfully experiment the system and analyzed the results. The microcontroller-based water pump automation system provided a very satisfactory performance with a minimal percentage of error. Using this automation system, one can save manpower. This could have a substantial benefit from this project for efficient management of water.



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