ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

DIGITAL LIQUID LEVEL METER USING ATMEGA328 MICROCONTROLLER

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DOI: 10.5281/zenodo.246797

ABSTRACT

Monitoring Systems are necessary to understand the changes that take place in environments. The data collection systems are useful and effective tools to collect information from bulk storage tanks and to monitor the same. The measurement of liquid inside the tank is most important and such systems are useful in industries which are categorized as safety critical systems.Wireless liquid monitoring system using ultrasonic sensors is developed. The system is tested and found to be running as expected. The features of the microcontroller were utilized to build an efficient system which is both low-power and easy to maintain. The installation of the system is easy and makes it more compatible for different environments.The CC2500 module used which uses the serial communication link to and from the microcontroller. This link and uses Commands to communicate with the module and configures the same to GUI mode and sends and receives packet of data wirelessly.Microcontroller Atmega328 is a heart of the system. It is used to control overall operation of the system. The ultrasonic sensor is placed with its face directed to the liquid surface. The module is connected to the microcontroller which is used to determine the depth of the liquid in the tank. The PC module directly connects to the unit which collects these values and represents them on the graphically. The data is tabulated and the variation of liquid is shown on a graph. For plotting graph there is a GUI (Graphical User Interface).

KEYWORDS: CC2500, Microcontroller Atmega328, Ultrasonic Sensors.

INTRODUCTION

In this system to monitor the level of water is often a key requisite in swimming pool, dam, river, coastal, fisheries, irrigation and canal control, oceanography and so on. Moreover, to detect the water level of water reservoir through wire communication is not a flexible and tedious ways. For this purpose a robust, real time, portable and easy to operating system is needed for monitoring the level of water. There are much of the technologies used today to execute the basic tasks as water-level measurement, water-quality characterization and so on. For monitoring the level of water, the system is a kind of structure which measures water deepness through ultrasonic sensor technology. Modern microcontroller and wireless sensor can provide a range of solutions for the automated monitoring of water levels in manyapplications. In most of the cases, costly radio modems are employed for fastest access of remote data, because it provides a long-distance and reliable radio link between the sensor networks. Simultaneously, the processed digitized data is transmitted via a wireless network (while using wireless system) to a remote location or device. In another sense, the transmission step is made over a wireless network control channel using GSM, CDMA, 3G, Wi-Fi, RF modules or Zigbee digital technology. Also, a WiDAS (Wireless Data Acquisition System) which is a remote-sensing device designed to obtain multi-angle infrared remote-sensing data in remote distance. Till now, several attempts have been made to provide an effective monitoring system to observe the level of water with different technologies.

OBJECTIVE OF THE SYSTEM

This system presents the architecture and initial testing results of a low power system for tank level monitoring using ultrasonic sensors, and digital liquid level meter using Atmega328 Microcontroller. A system thus developed should be scalable without major changes to the working system. There are systems which have been implemented for specific liquids like water, Kerosene. Typically, the measurements of liquids are done using various sensors which need physical contact with the liquid. These might induce wear and tear and introduce maintenance costs and decrease the longevity of the system. Ultrasonic sensors can be used to sense the liquid

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level by placing the sensors at a specified portion in the tank, calculating the level of liquid by time of flight of the ultrasonic wave and correlation with respect to the dimension of the tank, to get a more accurate value.

NECESSITY OF THE SYSTEM

The aim of this system is to provide a long-term monitoring to achieve continuous and correct information about water level. To fulfill this objective, the following test is conducted to evaluate the success of the developed monitoring system. The system connected with sensor proposed has a particular design to be simple, trustworthy, and low-cost which is fit to be used in swimming pool, embankment dams, river, coastal tanks, and reservoirs. This paper presents the implementation and experimental results performed by field tests.

The main function of the system is to sense the level of the water where the level is expressed in different levels: low, medium, high. The different levels of water were determined by the appropriate Sensor on the PC. The indications were as follows: and if water level is less than 50% is shows the GUI reading as half signal, Also, the level more than 50 % was determined by the GUI signal on PC.

BLOCK DIAGRAM

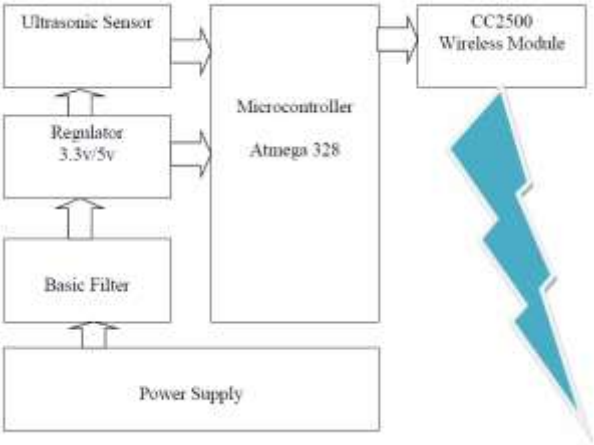

Fig 1 Block Diagram of Wireless Sensor Transmitter

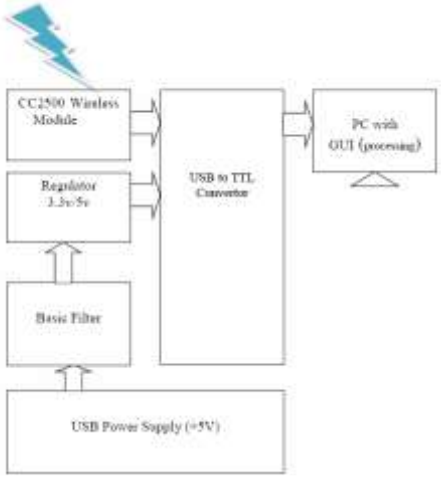

Fig 2Block Diagram of Wireless Sensor Receiver

In this Paper the main blocks are micro controller unit, Liquid level sensor and GUI display unit. The liquid level detection circuit is used to detect the level of the liquid in the tank; here sensors are placedat certain place to find out the liquid level and the signal is sent to the micro controller unit for further operations.

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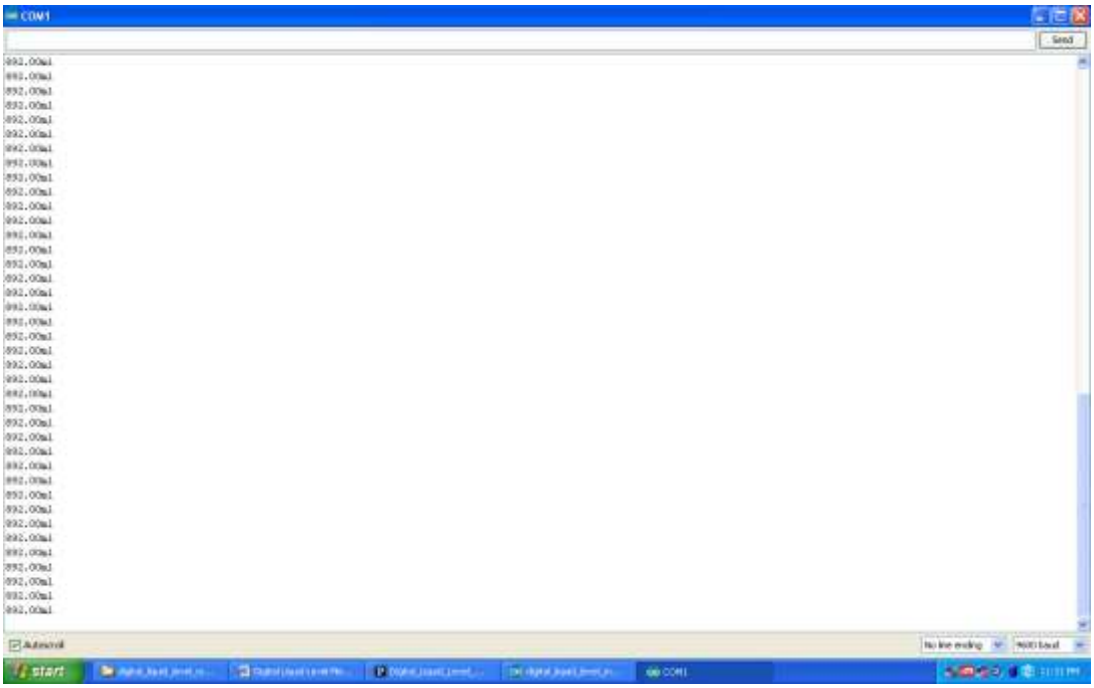
Here sensor is placed at liquid level tank to sense the liquid level and the signal from that sensor is sent to the micro controller unit to decide the exact level information. When the liquid level reaches the top level sensor which means that the tank is full and this will be indicated to the user by means of maximum tank level and the level information is indicated through GUI.

RESULTS AND DISCUSSION

Table 1. Comparison table for Results of Water Level

Sr. No	Manual Reading(ml)	Reading On PC(ml)	Distance of Sensor (cm)	Error(ml)	% Error
1	1000	999	7	1	**0.124**
2	900	892	9.5	8	
3	800	785	12.5	15	
4	700	679	15.5	21	
5	600	575	18.5	25	
6	500	490	21.5	10	
7	400	390	24.5	10	
8	300	285	27.5	15	
9	200	189	30.5	11	
10	100	92	33.5	8	



ComparisonResults of Water Level on PC

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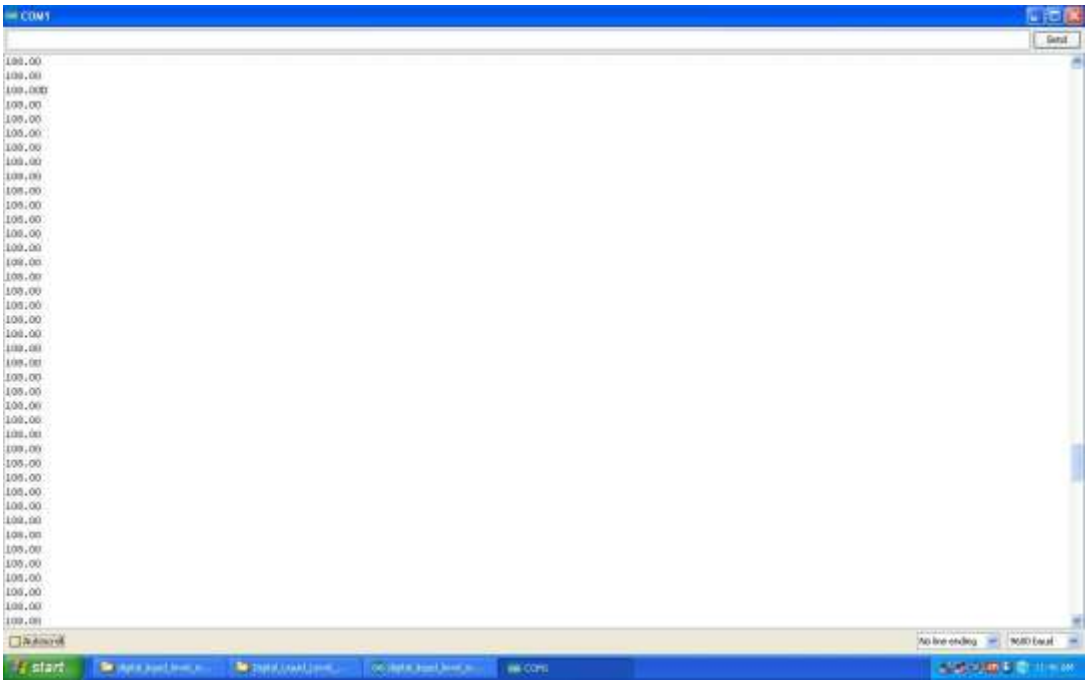
Table 2. Comparison table for Results of Kerosene Level

Sr. No	Manual Reading (ml)	Reading On PC (ml)	Distance of Sensor (cm)	Error(ml)	% Error
1	1000	989	7	11	**0.101**
2	900	895	9.5	5	
3	800	785	12.5	15	
4	700	686	15.5	14	
5	600	590	18.5	10	
6	500	490	21.5	10	
7	400	394	24.5	6	
8	300	288	27.5	12	
9	200	192	30.5	8	
10	100	90	33.5	10	



Comparison Results of Kerosene Level on PC

The system works with ultrasonic sensors which continuously monitor the level of the liquid in the tank of any shape.Distance and Volume, graphical user interface is prepared according to liquid level in the tank. According to maximum level of the liquid set to the respective parameter indicates the readings. It is found that by implementing this system the liquid level in the tank can be digitally monitored and hence the level can be continuous monitoring. All these observations of the system are above.

CONCLUSION

Automatic water pump control system employs the use of different technologies in its design, development, and implementation. The system used microcontroller to automate the process of water pumping in an over-head tank storage system and has the ability to detect the level of water in a tank, and display the status on a PC screen. This output has successfully provided an improvement on existing water level controllers by its use of calibrated circuit to indicate the water level. The module ensures that the accessibility of the network can be

made use of making it more reliable for users. Enabling microcontroller low power modes and restricting transmissions to once a day, we can use the system for the determination of Level of water in a tank or reservoir on terrace.

Any person can easily came to know about decreasing level of water as he can see on the PC & will open the valve of boring until tank again gets fully filled. This system is also useful in Industrial automation where liquid level monitoring is an essential criteria.

ACKNOWLEDGEMENTS

Completion of my work is a task which would have not accomplished without cooperation and help from my guide. At the outset, I wish to express my deep sense of gratitude to my guide **Prof. N. R. Kolhare**, Department of Electronics and Telecommunication Engineering, for her guidance and constant encouragement, without which it would have not been possible.I would like to thank **Prof. Dr. A. S. Bhalchandra** Head Department of Electronics and Telecommunication Engineering, for their encouragement, guidance and allowing me to use the all facilities in the department.I am also very much thankful to **Dr. P. S. Adwani**, Principal, Government College of Engineering, Aurangabad who has been a constant source of inspiration.I am very much thankful to all my faculty members, Collogues, and my parents whose presence always inspires me to do better.

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