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SOLAR POWERED WATER CONSERVATION SYSTEM

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Abstract

Water scarcity is one of the major problems faced by major cities of the world and wastage during transmission has been identified as a major drawback. To overcome this, computing techniques have been created as a barrier for wastage not only to provide more financial gains and energy saving, but also help the environment and water cycle which in turn ensures that we save water for our future. Monitoring Systems are necessary to understand the changes that take place in environments. Remote monitoring and 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. In our system we have used controller to automate the process of water pumping in a tank and has the ability to detect the accurate level of water in a tank and switch on or off the pump accordingly with the usage of mobile phone. If the level of water inside the tank is low/high the message will be sent automatically to the mobile phone indicating the three levels of the tank, by this we can prevents the overflow of water from the tank by switching on/off the pump automatically from the place where ever we are. Thus this paper presents the architecture and initial testing results of wireless system for tank level monitoring using ultrasonic sensors.

Keywords— Arduino,Ultrasonic sensor,GSM Module.

I. INTRODUCTION

The tanks are generally spread across a large area and use manual detection and measurement methods which are still under development. This makes it more laborious and time consuming to monitor the tank levels. Remote monitoring and data collection systems are necessary to collect information from the tanks and to monitor the same. So it is necessary to build a system which can be accurate, fast in measurement and simple to install and handle, but has an intelligence which takes decisions in real-time and alerts and communicates when necessary. The data acquisition is done by the sensors used to sense the changes in the liquid level of the tank and is stored in the system's memory.A server collects the information sent from the onboard microcontroller through a GSM module in the tank, saves it to a database and sends message to the mobile. Such intelligent monitoring systems help in effective management of tanks, by assessing the status of the tanks periodically allowing optimized logistical supply of product and minimized inventory holding. Scalability is the important parameter that determines the longevity of the system. A system thus developed should be scalable without major changes to the working system . The measurements of liquid is done using Ultrasonic 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 placed 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. The values thus collected needs to be sent to the mobile using a wireless communication medium, so GSM technology is used, it helps the system to be installed in industries, thus the measurements are sent to the mobile via a GSM module.

Liquid level control of any tank, packages or industrial processes is a very important requirement; it belongs to accuracy, quality, quantity and finally with cost. This is directly related to efficient use of the resources, which means by controlling liquid level, it reduces or eliminates possibility of wastage which is directly related to cost saving, energy saving, optimal utilization of resources. The main aim of this paper is to control the water level automatically through the usage of different technologies in its design, development, and implementation. In this model we have used arduino Uno to automate the process of water pumping in over-head tank storage system and has the ability to detect the level of water in a tank and switch on/off the pump accordingly .

BLOCK DIAGRAM

The Figure shows the block diagram of the proposed model. Here the ultrasonic sensor will be placed on the roof top of the water tank, face directed towards the liquid surface. It is used to measure the amount of liquid inside the tank. This

sensor send out high frequency waves which are reflected back when it strikes an object or a liquid surface. The time span between the transmitting and reflecting waves is measured by the controller. The controller used here is Arduino which sends a pulse through the software code, to the ultrasonic sensor which in turn transmits a wave form. Simultaneously, a timer in the software code is activated and runs until the waveform is received back. Once the waveform is received, the sensor sends a signal to the arduino and the timer value is counted and the distance is determined. The depth of the liquid is calculated accordingly and stored in the flash memory available for transmission to the mobile via the GSM Module.The supply for the entire system will be from the solar panel.Since the output voltage from the solar panel will not be same all the time a charge controller or a converter is used.

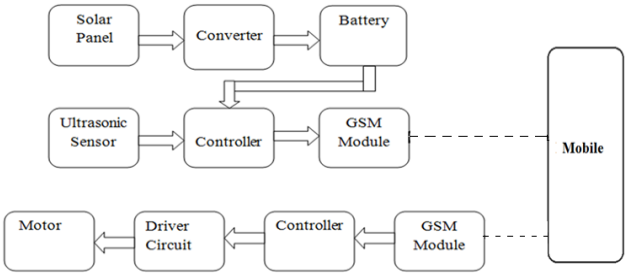

Figure 1.Block diagram

II. SOFTWARE IMPLEMENTATION

Proteus Simulation:

The Proteus Design Suite is wholly unique in offering the ability to co-simulate both high and low-level micro-controller code in the context of a mixed-mode SPICE circuit simulation. A truely invaluable and inexpensive way to get your communication software right prior to hardware prototyping. The detailed measurements on graphs, or perform other analysis types such as frequency, distortion, noise or sweep analyses of analogue circuits, you can choose the advanced simulation option . This option also includes Conformance Analysis-a unique and powerful tool for Software Quality Assurance.

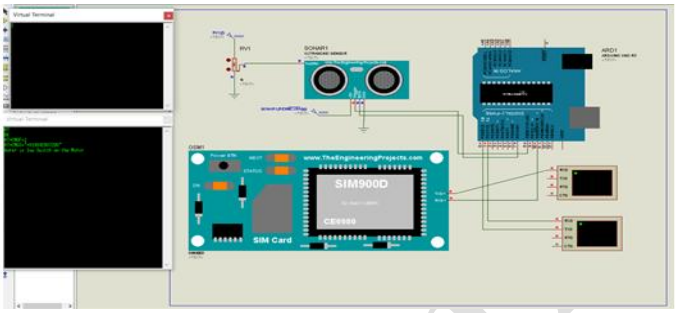

Figure 2. Proteus Simulation for the proposed model

The above figure shows the simulation of the proposed model. Here the distance is measured using the ultrasonic sensor. The supply for the ultrasonic sensor is given in VCC, the GND pin is grounded, input is given in Trigger pin and the output is taken in Echo pin. The output from the ultrasonic sensor is given to the arduino board. This arduino calculates the distance using the software code and sends a message to the GSM Module.

III. HARDWARE DESIGN AND IMPLEMENTATION

One of the major advantage of this system is its simple circuit and working principle. The system is divided into two parts: The transmiting part and the receiving part. The transmitting part that is the ultrasonic sensor, controller, and one GSM module is placed near the tank. The pvc pipe of height equal to the height of the tank is taken and mounted in the tank. . The ultrasonic sensor is placed at the top of the pvc pipe near the roof which is facing downward. A Plastic ball is taken and placed inside the pvc pipe where the ball act as a object. The sensor measure the distance of the ball and send it to the controller. It desides whether the motor should be on/off.The controller has three stages water is low ,yet to be full ,tank is full.The controller is connected to the GSM module which sends the details to the operators mobile phone. Also it is possible to get details about the level of the tank by simply messaging the GSM to send the details, this provides the accurate level of the water by litre.since it is placed above the tank it is supplied by the solar panel and battery.

Then there is another GSM for receiving part which will is placed near the motor. The message send from the first GSM module will be received directly through the second GSM module. When the message is received, the controller which is connected near the motor desides whether the motor should be on/off. There is a relaying unit which connects motor and controller. Thus we can control the whole system within our hand with the help of our mobile phone from where ever we are.

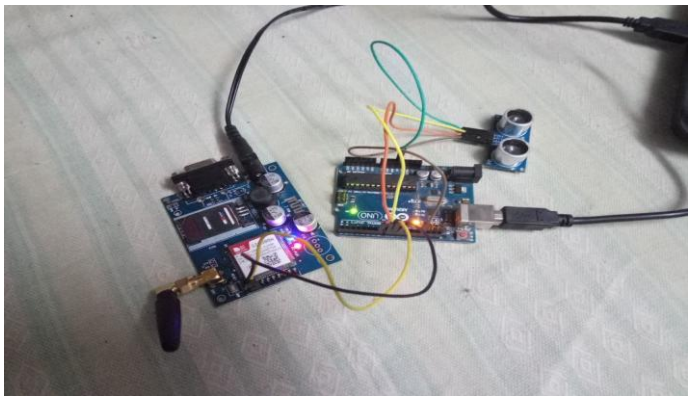

Figure 3. Hardware prototype for the transmitting part.

The above prototype model shows the transmitting part where the ultrasonic sensor measures the distance of the tank and sends them to the controller, then this controller with the help of the software code calculates the distance and sends command to the mobile phone whether we have to on/off the pump with the help of the GSM modules.

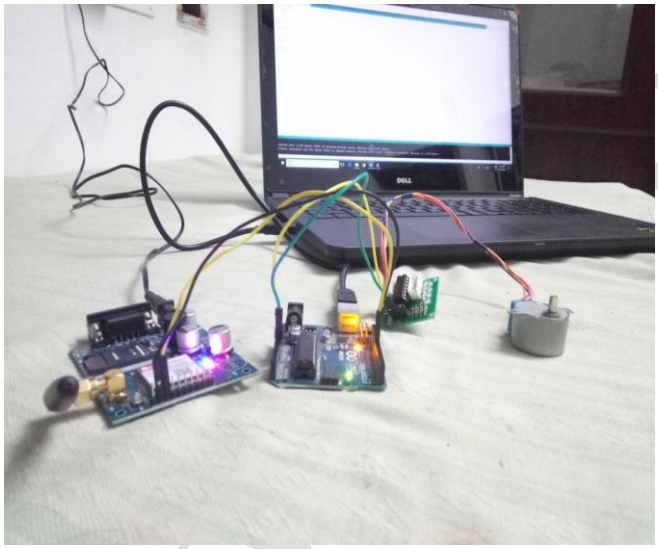

Figure 4. Hardware prototype of proposed model.

IV. 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 tried to overcome these problems and implemented an efficient automated water level monitoring and controlling system.A proposed system using ultrasonic sensors was simulated successfully. The system was tested and found to be running as expected. The features of the microcontroller were utilized to build an efficient system which was easy to maintain. The GSM module ensures that the accessibility of the network can be made use of making it more reliable for users.

V. REFERENCE

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