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Smart System for Rain Water Harvesting

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ABSTRACT: We know that Water management is the most important thing for the living of every individual. We live in a state where we have to face a lot of problems due to the unavailability of water and sometimes it also leads to drought conditions. In the traditional Rain Water Harvesting System, the water from the roof of the building is collected and it gets stored into the bore well due to which water gets diluted due to the addition of additive impurities. The purity of water in the traditional method is not maintained so as to use the water for drinking purposes or other household purposes.

The traditional model is a very basic model with minimum requirements. There are many errors and areas which need development to increase efficiency. For this purpose, a smart system for harvesting of water is designed. In this system many aspects like security, scalability, climatic conditions, purity of water, ease of access, etc. are considered.

In this, the storage capacity of water is comparatively increased than the traditional method, by utilizing maximum land by building pits with electronically operated doors. For this project, the Ultrasonic sensor, servo motor, water level sensor, float sensor, and GSM have been connected along with the ARDUINO microcontroller. All the information computed and generated by the various sensors has been forwarded to the user with the help of the GSM Module along with the Internet. The aim of this project is to reduce water wastage and indeed manage the rainwater.

KEYWORDS: ARDUINO microcontroller, Ultrasonic Sensor, Water Sensor, Float Sensor, Motor driver, GSM, etc.

I. INTRODUCTION

The technique of collection and storage of rainwater in a suitable reservoir (manmade or natural) is called rainwater harvesting. There are many areas and issues in the traditional method that can be developed. In the traditional method, the storage capacity of the rainwater is limited. Various issues such as unpredictable rainfall, purity of water, maintenance, ease of access, etc. are not considered. It just works as a physical model for the collection of storage of water. Many other features can be added to the system to increase its efficiency, usability, and designing an unconventional model which can be shaped according to the requirement of a particular area. This model can help in increasing the storage capacity and also help in monitoring the water level in the tanks which can help ineffective utilization of rainwater. In this, the storage capacity of water is comparatively increased than the traditional method, by utilizing maximum land by building pits with electronically operated doors, so that the same land will be compatible for other social usages along with water storage system. Security measures are taken to avoid any human harm while the operation of the electronically operated doors. Rain sensors are used in order to detect the rain and also a level sensor to detect the amount of rain so that unnecessary opening of doors can be avoided for drizzling of a short period of time. Level sensors are also used to monitor the amount of water in the tank and this level is conveyed to the respective proprietor with the help of the GSM module which collects the data from the level sensor and conveys it further. To control all the operations of the sensors ARDUINO controller is used.

II. METHODOLOGY

Smart Rainwater harvesting is a solution for preventing the maximum amount of water from getting wasted with the help of electronic devices. The project has a wide range of applications. With the help of simple and effective electronic components, a circuit can be developed to maximize the storage area of the harvesting pits and to electronically control the flow of water and have a smart indication of the groundwater level. This project can be developed using the ARDUINO

microcontroller which is an economy based one and its performance is high. For this project, the Ultrasonic sensor, servo motor, water level sensor, and the rainwater sensor has been connected along with the ARDUINO microcontroller. Whenever the rainwater has been drizzled on the rainwater sensor, a door attached to the big pit will be opened and the compound gate around the pit has been raised up in order to save the human error by mistakenly fell down into the Pit. An ultrasonic sensor and the water level senor which computes the water level stored in the pit as information , and all the information generated by the sensor has been forwarded to the Municipal board or to the respective Housing Society with the help of GSM Module along with the Internet. GSM module is a module which will compute the functioning of information transfer of data information. The data logging information is received by the management authority and management can ensure corrective actions.

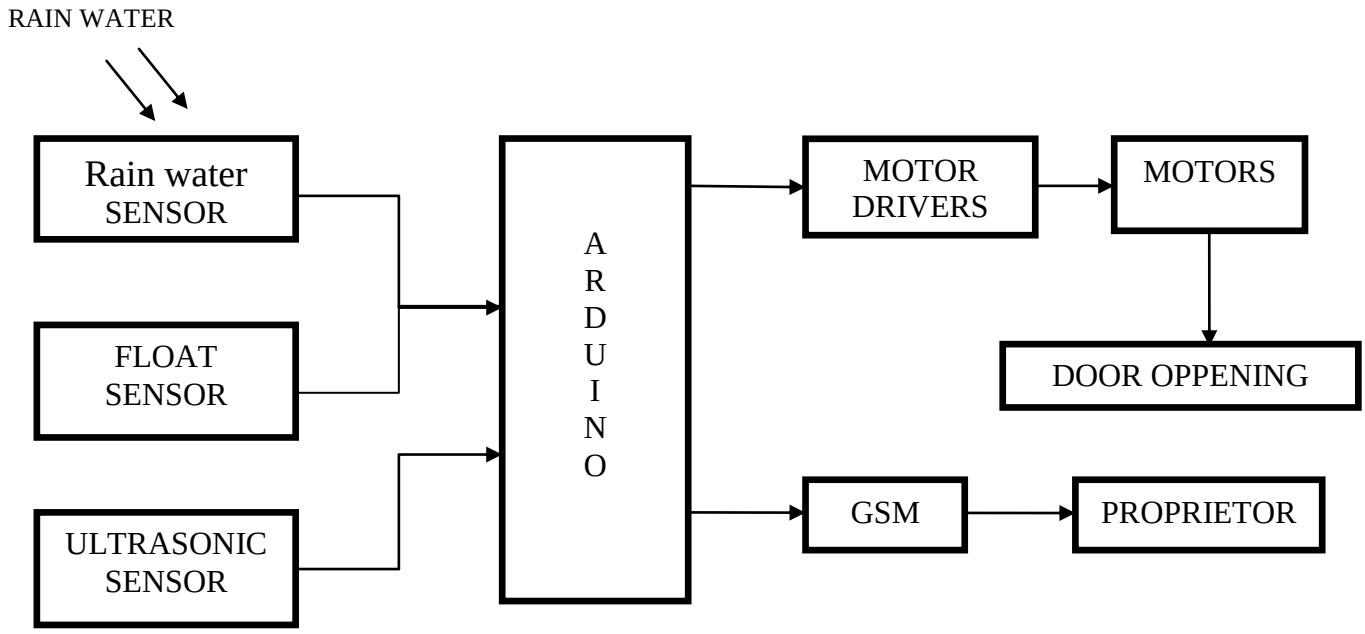

Fig.1. Block diagram of proposed system

ARDUINO UNO: The ARDUINO UNO is an open-source microcontroller ATmega328P microcontroller. The board is equipped with the sets of digital and Analog input/output pins that may be interfaced to various expansion boards and other circuits.
The board has 14 digital I/O pins, 6 Analog I/O pins and it is programmable with the Arduino IDE.
.
ULTRASONIC SENSOR: ULTRASONIC SENSOR work by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to reflect back, calculating the distance based on the time required.

WATER SENSOR: water sensor is an electronic device that is designed to detect the presence of water for the purpose such as to provide an alert in time to allow the prevention of water.

MOTOR DRIVER: A motor driver uses a large chip or discrete FETS which is able to handle a large amount of current and higher voltage than the standard 5V/3.3V from a microcontroller pin. They allow you to control a much larger load from a small signal. A brushed DC motor is simplest to control as there is no timing or protocol required.

GSM: GSM stands for Global System for Mobile Communication. It is a digital cellular technology used for transmitting mobile voice and data services.

FLOWCHART

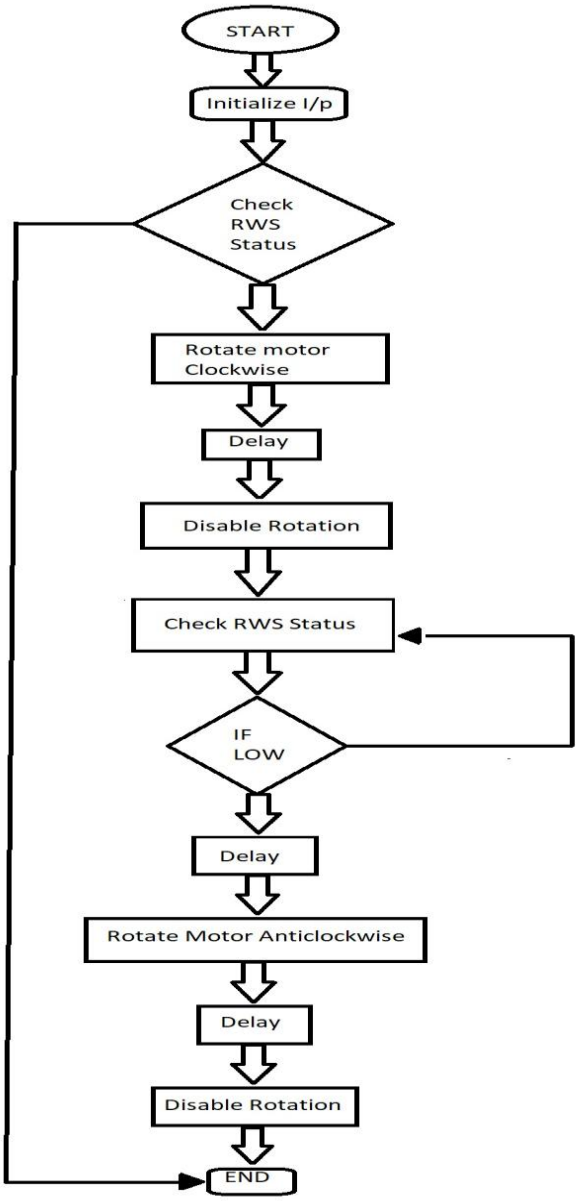

Fig.2. Flow chart

III. RESULTS AND DISCUSSIONS

As per the existing system, the process of testing involves checking of different parameters like Rain sensor which is basically a water sensor, Ultrasonic sensor, motor, GSM module, Arduino controller, etc. We tested all these parameters accordingto its specifications. In the observed result we saw that, Rainwater sensor , Ultrasonic sensor are successfully updating their output according to the level of water in the tank . The expected outcome of this system would be that the Smart Rainwater systemthat would be able to measure all the parameters of the rainwater tanks successfully and showing it on webpage or an application or using GSM module and continuously notify the user by updating the tank level through messaging. This would, in turn, help the person to take the necessary further action.

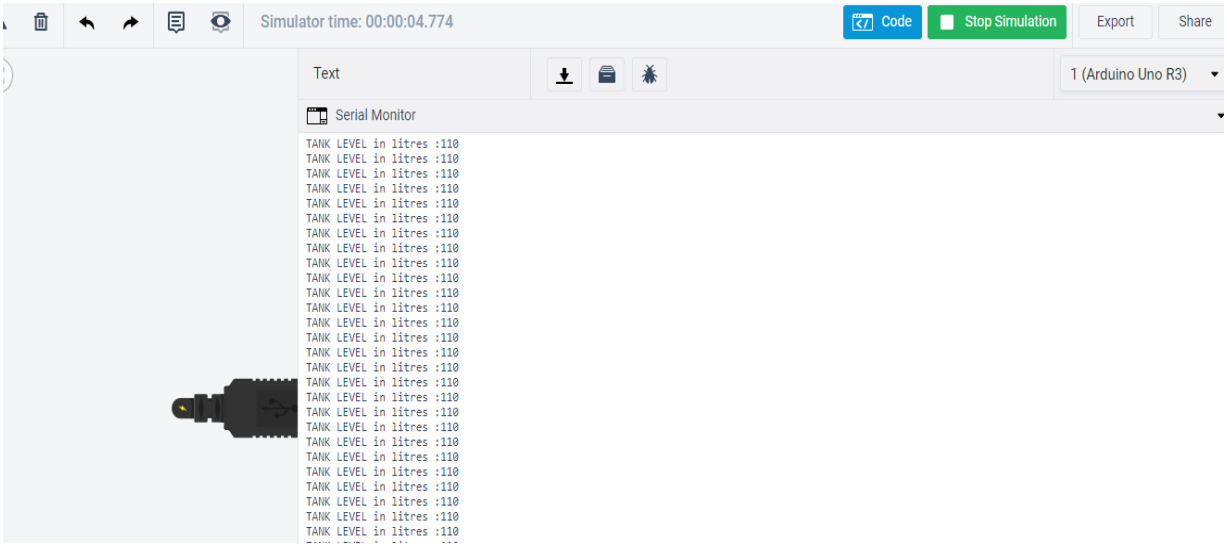

Fig.3 Simulation result of Tank level

Fig.4 Message Received via GSM module

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IV. CONCLUSION AND FUTURE WORK

The proposed system is designed and implemented to control and observe the Harvesting and storage. A system that will monitor the level of rainwater stored and that gives data acquisition about water level to the management. This system can be used in large societies and personal houses for preserving the rainwater. The traditional method does not allow the level measurement of the water, but using this system it is possible to do that. The collection of rainwater may reduce flooding in certain areas as well. Smart Rainwater harvesting technique
and storage can be incorporated in both rural and urban areas and provides many benefits to individuals, communities, and the environment.
With the advancement in the system, the system can be used to monitor the storage of large water systems. Rainwater management at a global scale can be achieved if systems are implemented and studied at higher levels. Drought prone and water-scarce regions can be provided with water supply even during seasons of less rainfall. The system if studied with an agricultural point of view will benefit the farmers. The system used in agriculture can provide a solution to water irrigation problems.

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