Automatic Proportional Water Distribution in Residential Buildings

[1]Ms. Anita V.Patole, [2]Ms Priyanka D. Solshe, [3]Ms Shruti B. Dagade, [4]Kulkarni P.P.

[1,2,3]Students, [4]Assistant professor
Department of Electrical Engineering,
NBN Sinhgad School of Engineering, Pune, India[1]

***ABSTRACT*: There are millions of people all over the world who don't have access to water. A lot of people are dealing with a crucial issue of overuse of water. It is overused by people for animals, farming and many other things. In urban areas, there is heavy use of water in residential societies. People in the societies use water for drinking, cleaning, washing etc. Huge amount of water is served to the flats from the tanks that need to be controlled. This can be done using various devices out of which one is a sensor. The sensor will be fitted on upper tank to check/sense the level of the water in the tank. Sensor will sense the upper and lower limit of a tank and accordingly switch off the motor. In residential units people make the use of water in a large proportion due to excessive availability of water. In some cases, a particular flat member uses more water than the other flat member. This paper describes the work carried out to distribute the water proportionally in each flat using Sensors, Solenoid valve and Arduino kit as main hardware components. Adding to this system GSM module is used for sending message codes to this system in emergency case by the user. This will serve as two way communication between the user and the proposed system. This project will help to avoid lots of problems related to water wastage, water scarcity, etc.**

***KEYWORDS*: Arduino software, proportional water distribution, Atmega 328, GSM.**

I. INTRODUCTION

In this paper work, it has been decided to control the level of water in the overhead tank as well as the water flow and distribute the water proportionally amongst the society members using Arduino kit (microcontroller Atmega 328), solenoid valve. A prototype model for this purpose will be designed and tested. Water is required for innumerable purpose. For household and sanitary purpose, water required per person is about 50 to 60 lit/day. In day to day household and industrial activity, we are using large quantity of water. To save this water for future motivated us to do the research on "Automatic proportional water distribution in the residential building" which is an attempt of saving few litres of water which will definitely contribute in fulfilling the future need of water on the earth and to conserve this precious water. There are many regions where water is available in high proportion whereas in some places water is not even available for drinking purpose. One of the reasons behind this is due to the wastage of water in the residential sectors. At present, there is no such system, which monitors the flow of water in every flat of a residential building, and no technology introduced to limit the excessive use of water. Some members in a society are working while some are non-working members. The working members being out of the house for most of the time are not able to use water in equal proportion as that of the non-working members. Therefore, comparatively the quantity of water available for them is less. This problem needs to be solved by introducing new technology. Therefore, this paper aims to give the solution using automatic proportion water distribution system in the residential building. Water when distributed proportionally among the society members will not only save the water but also it will save the cost too. This saved water can be used to solve other water related issues. This water can be supplied to the rural areas or the water scarcity areas. This paper will help to avoid lots of problems like shortage of water in rural as well as urban areas. Nowadays, various methods are used to reduce wastage of water. A water flow meter can be used but this method has some disadvantages like high cost. An automatic water level controller will be designed to switch ON the pump when the water level inside the overhead tank is low and to switch OFF when the tank is full. This will take place with the help of a sensor. The sensor will sense the level of water and depending upon the level it will switch ON or OFF the motor. The controller adjusts system inputs to produce desire system output. In the paper work, in addition to the water level controller, a new system namely 'A proportional water distribution system' will be developed for distributing water proportionally in each flat of a residential building. We are going to make our system more flexible and user friendly so that if any member requires more water for some genuine reason, they can ask for it by sending a simple text message to the system.

II.OBJECTIVES OF PROPOSED SYSTEM

1) To control the water level of tanks in residential buildings.
2) To distribute water proportionally in each flat in order to minimize the wastage of water.
3) Messaging system in case of emergency requirement of water to the user.
4) User friendly system.

III.PROPOSED METHOD

Design of water level controller

In the residential societies, water is served to every flat from the upper tank mounted on the building. Water is lifted from the lower tank to the upper tank by means of a DC motor & the water is than proportionally distributed in each flat. If the water in the tank exceeds its maximum limit the sensor present in the tank will turn OFF the motor supply. Similarly, if the level of water falls below the lower limit the sensor will sense the level & the motor will be turned ON.

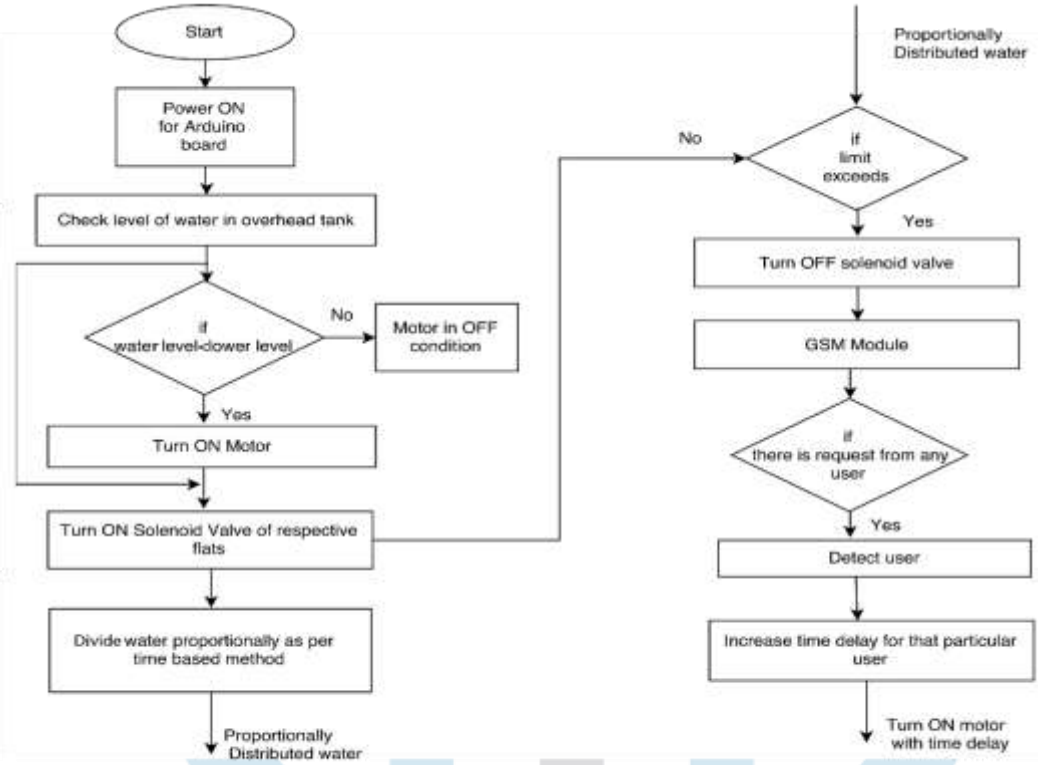

Fig1: Flowchart of Proposed System

Design of Proportional Water Distribution System

In order to distribute water proportionally, solenoid valve will be used in each inlet pipe of every individual flat. For dividing water according to the quantity of user, ultrasonic sensor will check availability of water in tank. Depending upon water availability, Arduino controller sets a value that will divide water in proportional amount among flats. When water reaches the set value, Arduino controller will give signal to the solenoid valve to stop the water flow in respective flats. It is planned to use the GSM module for communication between the user and proposed system. This will be a two way communication.

If due to utilization, the level of water of a particular flat falls below the lower limit than this will be indicated to the user by means of GSM module in the form of a message code.

In case of any emergency, a user from respective flat can request for extra water by sending a message to the GSM module as per the requirement programming related to this facility will be already done in this the circuitry.

IV.LITERATURE SURVEY

"Reference [1]", introduces water level monitoring andcontrolling system. In this system water level is not only sensed but also controlled by using PIC 16F84A. For this experiment they have used 8 bit microcontroller, an inverter, a reserve tank, water tank (overhead) and water pump. At the first stage of design a water level sensor is used for sensing water level accurately. Microcontroller is used to control the overall system automatically which reduces the design and control complexity. Microcontroller takes input from sensor unit which senses the water level through inverter.

After processing input variables, resultant output decides the water pump action (on/off) with respect to current after status of the tank. They have used audio visual alarms at desired levels and automatic control of pumps based on user's requirements. Proper monitoring with the help of sensors and automation is needed to ensure water sustainability.

"Reference [2]" Explains an automatic water level controller to switch on the pump when water level inside the overhead tank is low and to switch off when the tank is full. In many houses, there is wastage of water due to overflow in overhead tanks. Automatic water level controller can provide a solution to this problem. As water level rises or falls, different circuits in the controller send different signals. These signals are used to switch on or off the motor pump as per requirement.

"Reference [3]", presents the minimization of water wastage at the overhead tank due to overflow and prevents the motor from running continuously. Two conditions are always necessary for the motor to run. The overhead tank to be filled with water should be dirt free and there should be enough water at the source from which water is to be drawn. When these two conditions are satisfied, the motor will run and startfilling up the tank. After the water touch a certain level at the top of the overhead tank, the motor will stop running automatically and prevent the overflow of water.
Water level will decrease due to the utilization of water but the motor will still be in off mode state. When the level reached down a certain level at the bottom tank, the motor will run again and start filling up the overhead tank. This can be used in any organization, educational institute or domestic house. The main objective of this paper is cost minimization to build the circuit and making it work efficiently. Other aim of this work is the cost minimization for its design and implementation. By using 555 timers, transistors, LEDs,resistors, LDR which is a common and cheap component, this work is implemented without the use of microcontroller, seven segment display, decoder, logic gate and encoder.

"Reference [4]", presents indicating and controlling the water level in the overhead tank. In this system the level of the water is displayed through the LED. The copper probes are used to sense the water level. These probes are inserted into the water tank whose level of water is to be monitored. This water level controller cum-alarm circuit by using microcontroller 8085. It continuously monitors the overhead water level and displays it.

"Reference [5]", in this paper, the design and implementation of water level control system which is wireless, automatic, cost effective and reliable is considered. It uses two radio frequency transreceivers along with a controller each installed at the tank and pump. Radio frequency transreceiver is used for wireless communication and is automated with microcontroller. This technique is use to solve the issues of water scarcity in the societies and eliminate the manual efforts.

"Reference [6]", the unavailability and wastage of water leads to scarcity of water which is major problem in most of the cities and towns. The objective of this paper is to avoid overflow and wastage of water therefore controller can be used to reduce the wastage and overflow of water in societies.

"Reference [7]", People living in multi-storeyed building face a lot of inconvenience when there is a shortage of water which is particularly due to wastage of water. A stamp microcontroller is used for pump operation and a ping sensor is used to check the level of water in tank.

"Reference [8]", Analyses the effectiveness of water level control using fuzzy logic. It takes into account the set point. The fuzzy logic programmed in the microcontroller is applied which controls the level in the tank using drain and feed pumps. Once the set point is reached, the message along with the present level is sent back to the user. This indicates the water level.

"Reference [9]", it presents the idea of smart water tank management system operated with Atmega 128A microcontroller, which is the prime component of this project. This system can also be used for any other fluids in chemical industries or factories. The main aim of this project is to distribute water and reduce manpower.

"Reference [10]", Automatic Electronic Water Level Management System of a multi-storeyed residential building is very useful in cities which save energy. There are two reservoirs one at top and one at bottom. One pump is coupled with motor. Depending upon water level the motor will turn ON and OFF to maintain water level of roof top tank min level to max level through constant monitoring.

"Reference [11]", a new technology of controlling water pumps using smart phones. It uses wireless radio transmitters and Wi-Fi routers to turn ON and OFF the water pumps. This runs in Android OS version up to 6.0.1.This implementation helps to prevents wastage of water as well as wastage of electricity.

"Reference [12]", Level control is one of continuous [process that can be treated as an integrating process. It is used with electrical probes or sensors along with power supply and motor. The main aim is to design and develop an automatic water level controller to maintain the outlet process of the water level at its desired level. It also focuses on the need of people to install automatic water level controller to avoid wastage of water.

V. HARDWARE REQUIRED

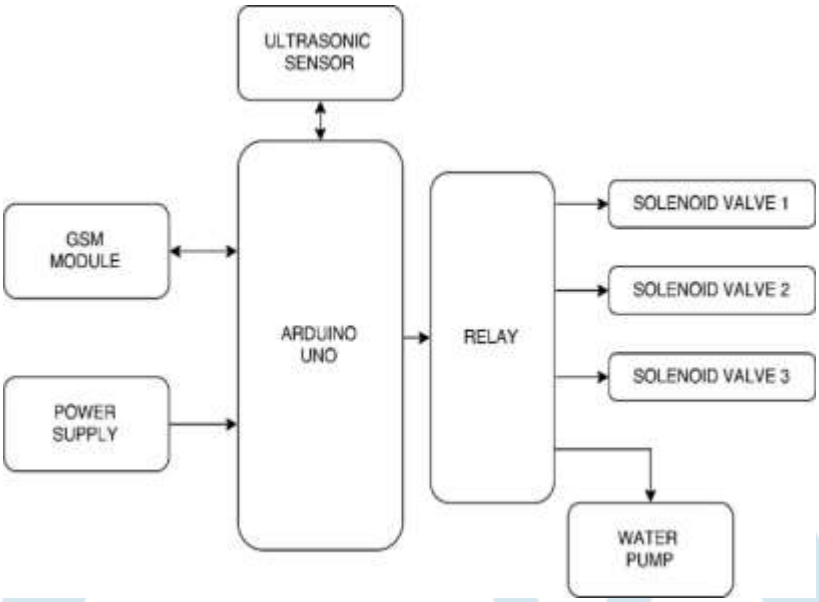

Fig2: Block diagram of proposed system

1 Arduino Uno

The UNO is a microcontroller board based on theATmega328P. It has 14 digital input/output pins out of which 6 can be used as PWM outputs and 6 analog inputs. It also consists of a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button on the board. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. "UNO" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The UNO board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino. The UNO board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The UNO can be programmed with the Arduino Software (IDE). The ATmega328P on the UNO comes pre-programmed with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). The Arduino UNO firmware source code is available in the Arduino repository. This is main part of our proposed system. All the system will be control through Arduino .It works on 5V DC supply.

1.2 Ultrasonic Sensor

The ultrasonic level indicator is a low-cost, noncontact and easy-to-install measurement device. The ultrasonic level indicator is a highly-accurate device with enough specialized uses to ensure that the needs of the customer are met, so we are going to use this sensor in our system for measuring water level in upper tank of residential building. If the level of water is below lower limit then ultrasonic sensor sense the level and gives signal to the motor to turn on through Arduino. When the water in a tank reached to an upper limit then it gives signal to motor and motor will turn off automatically.

1.3 Solenoid Valve

SSG Solenoid Valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: In the case of a Two-Port valve the flow is switched ON or OFF. Solenoid valve works on the energising and de-energising of coil. For equal water distribution Arduino will set a limit of water depending upon available water in tank up to set limit water will be supplied to flat, when limit will reached Arduino sends signal to coil of solenoid valve, then coil will de-energize and supply will get OFF.

1.4 GSM Module

SIM900A MODEM

The GSM is an ultra-compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS. Interface, the SIM900A delivers GSM/featuring an industry-standard GPRS 900/1800MHz performance for voice, SMS, Data. In our proposed system we are going to use GSM with SIM900A module for communication purpose between flat members and module. If the level of water in a particular flat reached at 75% & 100% it will be indicate to the flat member by a message. In case of any emergency, a user from any flat can recommend for extra water by sending a message to the GSM module as per the requirement.

After request (though message)of flat member for extra water Arduino kit will get signal from GSM module then by controlling solenoid valve through Arduino kit extra water will be add to that flat.

VI.CONCLUSION

This paper is a solution over various water related issues happening around in the environment. Water when distributed equally among the societies may lead not only saving in water but also cost and energy. This saved water can be used to solve other water related problems. This water can be supplied to the rural areas or the water scarcity areas. In this way, this paper helps in to save water and will bring change in the environment. This project can be implemented and tested on prototype model.

VII.ACKNOWLEDEMENT

It is indeed a great pleasure and moment of immensesatisfaction for we to present a review paper on "**Automatic Proportional water distribution system in residential building**" amongst a wide panorama that provided us inspiring guidanceand encouragement, we take the opportunity to thanks those who gave us their indebted assistance. We wish toextend our cordial gratitude with profound thanks to ourinternal guide **Prof. P.P. Kulkarni**for his everlastingguidance. It was his inspiration and encouragement whichhelped us in completing our paper.Our sincerethanks and deep gratitude to Head of Department, **Dr. Prof. V. S. Deshpande**and other faculty member; but also to all those individuals involved both directly and indirectly for their help in all aspect of the paper. At last but not least we express our sincere thanks to our Institute's Principal **Dr. R. S. Prasad**, for providing us infrastructure and technical environment.

REFERENCES

[1] S.M. Khaled Reza, Shah Ahsanuzzaman Md. Tariq, S.M. Mohsin Reza, ''Microcontroller Based Automated Water Level Sensing and Controlling: Design and Implementation Issue", Proceedings of the World Congress on Engineering and Computer Science 2010 Vol I WCECS 2010, October 20-22, 2010, San Francisco, USA.

[2] M. Javanmard, K. A. Abbas and F. Arvin, "A Microcontroller-Based Monitoring System for Batch Tea Dryer", CCSEJournalofAgriculturalScience, Vol.1, No.2, December 2000

[3] N K Kaphungkui ,Dept of ECE, Dibrugarh University, India ,"Design of low cost and efficient Water level control" International Journal of Advanced Research in Electronics and Communication Engineering(IJARECE) Volumr-3, Issue 6, June 2014.

[4]Kavita Jindal, Kavita Singh, "Hardware and Software based Water Level Controller System using Microcontroller" IJSTM VOL.2, Issue2.April 2011.

[5] Muktha Shankari K, Jyothi K, Manu E O, Naveen I P, Harsha Herle, "Wireless Automatic water Level Control using Radio Frequency Communication" International Journal of Advanced Reasearch in Electrical Electronics and Instrumentation Engineering,Vol.2,Issue 4,April 2013

[6] Karma Gyatsho Bhutia, Deepak Rasaily, Aarfin Ashraf, "PLC Based Automated Water Level Control System" 3rd International Conference on Electrical, Electronics, Engineering Trends, Communication, Optimization and Sciences (EEECOS)-2016

[7] Sudip Dogra, Suman Chatterjee, MirHasibur Rahaman, Subhrajeet Mitra, Pratik Bhattacharjee, "Design and Development of Automatic Water Level Controller Using Stamp Processor and Ping Sensor",(ICFTCC-2015)

[8] Namrata Dey, Ria Mandal, M Monica Subashini, "Design and Implementation of a Water Level Controller using Fuzzy Logic" (IJET)

[9] Yogita Patil, Ramandeep Singh, "Smart Water Tank Management System for Residential Colonies using Atmega128A Microcontroller" International Journal of scientific & Engineering Research ,Volume 5,Issue 6,June-2014.

[10] Tanmoy Chakraborty, Khairul Alam, Satadal Mal, Utpal Biswas, "Automatic Electronic Water Level Management System using PIC Microcontroller", IESA 2014.

[11] Souvik Paul, Mousumi Das , Anik Sau, Soumyadeep Patra, "Android Based Smart Water Pump Controller With Water Level Detection Technique", IJARCCE Vol.4,Issue 12,December 2015

[12] Md. Moyeed Abrar, Rajendra.R. Patil, "Logic Gate Based Automatic Water Level Controller", IJRET