AUTOMATIC WATER DISTRIBUTION SYSTEM

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ABSTRACT: - In urban areas the water supply to residence and commercial establishments are provided at a fixed flow rate. There are incidents of excess water drawn by certain customers/users by connecting motor-pump sets to the waterlines which is considered as water theft. In this project it is proposed to develop an embedded based remote water monitoring and theft prevention system by recording the flow rates at the consumer/user end. In order to implement the proposed water supply system, each consumer should be provided with an embedded based water flow monitoring system consisting of a microcontroller to record the flow rate using a flow sensor and to transmit the same to a remote monitoring station using wireless transmitter and it is also provided with an electrically operated solenoid valve to supply water to the consumers. The valve turns on/off to stop the water supply whenever the flow rate exceed a predefined limit. The solenoid valves are also controlled using real time clock to control flow of water accordingly for a fixed duration of time. It is proposed to employ a gsm modem for wireless communication so that the information can be passed to particular responsible officer"s cell phone for immediate action.One of the world's major problems is the scarcity of water, mainly due to the unmeasured consumption and the waste of this vital element. This project describes a modular water system, which helps not only in monitoring consumption but also in finding water pollution. In the past water resources were very limited & nobody can afford its wastage. For managing and providing water so many workers were required. Also to switch on valve & distribute water bill by going to home so many workers were required. To overcome this problem we have decided to work on automatic water management using microcontroller (atmega 328p). Also this project deals with problem of distributing water bill in different area by going to every user's home. We have decided to use GSM module for communication. In this project we will make a PYTHON based management software which will handle user account details.

Keyword: - ARDUINO ATMEGA 328P, PYTHON,GSM

INTRODUCTION:

With the continuous economic growth, the water demand of enterprises is also increasing. The monitoring of water resource for these enterprises can prevent the occurrence of stealing water and leaking water effectively. Therefore, the monitoring system of urban water supply has aroused extensive attention in recent years. Urban water supply networks form the link between drinking water supply and drinking water consumers. These large-scale networks are vital for the survival of urban life, for maintaining a healthy level of economic development, and for the continuous operation of factories and hospitals. In world, urban water supply systems are public enterprises, usually part of a local government, and the recent increased interest in privatizing public enterprises has not led to reforms of water systems. Nevertheless, in about 50 cities in the developing world, the water system either has been privatized or franchised to a non-governmental entity for its operation and maintenance. One of the most important aspects of any town management includes water management. It is a crucial aspect as now-a-days water resources are very limited and nobody can afford its wastage. This project deals about the automation in the water distribution and management with technical advances. In this system the level of water will be sensed by the water level sensor. Depending upon the level of the water the speed of the motor will be varied. The supply of water to different areas. The speed of the motor is controlled with respect to tank water level. This project deals about the mobile controlled water distribution in different areas and distribution of water according to bill payment. One of the major features of the project is distribution of the water according to bill payment and status update on mobile through GSM module. The ever-increasing population and the wide growth of urban residential areas has increased the necessity of proper water distribution. This water distribution in every house in different areas requires the control and monitoring for preventing the wastage of water and the water pilfering practices. Different technologies have been considered to allocate/supply the water to each and every house of housing areas. In the times of yore, water resources were very limited. Technology was not so developed as it is now. So wastage of water was not affordable. Many workers/Employees were required for managing and providing water. To overcome this crisis, we have decided to work on the automatic water distribution to different housing areas using Arduino ATMEGA 328p microcontroller, also to overcome the problem of distribution of the bills by going to the consumer's/customer's home, we have used the GSM module for direct communication. The overall idea of this project was very challenging. While selecting this project the important consideration was that it should benefit the day today life of the people, it should meet the daily needs of every human (viz WATER, an important thing for survival of human being), a project model which would be a beneficial to the society and reduce their problems.

RELATED WORK

The rapid growth of wide urban residential areas imposes the expansion as well as modernization of water supply facilities.Along with this one more problem is identified in the water supply channels, some people use ½ HP to 1 HP pump to suck the water directly from the channel of their home street[6].In [7] authors used PLC and SCADA systems for water distribution network. Their system included remote terminal units, specific transducers and actuators distributed on a wide geographical area and control and power panels for the pump stations. In [8] authors improved the earlier work by using GSM modules to send message regarding theft or leakage to responsible officer"s in the control room. In[9] the authors have implemented the system using ARM controller. The solenoid valve is driven using TRIAC and the controller was responsible for signal to intimate to water supply board.

A. Existing System

In existing system, urban water is supplied to the home with the help of some man power. The person in charge will go to the place

and then open the valve to that particular area. Once the time is over the person will go again to that place and close the valve. This type of operation needs man power. This is waste of time to go to that place and come back often. Also the people may take excess water for their personal use with the help of motor or some other equipment. Due to this many people will not receive sufficient water for their use. Here the supply of water to different areas is done according to the level of the water in main tank. A worker is needed to switch ON the supply so that the main tank located in the operator area gets filled and is ready to distribute water to different regions. Suppose there are two areas say area 'A' and area 'B'. if water is to be supplied to area 'A' then depending on the number of houses located in area 'A' the main tank should be filled 100% with water and then for the duration of one hour the water is supplied to that area, whereas area 'B' has to wait till the supply of water is done to the area 'A'. Now again it takes some time for the main tank to be filled with water in order to supply water to houses residing in area 'B' and remaining the same procedure is carried out. This states that the existing system is not capable of providing water to both the areas simultaneously.

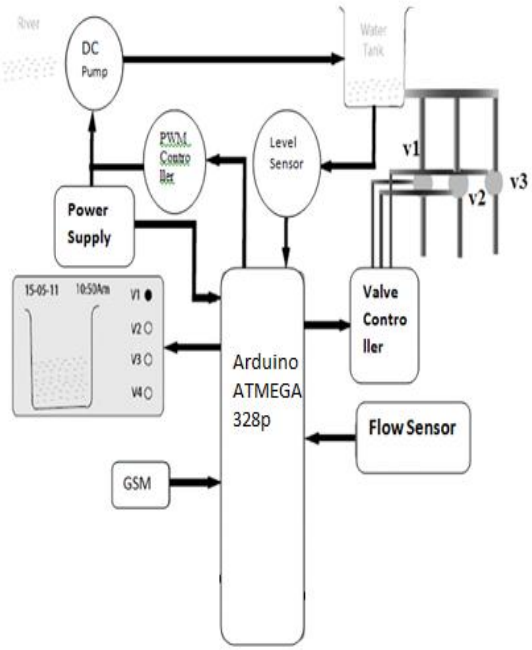
B. Automated System:

In this project we deal with the automatic distribution of water to overcome the basic problems. Here we will take care of the water level in the main tank and if less than the desired, then it will be filled automatically with the help of DC pump when indicated by the level sensor so that a person is not required to keep a eye on it. All the areas will be supplied water at the same time so that no house has to keep waiting for water. This technique will be continuously monitored so that there is no any disturbance caused in water supply to different areas.

This system includes:

- Mobile controlled water distribution in different areas.
- Motor speed control with respect to the tank water level. Calculation of bill on basis of water used. Distribution of water according to the bill payment.
- Status updates on mobile through GSM Module.
- PYTHON database GUI for billing management.
- Customer information and recharge facility.

BLOCK DIAGRAM:



The following are the important elements in the block diagram:-

- Microcontroller
- GSM
- Sonar sensor
- DC Water Pump
- Solenoid Valve
- Relay

1. MICROCONTROLLER

The Atmel 8-bitAVRRISC-based microcontroller combines 32 kB ISPflash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz

2. GSM

The term GSM900 is used for a GSM system which operates in any 900 MHz. The 900 MHz band defined in the ETSI standard includes the primary GSM band (GSM-P), the extension (see E-GSM) and the part of the 900 MHz band that is reserved for railways (R-GSM).

The total GSM900 band defined in the standard ranges from 876 - 915 MHz paired with 921 - 960 MHz. Mobiles transmit in the lower band and base stations transmit in the upper band.

In daily life, the term GSM900 band is used for the parts of the band that are used by the GSM operators to offer public services, which exludes the R-GSM band. This part of the band that remains ranges from 880 - 915 MHz paired with 925 - 960 MHz band.

3. SONAR SENSOR

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that

sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

Since it is known that sound travels through air at about 344 m/s (1129 ft/s), you can take the time for the sound wave to return and multiply it by 344 meters (or 1129 feet) to find the total round-trip distance of the sound wave. Round-trip means that the sound wave traveled 2 times the distance to the object before it was detected by the sensor; it includes the 'trip' from the sonar sensor to the object AND the 'trip' from the object to the Ultrasonic sensor (after the sound wave bounced off the object). To find the distance to the object, simply divide the round-trip distance in half.

4. DC WATER PUMP

The pumping of water is a basic and practical technique, far more practical than scooping it up with one's hands or lifting it in a hand-held bucket. This is true whether the water is drawn from a fresh source, moved to a needed location, purified, or used for irrigation, washing, or sewage treatment, or for evacuating water from an undesirable location. Regardless of the outcome, the energy required to pump water is an extremely demanding component of water consumption. All other processes depend or benefit either from water descending from a higher elevation or some pressurized plumbing system.

5. SOLENOID VALVE

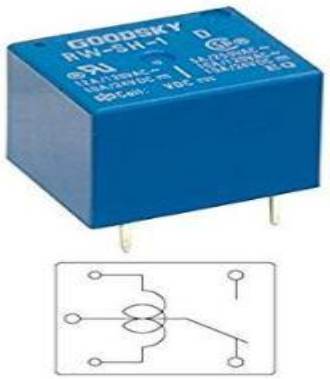
A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold.

Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids. They are found in many application areas. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the materials used, low control power and compact design.

6. LEVEL SENSOR

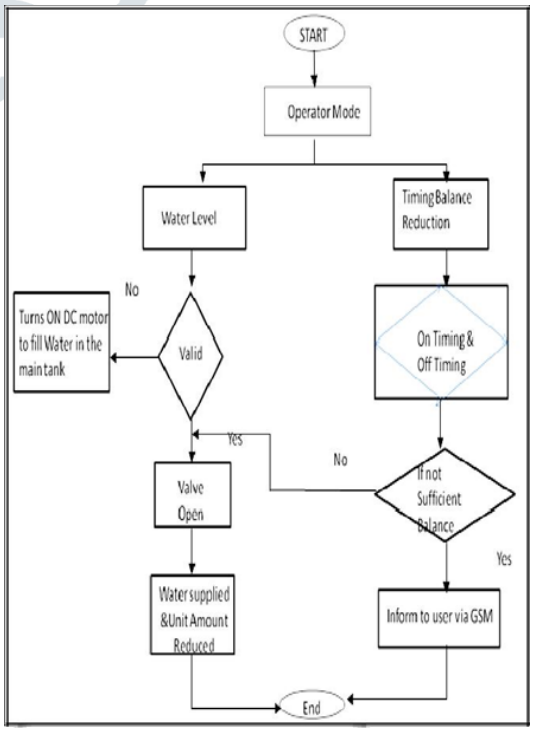
Level sensors detect the level of liquids and other fluids and fluidized solids, including slurries, granular materials, and powders that exhibit an upper free surface. Substances that flow become essentially horizontal in their containers (or other physical boundaries) because of gravity whereas most bulk solids pile at an angle of repose to a peak. The substance to be measured can be inside a container or can be in its natural form (e.g., a river or a lake). The level measurement can be either continuous or point values. Continuous level sensors measure level within a specified range and determine the exact amount of substance in a certain place, while point-level sensors only indicate whether the substance is above or below the sensing point. Generally the latter detect levels that are excessively high or low.

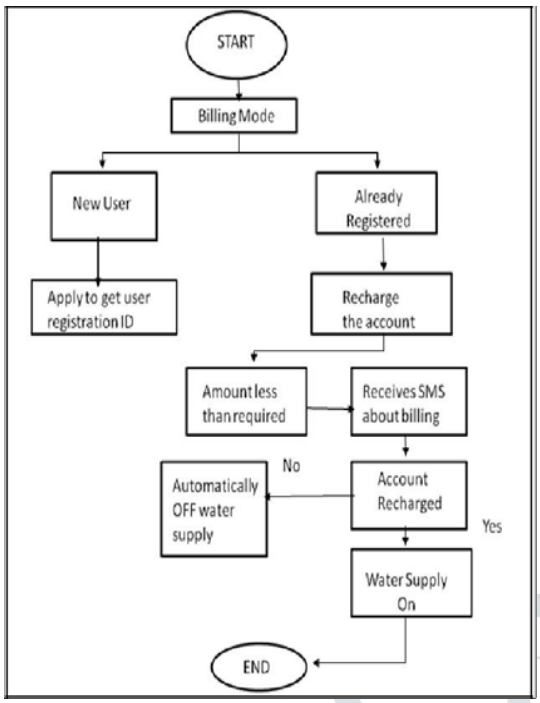
7. RELAY



It is used to drive AC/DC Load & also used for auto switching purpose.A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions.Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits, the link is magnetic and mechanical.

FLOW





WORKING

An operator fills the tank automatically from main water resources by using DC pump. Level sensor is used to sense the level of the water which is inserted into the main tank. If water level in the main tank is above 90% then automatically the DC pump will be turned OFF turned OFF. When the water level in the main tank is at or below 20% then DC pump will automatically turn ON. The flow sensor is used to determine speed/pressure of the water i.e with what speed the water is supplied to the houses.

The GSM modem is used for communication which will be interfaced with the PC to give the updates regarding the billing information of the customers and to show the status of the water level in the main tank which will be displayed on the LCD. MAX232 is the interface between the PC and the microcontroller through which all the information regarding the customer's will be stored with the help of the MATLAB (GUI) database. The calculation the bill payment will b done on amount of water used by the customer which will be updated on his registered mobile number with the help of GSM.The above proposed system isalsoimplemented using PIC controller. Here the level sensor senses the level of water. The speed of the motor is varied according to this water level. With the use of DTMF the water is supplied automatically to the targeted areas. The visual display is provided as graphical LCD for showing the necessary information and details. This system provided the given below function

- Mobile controlled water distribution
- Control of motor speed according to the tank water level
- Calculation of bill with respect to the water used
- GSM module is used for status updates on mobile The tank is automatically filled from the water resource with the help of AC pump. The level sensor present insidethe tank senses the level of water and accordingly AC pump to fill the tank is turned ON or OFF automatically. The DTMF shows the status on the mobile phone. The respective solenoid valve gets turn ON only if status of DTMF is 1. The status of DTMF reveals the image of the valve on the GLCD and this is used by GSM for sending SMS.

The detail working for the water distribution used in daily life is as shown in Fig.1. The proposed system gives the automatic implantation in water supply control. Herein we have also introduced the selfpower generation technique.Firstly the raw water is treated with alum and chlorine throughthe aerator. Here the manual technique of opening and closing of the valves in the existing system whichresults in inappropriate amount of release of alum into the raw water is replaced by automatic open and close of valves with the help of different controllers. Here the filtration is done automatically. When the backwash process is to be done, the valves between the granular filter and storage are opened and closed automatically up to the sludge pit. The water theft and leakage are identified with the use of flow sensors. The controller calculates the difference in the flow rate of sensors. If the difference exceeds the particular limiting value, the leakage or theft is recorded and the valves behind the first flow sensor and water distribution motor are turned off automatically using the GSM modem technology a message regarding the leakage or theft is delivered to responsible officer in the control room.This proposed system has been implemented through different controllers such as microcontroller 89S52 and relay, PIC controller, ARM controller and also using PLC & SCADA as mentioned in the further sections.

ADVANTAGES:

- More convenient:
- Reduces the man power required to switch on the valves to distribute water to the area.
- Reduces the manual calculation of water bill/payment.
- Helps in finding out the water pollution.
- Helps in reducing wastage of water

DISADVANTAGE:

- Lots of work done in this field.
- A lot of Manual labour required to implement on a larger scale

APPLICATIONS:

- This can be used as water management system and can help in minimizing the water wastage taking place.
- This model can help us in providing a more efficient way of water management and easier ways of bill payment through the use of mobile phone.

FUTURE SCOPE

- This project when developed on a larger scale can be practically implemented in the Municipal Corporation of any village, town or city.
- The same system can be implemented for automated town electricity management system.

CONCLUSION:

This Integrating Solar, Lightning Energy Power Generation System will be highly effective in all places, especially in rural areas where the commercial electricity has not reached or undelivered. It causes no effect on nature i.e. pollution free, at the same time not proneness any kind of accident due to lightning and highly suitable for domestic purposes. By using this system, people can save electricity charge and very less maintenance charge to this equipment is required. The designing of this equipment is done in such a way that it is very compact and acts as user friendly. Moreover there is no power failure or load shedding situation at any times. Therefore, it is the most reliable renewable power or electricity resources with the least expenditure in the globe.

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