

# Smart Water Leakage Detection and Water Level Monitoring

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**Abstract:** This paper is about the application of wireless sensor networks. In order to overcome the problem of water dispersion in underground water pipes, this application is used to detect water leakage in water distribution networks. Prevention of leakages and identification of breaks in water distribution networks are basic for an adequate use of natural resources. To solve this problem of identifying leakages, the authors had put forth a wireless networking system that makes use of a mobile wireless sensors that identifies the break in underground pipes and not only saves energy but also its time, cost etc. which poses smart water leakage detection in its pipelines. This helps in measuring the water level in tank and has control over its pump to turn it on when the tank has a low water level. This is designed with two main parts: firstly the alarm which is based on the Global System For Mobile Technology (GSM). This GSM helps in sending short message service (SMS) ie. a text message to the owner. This system consists of the basic components such as sensors, GSM module, Arduino which is related to the control device. Secondly it has the controlling part which makes use of the android mobile application to have control over its pump. The benefits of using this proposed system is the efficiency of operation is improved along with reduced delay time and cost of maintenance of pipelines after detecting the leakage.

**Keywords —** *Arduino, Wireless Sensor Networks(WSN),SMS, Smart water leakage detection., GSM*

## I. INTRODUCTION

Water is an essential and limited resource used for all fundamental purposes like agriculture, factories, and also for all the creature's existence on this planet. Due to defiling of water by various human activities pollution of water takes place and hence leads to wastage of water. Hence, efficient use of water in homes, industries or other places is a potential constraint in the water management system.

Water leakage is one of the main reason for waste of water due to its inefficient use. Hence, in this paper we will show the whole system ideas, its procedure and benefits, devices and apparatus used to accomplish this in a technical way with improved efficiency. The main goal is to identify the occurrence of water leakage in pipelines and the low water level in tanks.

By using the water monitoring system SWLD, we can overcome the wastage of water for our future generation's use. Basically, what we do here is we arrange the water pipelines and put the water sensors on points which have high probability for water leakage. A microcontroller like the Arduino is also used to control and process the actuators

on its output ports. The Arduino connect to the rain drop module to detect the water leakage and ultrasonic sensor to detect decreasing in water level rapidly and remotely and then send SMS to the owner via GSM module. And we use SMS to receive these data from GSM and android application for control on pump. The purpose of this system to bring comfort and energy saving to our lives.

## II. GSM TECHNOLOGY

GSM stands for Global system for mobile communication. First generation technology did not provide SMS or other data services. Upgrading from first generation to Second digital system Generation (2G); this transition was posted due to several services provided by 2G technologies such as: coping, data storing, compression and encryption and permits data transmission without loss of data and also supporting error correction.

Second generation technologies 2G, includes GSM that is based on both Time Division Multiple Access mechanism (TDMA), and Frequency Division Multiple Access mechanism (FDMA), where a spectrum is divided into small parts, as well each part is divided in time to multiple

time part, where users are allocated in turn to specific spectrum part, and specific time part as well.

The Third Generation cellular networks (3G) were developed for offering high speed data and up to 2 Mbps in the some served areas or more which allow the operators for offering multimedia connectivity and other data services to the end customers. Few technologies are able to fulfill the the mentioned rate such as Code Division Multiple Access (CDMA), High Speed Packet data Access (HSPA) has been an upgrade to Wideband Code Division Multiple Access (WCDMA), Universal Mobile Telecommunications System (UMTS) and others. Networks used to increase packet data performance.

### III. PROPOSED SYSTEM

The main purpose of making this project is to save water which gets wasted in our daily usage knowingly or unknowingly. When the water level rises up to certain level in the tank the water stops flowing out of the tank after a certain level so it helps from wasting water. Suppose, the the tank is empty then at such moment the GSM module sends a notification to the user that there is no water and the user has the option to start the motor or ignore the notification. The other great advantage of this system is that of there is leakage in any if the pipe of home then it notifies the user of where the exact leakage is taking place.

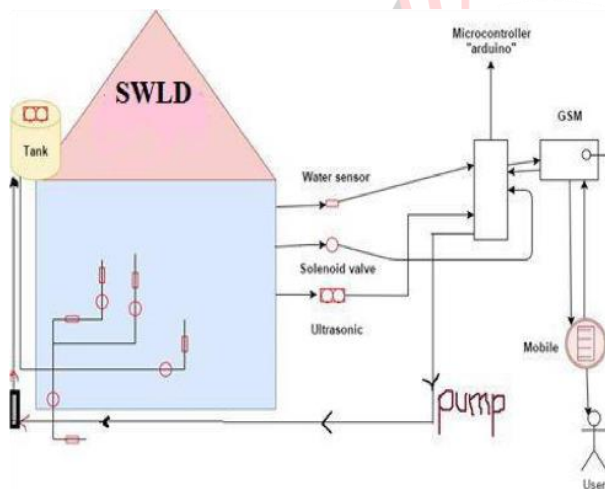


Figure 3.1. Model of SWLD system

### IV. METHODOLOGY

This block diagram defines all the function to be performed by the system. A modular approach to system design was taken. The Adriano mega2560 is used to built this system..

The system contains water sensors to detect leakage. The sensors like raindrop sensor , ultrasonic sensors collect information and the system is controlled by the mega Arduino, the controller decides the risk and sends SMS to the owner using a GSM module.

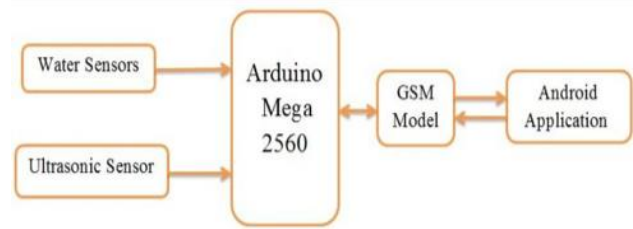


Figure 4.1. System block diagram

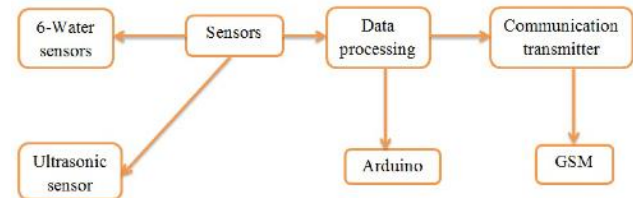


Figure 4.2. Functional block diagram of the SWLD

The pump and turns on if there is low water level in tank. Monitoring of tank water level, is used to avoid under flowing and overflowing level of water in the tank. Water controlling system comes of great use as it is used to on/off the device. Based on the design requirements and specifications of system, the first function of this system is to detect leakage of water which can occur in the distribution units and tracks of the domestic water plumping network. When water leakage sensor which is rain drop module here sense the leakage then it sends the signal to the controller and it sends SMS to the user mobile number. The second function of this system idea is to measure and detect the water level of the upper domestic tank which is usually located on the roof, we are using an ultrasonic sensor to measure the water level in the tank, depending on the comparison between the actual value of water level which is returned by ultrasonic sensor and the preselected value, an actuator which is water pump will be turned on to supply the upper tank and water sensor is turned off if tank is full. The actuation of the pump is wireless and it uses Android application to control it which will be installed in users mobile phone.

### V. DESIGN

In this paper we describe the software system design, program techniques.

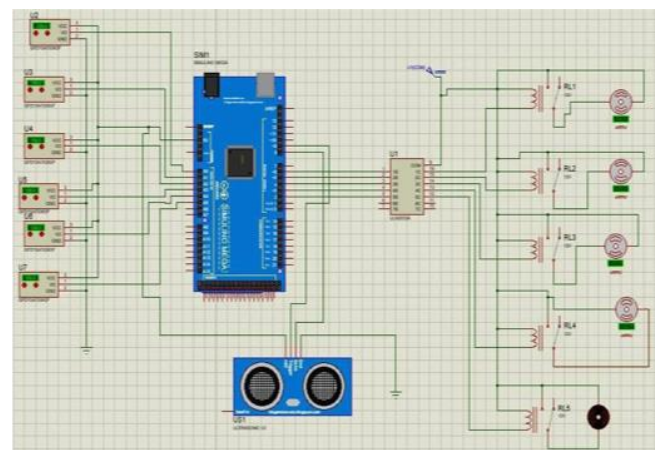


Figure 5.1 Circuit diagram

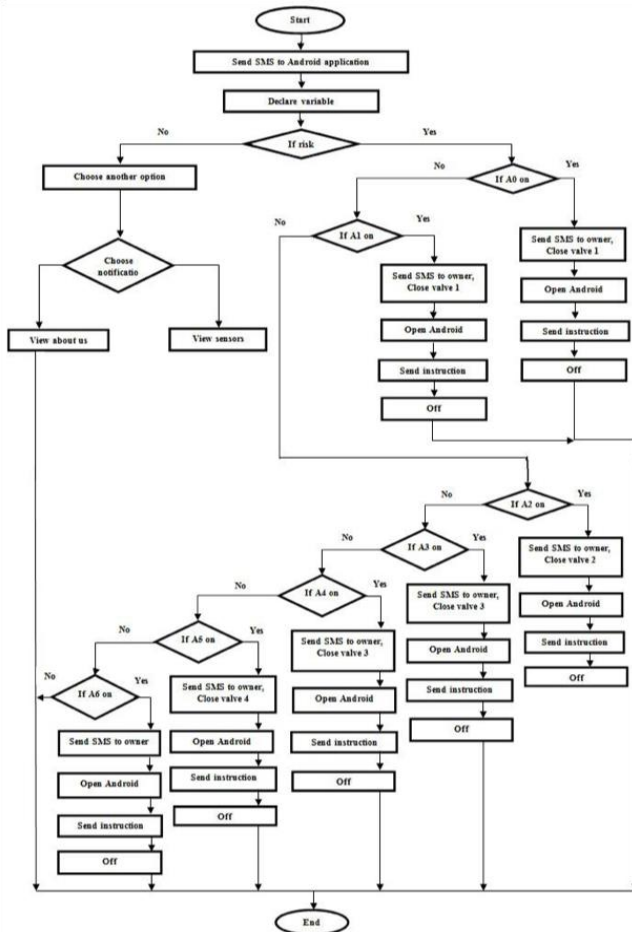


Figure 5.2 Flowchart of the total system

#### A. Use Case Diagram

Fig 5.3 shows home owner must login in that application where he/she can choose any of the choice which appears in main display of application like switching on and switching off motor.

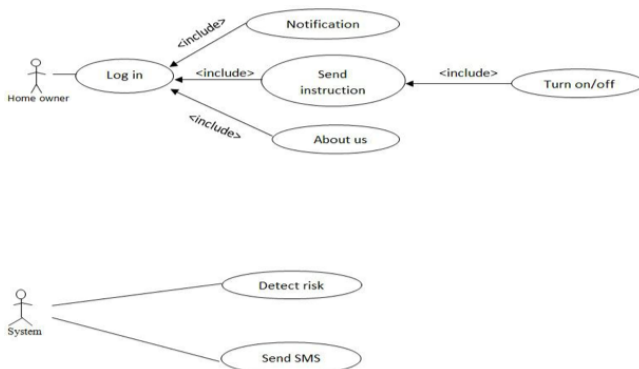


Figure 5.3 Use case diagram

### VI. EXPERIMENTAL RESULT

TEST CASE 1:



Figure 6.1 Result when leakage detected in region 1.

TEST CASE 2:



Figure 8.2 Result when leakage detected in region 2.

TEST CASE 3:



Figure 8.3 Result when leakage detected in region 3.

### VII. DIRECTIONS FOR FUTURE RESEARCH

To improve this system we need to work on the insulation system that will cover and protect the wires.

The insulation is important to avoid damage the sensors and the electrical wire. we can apply this technical method of detecting water leakage in the maintenance companies to allow them be able to monitor the plumbing networks in the buildings and homes.

### VIII. CONCLUSION

The proposed systems are tested on the model of SWLD which is shown in Figure 1. This system feature is expected to draw much attention in the next decades.

Firstly, this make the home owner able to be notified when leakage occurred directly, also the solenoid valves will be closed directly. Secondly, using GSM which deals with mobile allows the home owner to control the water pump whenever the water level is decreased in the tank which will be supplied from the main municipality supply using the pump.

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