

Automated water Distribution and effusion Detection by adopting embedded system

Kiran Gurav¹, Krishnakumar Yadav², Avinash Pardeshi³, Ameya Gharat⁴, Sneha Sankhe⁵

Information Technology Department, Theem College of Engineering, Boisar (India)^{1, 2,3,4,5}

ABSTRACT

As the increasing demand for water arising from global population growth and urbanization in recent years, it is stressing the water supply to its limits. In most water-distribution systems; a large percentage of the water is lost in transit from treatment plants to consumers [1]. Currently implemented water effusion system is Noninvasive Leakage distribution system, which detects leakage from outside the pipeline using sensors or visual inspection. Such system scans manually entire pipeline for damage. Also, some of the new proposed systems use the principle of an ultrasonic transducer, which is not suitable for discontinuities in the fluid (bubbles).

As our country moves towards Smart City, there is need to develop the system that provides efficiency to precious water infrastructure. We proposed the invasive Leakage distribution system that monitors the flow rate of water in distribution pipe using Hall Effect sensor. The sensors are mounted at various node/points in water distribution pipe. If the sensors sense any change in the rate of flow of water then the person at control station will close the automated valve at the pipeline by using GUI and also the system is able to close the valve itself. These will close the flow of water in that area of the pipeline.

Thus the water will not be wasted and its savage is done without wasting time. The graphical user interface is present at the control station to monitor or control the water distribution, also registered users or consumers at a particular location will get a message regarding effusion in their area. The proposed system help government authority to control or monitor water distribution, future water consumption.

Keywords: *Hall Effect sensor, smart city, water effusion, water distribution, water wastage*

1) INTRODUCTION

Earlier the water infrastructure monitoring process was done by a human that caused an error. The presently available system leads to unnecessary loss of water and due to improper handling; water is not properly distributed to the end users [1]. Also, issue of leakage is not handled properly that effects on our natural resources such as water. Also, consumers are not able to get alert related to some critical problems in water infrastructure.

1.1. Objective

- Handle water Effusion issue by using flow sensors and actuators to save lots of water.
- All the manual work done by humans is reduced because of automated system apply on water infrastructure.
- Make government authorities work smart, by adopting these system authorities are able to monitor or control entire water infrastructure using software interface.

- Alert or inform consumers about water effusion via an android app on mobile.

2. WORKING

One of our achievements is to successfully estimate if there is an effusion in the pipeline. These are done with the help of flow rate sensors fixed at various node/points on distribution pipe. At the particular node, the system takes current value and one previous value of flow sensor if both values are same, that means water flow is steady. Then it compares it with another flow sensor or node to find effusion between those two nodes. Then, the data is given at the control station GUI software via radio transceivers from one Arduino board to another Arduino board. The data from flow sensor is presented in GUI in a graphical format. If there is effusion happened in particular area, then we know it from the software readings. This is handled by closing the automated valve in that particular area through software present at the control station.

This system is based on embedded technology. We are using Arduino board to connect sensors and RF transceiver to communicate between two Arduino boards. RF transceiver is used to send flow sensor data to the Arduino board present at the control station. The Bluetooth module hc-05 is used to alert consumers to their mobile via the android application. The solar power supply is used to power Arduino board. The software present at control station is developed by using .NET windows form. All the data coming from the Arduino board at the control station to the software is via the serial port.

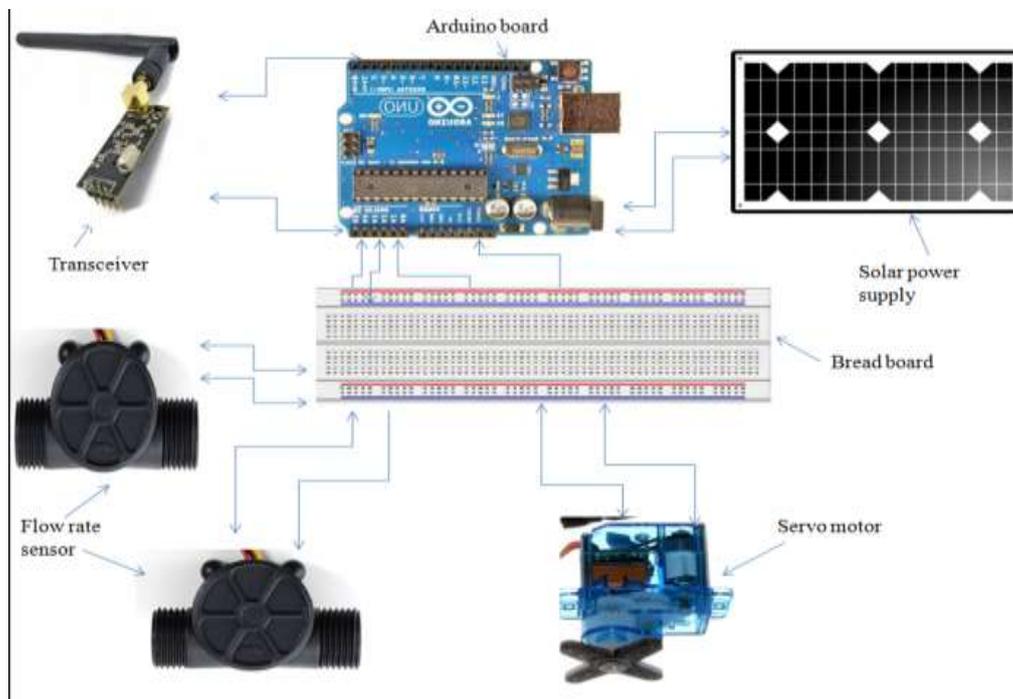


Fig 1: Architecture at an actual site

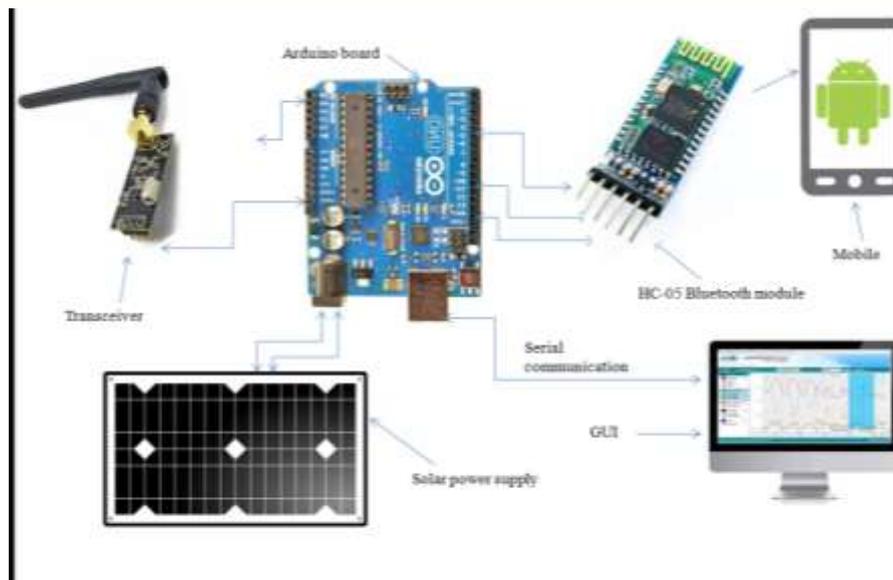


Fig 2: Architecture at a control station

2.1. Software Interface

We are using visual studio IDE and .net platform to build the software. Through the software, government authorities can monitor the water flow in distribution pipe. Also know about effusion in a particular area, from their office where the water distribution in the city is handled. This software will also be upgraded to record water flow and analyze the water uses and effusion pattern using data mining.

The aim of developing the Android application is to notify consumers or common people regarding water distribution in their city. And also notify them about water leakage in their area or sector, so that consumers can use remaining water source carefully. This will increase the transparency between water department and consumers.



Fig 3: Prototype

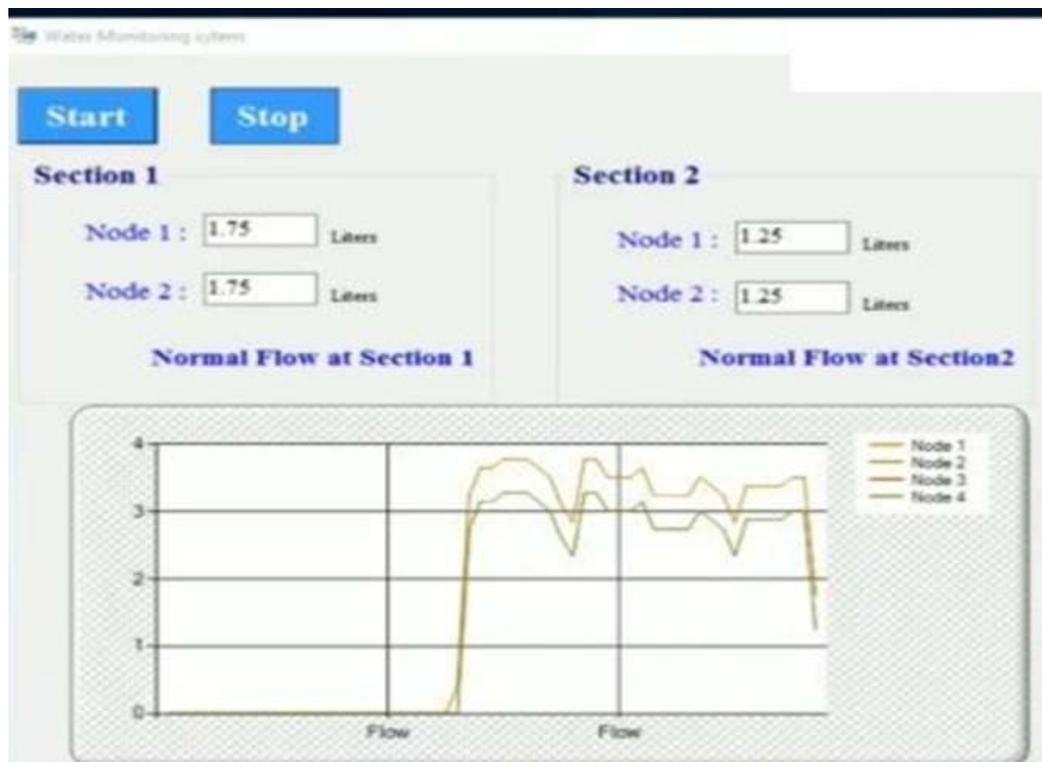


Fig 4: GUI of the System

In Fig 3 you can see the prototype of our system, which simulates the water distribution pipe. There is two section of pipe each has two flow sensors and called as a node to calculate water flow. In Fig 4 you can see the normal flow reading in section 1 and section 2 as well as the graph of readings.

3) CONCLUSION

In this paper, we discuss the problem in water distribution and how to overcome those problems using technology. The project has been having a challenging concept for implementation but the hardware components work perfectly around each other in all conditions and have a good contribution towards the working of the project. The merging of software techniques into the project to monitor and control the system are the major areas where the project has to be taken care of.

The objective of achieving the goal of the social issue has been up to the mark and the system is going to be very useful for government authorities to solve the problems in water distribution. After testing our prototype, it is giving good results for leakage detection. Also for an android app, we can use Wi-Fi module instead of Bluetooth to alert consumers at any time. But before implementing this system in real life situations we have to customize some parts of the system and also test it for large-scale values or physical conditions.

3.1. ADVANTAGES

- The idea (discusses a social problem and suggests a solution): this system is based on social problem and provides complete water solution.
- Effective utilization of natural resources: As whole water, infrastructure will be monitor by the system so there is effective utilization of resources.
- Increase overall efficiency of water distribution: Authorities control water distribution using software interface so it can be more transparent.
- Reduce operational expense: This system is able to detect effusion, so it reduces extra operational cost.
- The power supply is providing by solar power panels as it requires being work on the whole day.

3.2. APPLICATION

The system has many business applications as on the large scale it is very useful for city's water distribution and reduces the operational cost of the government authorities.

This system will apply in housing complexes for water pressure management.

Hydroponics is also the major area where this system can be used.

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