Automatic Water Supply Controller and Sensor

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Abstract— In this paper, we have a tendency to investigate the operating and structure of the automated water flow Controller and sensing element integrated with Arduino UNO board and a water level sensing element device that's able to observe and manage the amount of water flowing through an explicit water instrumentation or such water storage system. The system achieves automation via consecutive logic enforced by a flip flop. The water flow is measured victimisation the water flow sensing element, once the brink worth is reached the coil valve gets closed mechanically. The calculation and processing will be done through embedded programme. If potential, the values are updated within the database and dataset could also be used for more machine learning functions.

Keywords: Water Supply Sensor, Arduino UNO board, Solenoid valve

I. INTRODUCTION

Our society and surroundings face heaps of water inadequacy. As water is one in all the scarce natural resources, it's vital to properly use and manage our usage in numerous sectors. Especially in those places who are known for less-drinking water supplies like Middle East and North African (MENA) countries, there's a requirement to observe the water usage across the various sectors like the residential, agricultural, industrial and industrial areas. In recent years, there's heaps of study to conserve our natural resources such as energy and water. Water and energy conservation techniques and technological interventions are important to find sustainable solutions to our environment that is presently in danger due to excessive use of the available natural resources as a result of more population, human demand and economic process. According to United Nations (UN) report, nearly half of the world's staff add water-related sectors showing most of the roles keen about water. Individuals ought to get correct quantity of water, thereby not wasting water and providing the proper amount of water to individuals. Individuals at some areas misuse the water provided to them, simply by filling excess water and commercialism them at higher price. These kind of activities are illegal and the reason they get more water is because the quantity of water provided to them is not measured, the water will be supplied for a period of time or in some advanced areas the water supply will be automatically stopped once the container or the tank gets crammed. So, some people will pour water from the tank simultaneously, while the tank gets filled and filling some other container to sell them. This kind of activities must be stopped. Thus, in this paper, we propose a water-flow monitoring system, which can sense the water movement towards the water container and then indicate the proper water supplied. The device will have sensors merged with the pipe line; the purpose is to measure and supply the exact quantity of water to the tank. The device also contains an automated part where it can control a water pump by switching it on. We believe that the installation of such a system will enhance proper management and usage of water in domestic houses, agricultural or industrial areas through monitoring and control of the quantity of usage. Such systems contribute towards the aim to conserve our natural resources and maintain the sustainability of the environment as through monitoring, water usage patterns and inefficiencies can be identified and reduction targets can be planned.

II. SYSTEM OVERVIEW

The proposed system comprises a water level sensor (with voltage output readings), an Arduino UNO, which acts as the heart of the Automatic water Supply Controller. It is a microcontroller board which is based on the ATmega328P (datasheet). It consists of 14 digital input/output pins (out of which 6 can act as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (The source of the clock signal for Arduino UNO board), an ICSP (In-Circuit Serial Programming) header, a power jack, a reset button, and a USB connection. Arduino Uno is open-source hardware. The Arduino Uno can be programmed by using a software called Arduino Software (IDE). The ATmega328, which is an Atmel microcontroller, on the Arduino Uno comes pre-programmed with a bootloader which permits you to upload new code into it without using an external hardware programmer. It conveys through the native STK500 protocol. The power affiliation for the Arduino UNO is provided by a USB connection or also can be powered by means of an external power supply. The power origin is selected as a direct consequence. Superficial (non-USB) power can supplied either from a battery or an AC-to-DC electric plug. The electric plug can be connected by plugging a 2.1mm center-positive electric stopper into the board's electricity jack. The ATmega328 packs a 32KB (out of which, 0.5 KB will be occupied by the bootloader) ISP flash memory with read-while-write options. It also adds a 2 KB of SRAM and a 1 KB of EEPROM. Fig 1 represents the actual image of the Arduino UNO board.

Fig 1: Arduino UNO Board.

The system also consists of the Solenoid valve. Fig 2 represents the Structure and working of the Direct-Acting Solenoid valve. A solenoid valve is nothing but a valve, which is electromechanically operated. Solenoid valves vary

with the characteristics of the electrical current they use, the strength of the force field they generate, the mechanism they use to manage the fluid, and thus the type and characteristics of fluid they manage. The mechanism differs from linear action, plunger-type actuators to pivoted-armature actuators and rocker actuators. The valve can use a two-port style to govern flow or use a three or more port design to shift flows among ports. More than one solenoid valve can be placed combined on a manifold. Solenoid valves are the most often used management components in fluidics. Their job is mainly to shut down, release, dose, distribute or combine fluids. They are found in several application areas. Solenoids supply quick and safe shift, high trustworthy, long service life, smart medium affinity of the materials used, low power management and compact design.

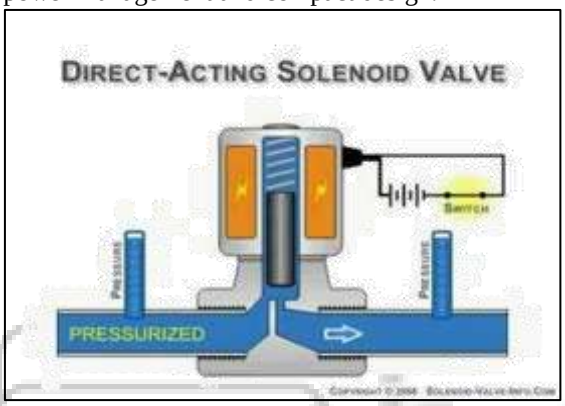

Fig 2: Working of Solenoid valve.

Another important component is Water Flow Sensor. To measure the water flow, an electrical device called flow sensor is used. The amount of water flowing through the pipe line is been measured by the pin wheel sensor which is present inside the water flow sensor. For each and every revolution, the integrated magnetic Hall Effect sensor produces an electric pulse. The sensor uses EMF and acoustic waves to degree the water passing through a given vicinity via physical quantities like acceleration, wavelength, pressure, quantity etc., The sensors are strongly built and offer a digital pulse at every interval, while the water flowing through the pipe. Embedded C program is utilized to calculate the basic operations such as the water flow (in litres), controlling the solenoid valve and sending data to a local server or online storage system to store the information and use it for future machine learning purposes. Fig 3 shows the actual connection between the Arduino UNO Board and the Water Flow Sensor.

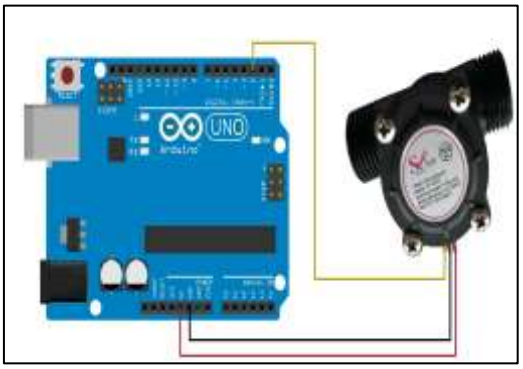

Fig 3: Water Flow Sensor Connected with Arduino UNO

III. WORKING MODEL

At first, the Arduino board and the water flow sensor will be switched on. The sensor will then start to measure the water flow. By measuring the water flow the quantity will be calculated, when the threshold value is reached, the electric solenoid valve will get automatically closed. If the threshold value is not reached, the water flow sensor will be continuously measuring the water flow. Arduino will be controlling all these periodic activities. If possible, all these values will be updated in the database and dataset may be used for further machine learning purposes. The working process of the Automatic Water Supply Controller is clearly displayed in the following flow chart.

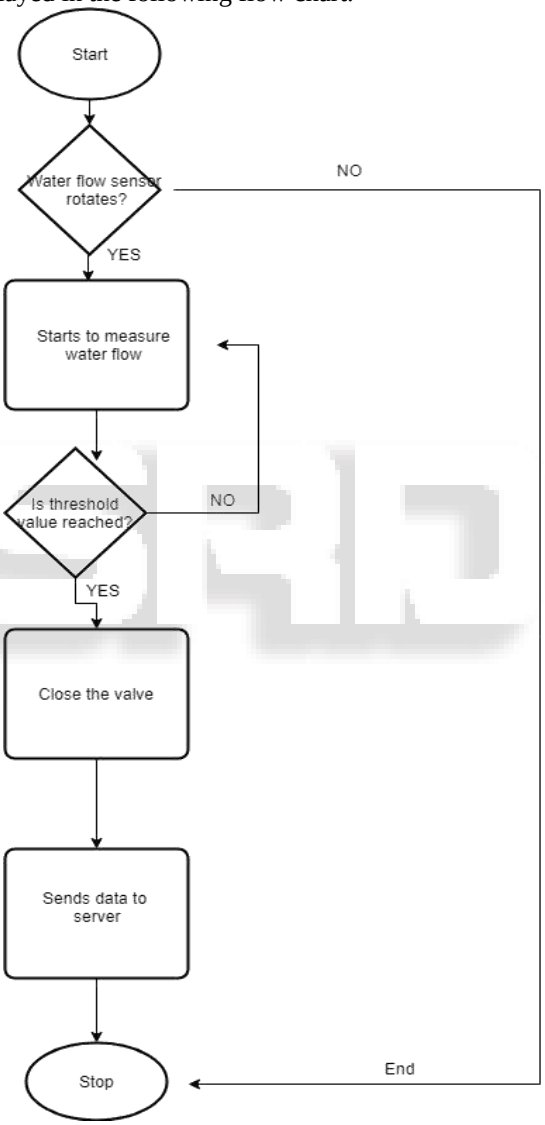

Fig 4: Flow Chart of Automatic water supply controller

IV. CONCLUSIONS

Usage monitoring is the first step to implement water conservation programs. Water is a scarce resource and the proper use and conservation of water is very crucial in the 21st century and beyond especially in the Gulf Cooperation Council (GCC) countries like the United Arab Emirates (UAE) as they are known for the low drinking water reservoirs and mainly dependent on desalinating the sea water. Water is a key element for the human survival but

unsustainable patterns of water consumption and usage are still evident in our practical life and hence there is a strong need to change this pattern or behaviour to sustainability as the world would indeed cease to exist without the availability of water.

In this paper, an automated electronic system is designed to control and monitor the water flowing through the tank or a similar reservoir based on the water detector sensor information. The different stages of the proposed system are designed using easily available discrete components. The electronic system is designed to automatically control the water flow. The methodology of the design can be extended to design a system for controlling any other required number of water levels. The proposed system eliminates labour monitoring and administrating for home, agricultural or industrial users. The system achieves proper water management and enhances productivity from automation.

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