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Measurement of Wastage of Water Using Arduino

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ABSTRACT: Water is used for various kinds of purposes: for agriculture, industry, fishery, and domestic purposes. It is supplied from the ocean to the atmosphere by evaporation and comes back to the ground surface as rainfall. It supports various kinds of human activities and, of course, the natural ecosystem. As water flows over the ground surface and becomes available as water resources in rivers, lakes/marshes, underground water, and coastal water, it accumulates inorganic substances from the soil, and organic substances and microorganisms generated by human activities and the natural ecosystem.

KEYWORDS: Arduino, Microcontroller, Water Flow Sensor, SIM900A Modem, LCD

I. INTRODUCTION

Depending on the context, technology might be understood as knowledge, artifacts, established social relationships, etc. This has caused a gulf in communication and some degree of confusion. To investigate the relationships between these various viewpoints. It begins to accomplish this by examining four empirical aspects of technology. To begin with, the term "technology" is rather new—much younger than most people realize. Secondly, its significance has endured over time. Third, since technology and applied science have different goals and objectives, they are not the same. Fourth, there is an intrinsic component to technological knowledge.

There are many uses for water, including residential use, industry, agriculture, and fishing. It is transported to the atmosphere from the ocean via evaporates and returns as rain to the earth's surface. It sustains the natural ecosystem as well as a variety of human endeavors. Water collects inorganic materials from the soil, organic materials, and microorganisms produced by human activity and the natural ecosystem as it moves over the surface of the ground and becomes available as water resources in rivers, lakes/marshes, subterranean water, and coastal water. Utilizing water entails making advantage of its properties, such as its capacity for dissolution, transportation, or heating. Consequently, it should be noted that when water is used, its volume does not change; rather, it turns into wastewater, with dissolving power, transportation power, or heat characteristic. These days, technology permeates every aspect of our life; it's constantly there, no matter where you look or where you sit. Technology's influence doesn't Put an end to using computers, cell phones, and other intelligent devices. In our own homes, even the most basic items and functions are highly sophisticated. This project is the result of the researcher's astute idea and ongoing technological progress. The goal of this project is to assist homes with their mounting expenses on a daily basis. We cannot dispute that occasionally, not even the amount of water we consume is tracked. The household will be able to monitor their water consumption in real time with the Arduino Based Water Consumption Monitoring System with SMS notification.

The purpose of the research

The project's primary goal is to establish an automated water meter with SMS notification so that users may monitor it conveniently.

Its specific objectives are to:

- 1.
2. To keep an eye on water usage.
3. To digitally display the water use in real time.
4. To design a project that will record the volume of water used.
5. To offer a project that determines the payment amount based on water consumption.
6. To send the user an SMS alert while the flat rate is being monitored.

II. MATERIALS AND METHODS

The material used to build this project are:

Arduino Uno The Arduino Uno is an open-source microcontroller board created by Arduino.cc, which is based on the Microchip ATmega328P microcontroller. A microcontroller stores a program or set of instructions, which are then performed to operate every module attached to the microcontroller board.

Water flow sensor A plastic valve body, a water rotor, and a hall-effect sensor make up a water flow sensor. The rotor rotates as the water passes through it, changing its speed in proportion to the flow rate. The matching pulse signal is output by the hall-effect sensor. There are many diameters, water pressure (MPa), and flow rate (L/m) ranges for this kind of sensor. The sensor that was employed has a 20 mm diameter, a water pressure range of <1.75 MPa, and a flow rate range of ~30 L/m.

Liquid-crystal display (LCD) An electronic visual display, video display, or flat panel display that makes use of liquid crystals' ability to modulate light is called a liquid-crystal display (LCD). Light is not directly emitted by liquid crystals. A monochrome 20x4 alphanumeric LCD is employed in this module. Twenty characters can be shown in each of the four rows of a 20x4 LCD, for a total of eighty characters that can be shown at any given moment.

The LCD shows the volume of water in the first row, the number of liters consumed in the second row, the cubic meter equivalent in liters in the third row, and the amount to be charged in the fourth row.

SIM900A Modem Dual Band GSM/GPRS based SIM900A modem from SIMCOM is used in the construction of this modem. It operates between 900 and 1800 MHz. The SIM900A has automatic band scanning capabilities. It is a dependable and incredibly small wireless module. This SMT-type GSM/GPRS module is fully functional and features an AMR926EJ-S core integrated into a very potent single-chip processor. This module sends SMS notification when the microcontroller perceives that the household surpasses monthly water rate consumption.

DS3231 A cheap real-time clock module, the DS3231, can store information about the day, month, and year in addition to hours, minutes, and seconds. Either 3.3V or 5V can power the module. A standard CR2032 3V battery can run the module and preserve the data for over a year. The battery input is 3V.

Jumper wires The size and color of jumper wires usually vary based on their intended application. In order to connect the microcontroller to a sensor or breadboard, jumper wires are utilized.

12V power supplies One of the most widely used power sources in use today is the 12V power supply, also known as the 12VDC power supply. Generally, a mixture of transformers, diodes, and transistors is used to convert a 120VAC or 240VAC input into a 12VDC output. It supplies power to the Arduino Board and the Arduino board regulate power supplies and past Researchers tested each item to assess functioning, features, and how to re-establish each before prototype creation started code for a program. The open-source Arduino IDE program is used for both program development and testing. When the completed prototype was prepared for testing. The local water district assessed the system after it had been installed in three (3) homes and tested by an IT specialist. After one (1) week of the system being in a dry run, the researcher implements some of the evaluator's recommendations and fixes the small issue.

The processes involved in developing a novel technology for an SMS-notified automated water measurement.

Functional Requirements

To define the capability and function of the system performance in way that the beneficiary will be benefited, the requirements are necessary. The project needs an Arduino UNO, water flow sensor, LCD screen 20x4, breadboard, SD card module and GSM module as the requirements for the project.

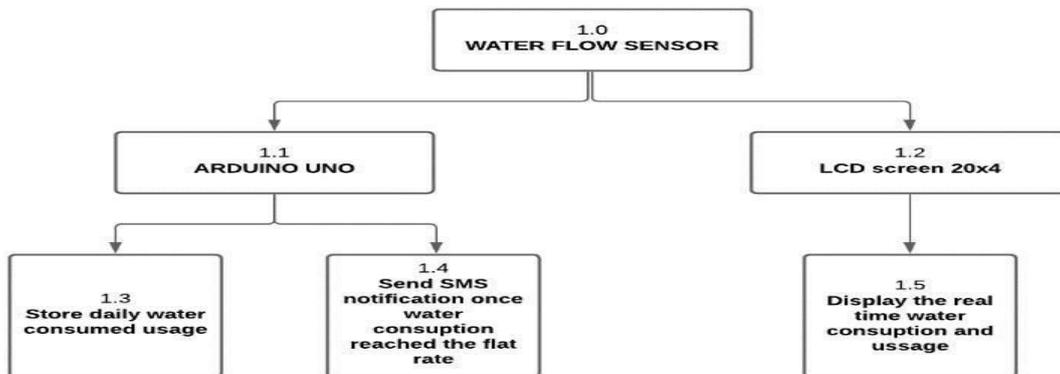


Figure1: Hierarchical Input-Process -Output Input

A-Interface Requirements

The LCD screen 20x4to display the amount and cubicmeter consumed

B-Regulatory/Compliance Requirements

Compliant with the Department of Trade and Industry

C-Non -Functional Requirements

This refers to qualities that are non-functional.

D. Security

Only the water consumers can use the system.

E.Capacity

The project can store up to 4GBand display in LCDscreen 20x4.

F. Availability

Available to water consumer only.

G. Reliability

If the project failed to function, the user can refer tothe user manual or contact the system developer.

H. Recovery

System recovery depends on the system error.

F. Hardware Requirements

Water flow Sensor, Arduino Uno, Breadboard, Jumper Wires, Real Time, SD Card, Potentiometer, LCD screen 20x4, GSM module.

Software Requirements

Arduino Software.

Hierarchical Input-Process -Output

The system's design is displayed in the chart below. The first step was to identify the problem and the requirements that must be met by the system, which are the input, the process, and the output.

Input-Process -Output

This pattern shows each of the data to input, the processes to take into consideration up to the system output.

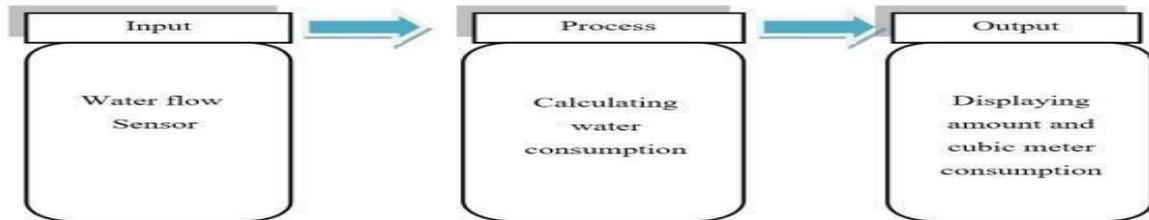


Figure 2: Input-Process –Output

Development and Testing

The Arduino software program was used in the development of this system to create the codes needed to operate it. The purpose of the real testing was to determine the device's quality and to confirm that the LCD screen shows the required output. To fulfill the expectations and accomplish the project objectives, the developers put it through multiple tests and demonstrated its functionality to a representative group of respondents.

Description of The Prototype

In this project it is refer to households on how they monitor their daily water usage. The Arduino is a hardware device that manipulates in all hardware devices that use in the project



III. RESULTS AND DISCUSSION

This displays the findings from the assessment that was given to the fifteen end customers. The system's functionality and accuracy in producing the required output were assessed. The following Likert scale was employed in the evaluation: Poor (1.0–1.99), Satisfactory (2.0–2.99), Good (3.1–3.99), Very Good (4.0–4.99), and Excellent (5.0–5.99). Overall, the findings showed that the system computes or calculates the amount of water consumed in cubic meters and the associated payment amount with accuracy. The mean rating for both accuracy and functionality was 4.7, which is Very Good and 4.5, respectively. This suggests that end consumers are happy with the system. The project's ability to monitor consumers' daily water usage is cited as evidence for the results that a system should be functional and accurate.

Accuracy

According to one definition, data is considered high quality if it meets the needs of the purpose for which it is designed. It is so lacking in quality that it falls short of the requirements. The intended application of the data affects its quality just as much as the data itself. The data must be precise, timely, relevant, full, understandable, and reliable in order to fulfill the intended usage. This suggests that the system is highly efficient and meets the needs of the user.



Analysis on The Accuracy of The Automated Water Meter Per Evaluation by The Consumer

Indicative Descriptive	Mean	Rating
The system calculates water usage	4.6	Very Good
Display daily water	4.5	Very Good
The system displays amount digitally	4.8	Very Good
The System provides SMS notification	4.7	Very Good
Total Mean	4.7	Very Good

Functionality

Functionality is the general state of quality and system performance. For instance, a software application could have new features and settings that were not there in earlier versions, improving functionality over the prior edition. It also encompasses all of the features that a computer program or gadget can offer a user.

Table 2 reveals the functionalities of the data presented through the use of the system with a measured mean of 4.5 a very good as per evaluation by the end-users. This implies that the system is a very effective tool that must user’s requirements.

Table 2 Analysis on The Functionality of The Automated Water Meter Per Evaluation by The Consumer

Indicators Descriptive	Mean	rating
The system provides monitoring of water usage	4.1	Very Good
The system helps the consumer monitor their daily water usage Stored information	4.5	Very Good
	4.6	Very Good
The system provides SMS notification to users	4.7	Very Good
Total Mean	4.5	Very Good

IV. CONCLUSION AND FUTURE SCOPE

The creation and upkeep of suggestions for enhancements and sustainable performance. The goals and plan are to make the initiatives and actions that will be carried out by the concerned users and owners more concrete.

An evaluation is necessary for a certain study project or capstone. It offers a means of enhancing the project. In order to satisfy the needs of the users, the respondents should primarily collaborate with the researchers. Water Consumption Monitoring System with SMS Notification Powered by Arduino.

Table 3 Summary Results of The System’s Evaluation Conducted to The End-user

Indicators	Results of Mean rating	Descriptive evaluation
Accuracy	4.7	Very Good
Functionality	4.5	Very Good

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