IOT BASED WATER CONSERVATION SYSTEM

MINI PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report title **IOT BASED WATER CONSERVATION SYSTEM** is the bonafide work of **ARUNKUMAR.K,ARUNKUMAR.S,DELVIN.M, MAHALINGAM. K** who carried out the project work under my supervision.

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DESIGN THINKING AND INNOVATION

Design Thinking is a design methodology that provides a solution-based approach to solving problems. It's extremely useful in tackling complex problems that are ill-defined or unknown, by understanding the human needs involved, by re-framing the problem in human centric ways, by creating many ideas in brainstorming sessions, and by adopting a hands-on approach in prototyping and testing.

EMPHATIZE

The first stage of the Design Thinking process is to gain an empathic understanding of the problem you are trying to solve. This involves consulting experts to find out more about the area of concern through observing, engaging and empathizing with people to understand their experiences and motivations, as well as immersing yourself in the physical environment so you can gain a deeper personal understanding of the issues involved. Empathy is crucial to a human centered design process such as Design Thinking, and empathy allows design thinkers to set aside their own assumptions about the world in order to gain insight into users and their needs.

DEFINE

During the Define stage, you put together the information you have created and gathered during the Empathize stage. This is where you will analyze your observations and synthesize them in order to define the core problems that you and your team have identified up to this point. You should seek to define the problem as a problem statement in a human-centered manner.

IDEATE

During the third stage of the Design Thinking process, designers are ready to start generating ideas. We have to "think outside the box to identify new solutions to the problem statement. Brainstorm and Worst Possible Idea sessions are typically used to stimulate free thinking and to expand the problem space. It is important to get as many ideas or problem solutions as possible at the beginning of the Ideation phase. You should pick some other Ideation techniques by the end of the Ideation phase to help you investigate and test your ideas so you can find the best way to either solve a problem or provide the elements required to circumvent it.

PROTOTYPE

The aim is to identify the best possible solution for each of the problems identified during the first Three stages. The solutions are implemented within the prototypes, and, one by one, they are Investigated and either accepted, improved and re-examined, or rejected on the basis of the users. Experiences. By the end of this stage, the design team will have a better idea of the constraints Inherent to the product and the problems that are present, and have a clearer view of how real users Would behave, think, and feel when interacting with the end product.

TEST

Designers or evaluators rigorously test the complete product using the best solutions identified during. The prototyping phase. This is the final stage of the 5 stage-model, but in an iterative process, the Results generated during the testing phase are often used to redefine one or more problems and inform. The understanding of the users, the conditions of use, how people think, behave, and feel, and to Empathize. Even during this phase, alterations and refinements are made in order to rule out problem. Solutions and derive as deep an understanding of the product and its users as possible.

ABSTRACT

Water is generally regarded as precise and tonic of life. Water shortage has become an important heartbreak.

Water shortage is defined as the lack of sufficient available water in all the water resources particularly to meet the demands of water usage. For this core factor we need to save water in all the aspects possible. When we are going to buy a home in residential apartment/society.

Therefore, society must have important amenties like automatic water maintenance bill to detect usage of water by individual flats .The objective of IOT based Society Water Management with Automatic Bill Generation system is to provide smart monitoring.

water flow in pipes and purity of drinking water, to minimize the wastage of the water and to distribute the water bill according to the usage of water per flat.

A comparative study of pros and cons of these approaches have been perceived and the performance metrics of purity, leakage in water pipes and time of responses have been discussed.

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CHAPTER 1

INTRODUCTION

Water is an important resource for all the life on the earth. Water comes in one of the five basic needs to survive for every living thing on Earth.

Water is generally regarded as precise and limit resource. Although more amount of water is available on earth but only limited amount of fresh water is available for human activities. System management requires human intervention.

Water management is now a major problem in housing. This issue affects various processes such as water management, water consumption, distribution, and maintenance of system detection and equipment. Sometimes the water tank is filling and water is overflow.

If we can control this we can save large amounts of water. Conventional water tanks can neither monitor nor control the water level in the tank. As of now, the water level has to be manually checked and refilled according to the requirements.

The main aim of the system is to minimize the wastage of the water and to distribute the water bill according to the usage of water per flat. So in this , we solve all the above mention problems with automatic water level detection and refilling of water storage system with the help of Internet of Things (IoT).

We are going to implement IOT based Society Water Management with Automatic Bill Generation System the Water Level and Flow is Measured by Sensors and the Data is Transmitted and Collected Through Wi-Fi module

CHAPTER 2

LITERATURE SURVEY

SI	TITLE	STUDY	AUTHOR NAME
1	Smart water consumption measurement system for houses using IoT and cloud computing	This paper is the implementation of a smart water measurement consumption system under an architecture design, with high decoupling and integration of various technologies, which allows real-time visualizing the consumptions, in addition, a leak detection algorithm	Fuentes H, Mauricio D (2020)
2	IoT and ICT based smart water management, monitoring and controlling system	This paper is the implementation of a smart water measurement consumption system under an architecture design, with high decoupling and integration of various technologies, which allows real-time visualizing the consumptions, in addition, a leak detection algorithm.	H. M. Yasin 2021
3	Internet of Things in water management and treatment	This paper is implement the IoT based approach to environmental quality and monitoring by generating new knowledge and innovative approaches that focus on sustainable resource management	A. Salam 2020
4	Agriculture and inefficient water use" in Global Pathways to Water Sustainability	This paper discussed the problems associated with inefficient agricultural water use, including critical groundwater declines, saltwater intrusion, and competition for water among water users	D. E. McNabb 2019

2.1 PROBLEM STATEMENT

Water scarcity is a critical global challenge, exacerbated by factors such as population growth, urbanization, and climate change.

Efficient water management is imperative to ensure a sustainable future. In this context, the traditional methods of water conservation often fall short in optimizing resource utilization and addressing the dynamic nature of water demand.

There is a pressing need for innovative solutions that leverage emerging technologies like the Internet of Things (IoT) to create intelligent, data-driven water conservation systems.

This necessitates the development of an IoT-based water conservation system that can intelligently monitor, analyze, and manage water resources in real time.

The successful implementation of an IoT-based water conservation system will contribute significantly to sustainable water resource management, ensuring the availability of clean water for future generations while reducing wastage and environmental impact.

CHAPTER 3

EXISTING SYSTEM

As of my last knowledge update in January 2022, several IoT-based water conservation systems and projects were in development or deployment stages.

note that developments may have occurred since then, and it's recommended to check the latest literature, research papers, and industry updates for the most recent information.

It's important to consider that the effectiveness of these systems depends on factors such as implementation, integration with existing infrastructure, and user engagement. Additionally, ongoing research and technological advancements continue to enhance the capabilities of IoT-based water conservation solutions.

CHAPTER 4

PROPOSED SYSTEM

The IoT-based water conservation system aims to overcome these challenges by deploying sensors, actuators, and communication devices throughout the water supply network.

These devices will collect real-time data on water usage, monitor for leaks, and provide actionable insights to both consumers and water management authorities.

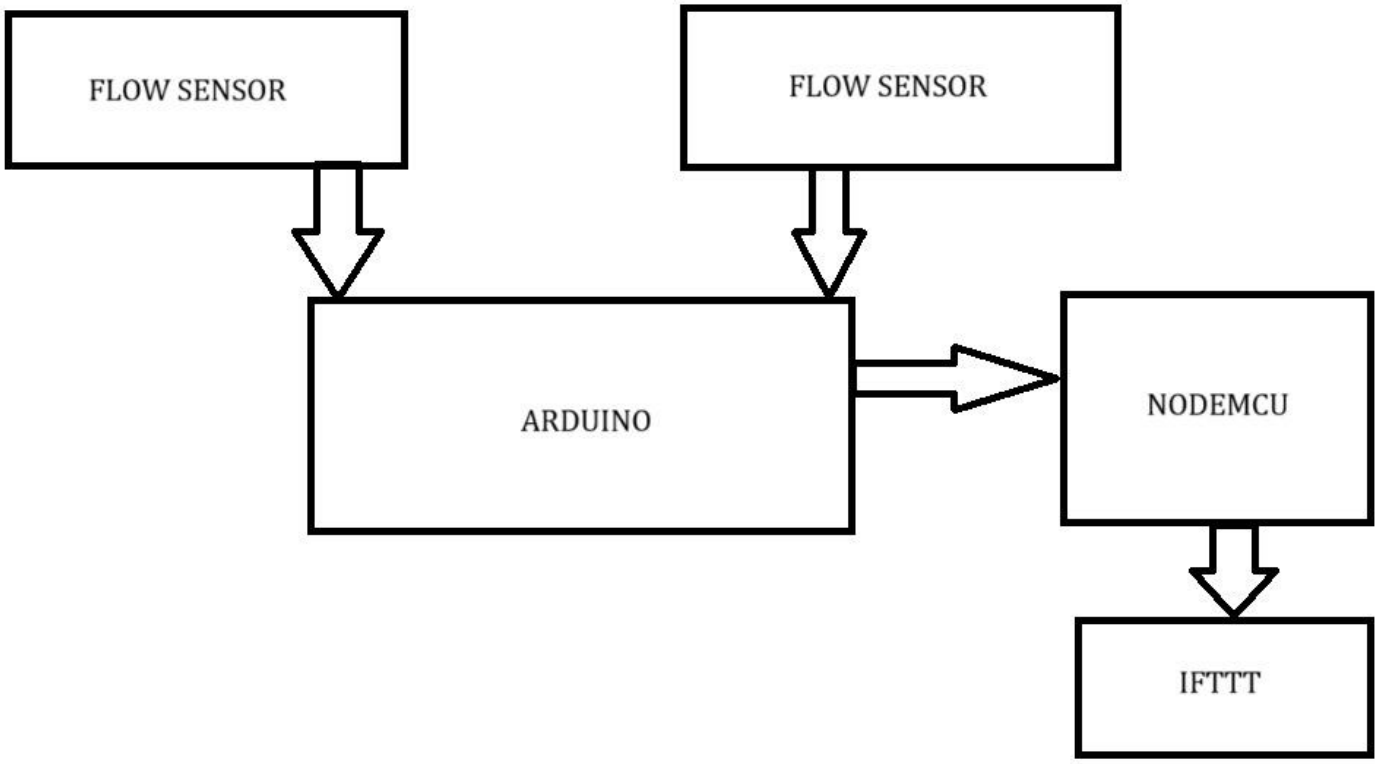
The system will employ machine learning algorithms to analyze data, predict anomalies, and optimize water distribution.Additionally, a user-friendly interface, possibly through a mobile application, will empower consumers to track their water consumption, set usage goals, and receive real-time feedback.

The system will also enable automated alerts for leak detection, promoting quick response and minimizing water wastage.

The successful implementation of this IoT-based water conservation system promises to revolutionize water management practices, fostering sustainability and responsible water usage for the benefit of communities and the environment.

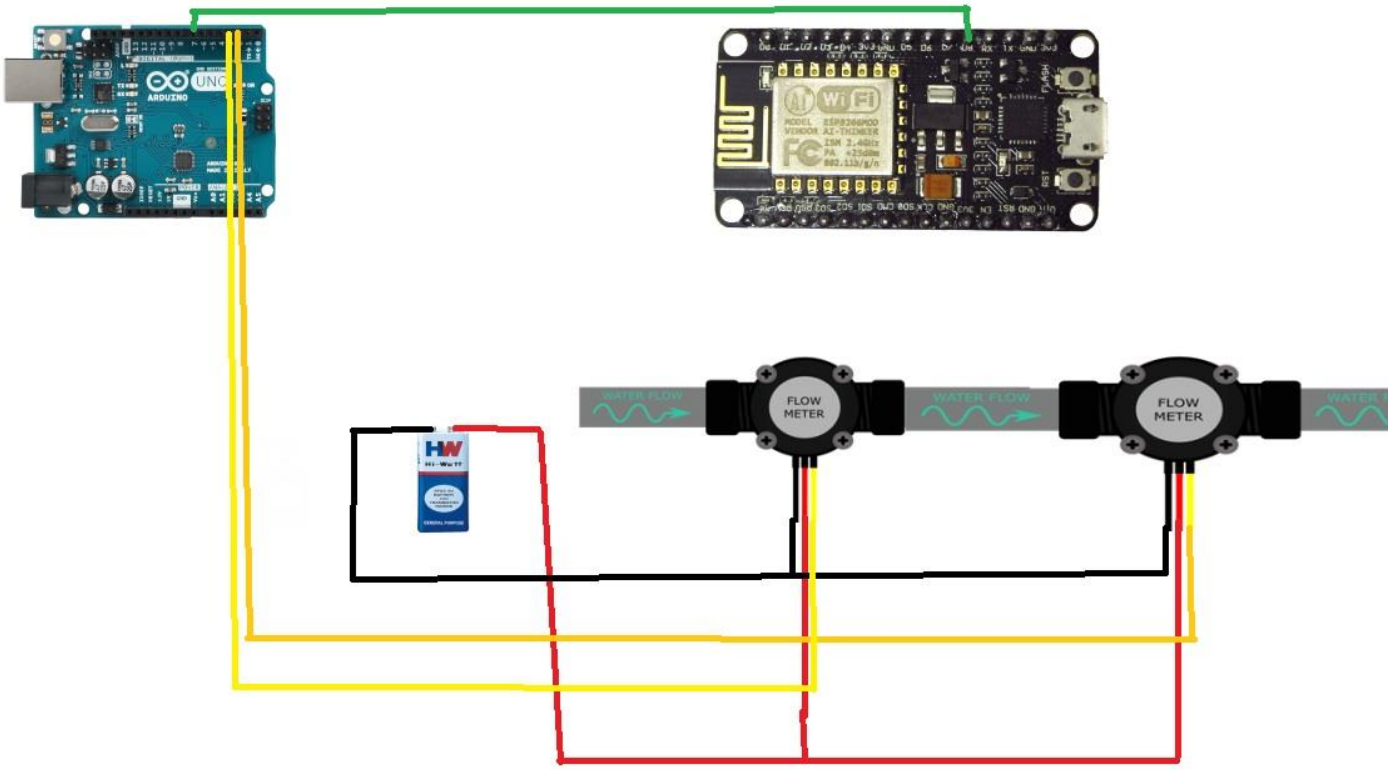
CHAPTER-5

BLOCK DIAGRAM



CHAPTER 6

CIRCUIT DIAGRAM



CHAPTER-7

HARDWARE REQUIREMENTS

7.1 ARDUINO UNO:

Arduino Uno is a popular microcontroller board widely used in the field of electronics and prototyping. It is based on the ATmega328P microcontroller, which is the brain of the Arduino Uno board.

Here's a breakdown of its key components and features:

- **Microcontroller:** The heart of the Arduino Uno is the ATmega328P microcontroller. It contains an 8-bit AVR (Advanced Virtual RISC) processor, operating at a clock speed of 16 MHz speed. The microcontroller handles program execution and interacts with other hardware components.

- **Digital Input/Output (I/O) Pins:** The Arduino Uno has a total of 14 digital I/O pins, labeled from 0 to 13. These pins can be used for both input and output operations. They can be configured to read digital signals from external sensors or devices or output digital signals to control other components.

❖ **Analog Input Pins:** The board features 6 analog input pins, labeled A0 to A5. These pins can measure analog voltages within a range of 0 to 5 volts. They are used to read values from analog sensors, such as temperature sensors, light sensors, or potentiometers.

❖ **USB Interface:** The Arduino Uno has a built-in USB interface that allows it to be easily connected to a computer. This USB connection serves two main purposes: it powers the board and allows for program uploading and serial communication with the computer.

❖ **Power Supply:** The Arduino Uno can be powered in multiple ways. It can be powered via USB from a computer or using an external power supply connected to the board's power

6.2 ESP8266 WIFI MODULE:

ESP8266 is a popular Wi-Fi module that provides wireless connectivity to microcontroller-based projects. It is a low-cost, highly integrated system-on-a-chip (SoC) that combines a microcontroller unit (MCU) with Wi-Fi capabilities.

Here's an explanation of the key features and components of the ESP8266 Wi-Fi module:

✓ **Wi-Fi Connectivity:** The ESP8266 module is designed to provide Wi-Fi connectivity to embedded systems. It supports IEEE 802.11 b/g/n wireless standards, allowing devices to connect to Wi-Fi networks and communicate over the internet.

- ✓ **GPIO Pins:** The ESP8266 module features a number of General-Purpose Input/Output (GPIO) pins, typically ranging from 8 to 17, depending on the specific model or variant. These pins can be configured as digital input or output pins and used for various purposes, such as connecting sensors, actuators, or other peripheral devices.

✓ **Serial Communication:** The ESP8266 module communicates with other devices, such as microcontrollers or computers, through serial communication protocols. It has built- in UART (Universal Asynchronous Receiver-Transmitter) interfaces that enable communication using protocols like Serial Peripheral Interface (SPI) and I2C.

✓ **AT Command Set:** The ESP8266 module supports the AT command set, which allows for easy control and configuration of the module through simple text-based commands. These commands can be sent over a serial connection, enabling rapid development and prototyping.

7.3 FLOW SENSOR:

❖ A flow sensor, also known as a flow meter, is an electronic device that measures the flow rate of liquids and gasses in pipes and tubes.

❖ A flow sensor (more commonly referred to as a “flow meter”) is an electronic device that measures or regulates the flow rate of liquids and gasses within pipes and tubes.

CHAPTER 7

SOFTWARE REQUIREMENTS

7.1 ARDUINO (IDE):

Open-source Software: The Arduino IDE is open-source software, which means its source code is freely available to the public. It is developed and maintained by the Arduino community, allowing for continuous improvements and contributions from users worldwide.

Cross-platform Compatibility: The Arduino IDE is designed to be compatible with multiple operating systems, including Windows, macOS, and Linux. This ensures that users can develop Arduino projects regardless of their preferred operating system.

Simple and User-friendly Interface: The Arduino IDE features a simple and intuitive interface, making it accessible to beginners and experienced users alike. It provides a straightforward way to write, compile, and upload code to Arduino boards.

Code Editor: The IDE includes a code editor with syntax highlighting and auto-completion features, which help programmers write code more efficiently. It supports the C++ programming language, allowing users to write Arduino sketches (programs) using a familiar syntax.

Library Manager: The IDE includes a library manager, which allows users to easily search for, install, and manage libraries (pre-written code) from the vast Arduino library ecosystem. These libraries provide additional functionalities and make it easier to interface with sensors, actuators, and other components.

Serial Monitor: The IDE includes a built-in serial monitor tool that allows users to communicate with their Arduino board via the serial port. It displays data sent from the board and allows users to send commands or debug their code by viewing the serial output.

Integrated Board Manager: The IDE includes a board manager that simplifies the process of adding support for different Arduino boards. It allows users to easily select the board they are using and install the necessary drivers and board-specific configurations.

Examples and Tutorials: The IDE provides a range of example sketches and tutorials that cover various Arduino functionalities and projects. These examples serve as a starting point for learning and experimenting with Arduino programming.

Integrated Compiler and Uploader: The IDE includes a compiler that converts the written code into machine-readable instructions for the Arduino board. It also has an uploader tool that transfers the compiled code to the board, allowing it to run the program.

Active Community and Support: The Arduino IDE benefits from a large and active community of users. This community provides support through forums, online resources, and documentation, making it easier to find answers to questions or seek guidance on Arduino projects.

CHAPTER 10

WORKING

- The real-time reading from the sensor places at both ends with each having a capacity of detecting up to 25 L/Min and pressure of 2.0 MPa (Mega Pascal).

- If there is any difference value in the two sensors then it detects that as an leakage and send Message to the admin by the help of Nodemcu 8266 and Arduino UNO.

- The message will be transferred if there is any leakage. The message will be send through the nodemcu to Arduino and then it will be transferred to the web server.

- The webserver will send the message to the admin mobile .

CHAPTER 11

RESULT AND DISCUSSION

CHAPTER 12

REFERENCE

- Michel R. Machado, Tiago Ribas Junior, Michele R. Silva, Joao B. Martins; “Smart Water Management System using Microcontroller ZR16S08 as IoT Solution”, 2019 IEEE 10th Latin American Symposium on Circuits & Systems (LASCAS),IEEE 18 March 2019.
- Kaushik Gupta, Mandar Kulkarni, Manas Magdum, Yash Baldawa, Prof. Shivprasad Patil; “Smart Water Management in Housing Societies using IoT”; 2nd International Conference on Inventive Communication and Computational Technologies, April 2018.
- Chanda Rajurkar, S R S Prabaharan, S. Muthulakshmi, “IoT based water management”, IEEE 2017 International Conference on Nextgen Electronic Technologies: Silicon to Software (ICNETS2), 16 October 2017.
- Thinagaran Perumal, Md Nasir Sulaiman, Leonzg.C.Y; “Internet of Things (IoT) Enabled Water Monitoring System”, 2015 IEEE 4th Global Conference on Consumer Electronics (GCCE), 04 February 2016.