Smart System for Water and Light Management using IoT

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Abstract: **Increasing demand of resources has become a major challenge for the world. Water and electricity needs have increased unpredictably in India in the past decade. Therefore, conservation and management of the resource should be given importance. The proposed IOT system is for water and light monitoring. The level sensors are placed in the tank to monitor water level at real time. According to water level in tank, the motor will be turned on /off. We measure the amount of water distributed to every household and close the valve automatically when the user exceeds its daily limit. Also, we detect the human presence or absence in the room using motion sensor and automatically switch ON/OFF lights.**

Keywords: **IoT, Flow Sensor, Level Sensor, PIR Motion Sensor, Solenoid Valve**

1. Introduction

Huge amount of resources is being wasted because of their uncontrolled use. Resource conservation is the utmost need in these days. To manage and avoid waste of water and light resource, we propose this system.

In water monitoring system, the water usage of every house is recorded and this data is stored on the cloud. Every house is given a water limit and if usage exceeds the above limit, the water supply of that particular house will be cut off through solenoid valve.

Large amounts of water are wasted because of overflowing tanks in housing societies. Conventional methods are used for manually checking and refilling of tanks according to requirements. Therefore, use of level sensors in water tanks eliminate this human effort.

The level sensors are used on the tank for continuously monitoring water level in the tanks. If the water level in tank is above a threshold level, the water pump will automatically have turned off. And if the water level in tank is below a threshold level, the water pump will automatically have turned on. This will help to save a large amounts of water without any human effort.

Energy is wasted in big organizations because of conventional methods of turning lights on/off. Many times, people leave the room forgetting to turn off the lights. This leads to waste of light resource.

In light monitoring system, the motion sensor detects the presence or absence of human and accordingly switch on/off lights. This helps in power conservation without any human intervention.

IOT creates a smart environment which makes life easy. Through use of IOT systems, human work and time are saved. The proposed system makes use of IOT technology for water and light conservation and manage these resources efficiently.

2. Literature survey

Jemy Joseph, Manju K M, Sajith M R, Sujith Nair, Vishnu P Viay and Sithara Krishnan in their work have presented a device of Internet of Things Technology for managing and planning the usage of water. The Internet of Things technology is used for the implementation of the system. The system-devices like sensors communicate with the help of internet. The system consists of a laser sensor that is placed on the tank and it continuously monitors the water level. This is done at real time. This data will be updated in the cloud. As per the level of water in the tank, the motor functioning is automatically controlled. When water levels fall below the threshold level, the motor will be again turned on automatically. The system can also help in detecting leakage in the tank [1].

Patawala Amatulla.H, Bansode Navnath.P, Bhong Yogesh.P and Prof. Zadbuke Ashwini. S have presented an IOT design for water monitoring and control. The design is based on Internet of Things Technology and it supports the internet based data collection on real time. By deploying pH and conductivity sensors, the quality of water that is distributed to every house, is measured. The proposed system is a wireless system for smart quality monitoring and communicate data wirelessly, making it a solution to the existing systems which require periodic human intervention [2].

Shivani S. Adsar, Tanvi D. Mutha and Prashant Lahane have proposed the development of a low cost home automation control system. The system can be accessed by a hybrid mobile application. The system consists of a home server, an android application and an internet based application which is controlled by a microcontroller. The controller gets the commands from the home server an android application. The commands are first passed on to the home server from the android application and then to the microcontroller through Wi-Fi Technology. The work has presented the study of different home automation systems. The proposed system helps in

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397

reduction of power consumption [3].

Pooja N. Pawar, Shruti Ramachandran, Nisha P. Singh and Varsha V. Wagh in their work have presented the implementation of a low-cost, home automation system. The system uses wireless communication which provides the user with remote control of the various electronic appliances.

3. Block diagram

The proposed system consists of two modules: A module for water monitoring and a module for light automation.

- Water module consists of Solenoid Valve, level sensor, NodeMCU, Water Flow Sensor, Motor, Relay, Power, GSM.
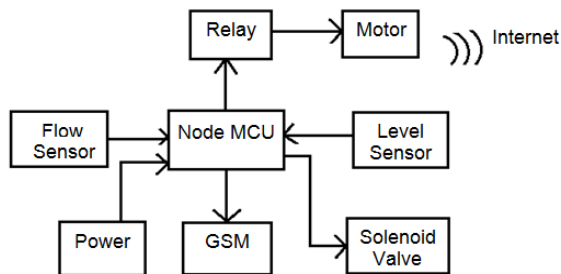
Fig. 1. Block diagram for water monitoring

The system collects the water usage data of every house and send that data to the cloud.

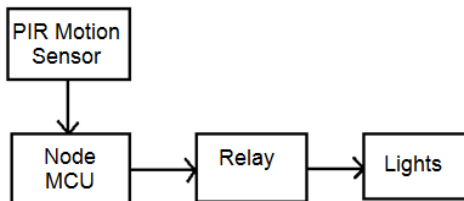- Light module consists of Node MCU, Lights, Motion Sensor, Relay and Power Supply.

Fig. 2. Block diagram for light automation

According to motion of the human the relay will turn the lights ON/OFF in the room.

A. Power Supply

In this system, we need a power supply of 3.3V for NodeMCU. Power supply and 9V for level sensor, and 12V for water solenoid valve.

B. NodeMCU

Node MCU is used as the microcontroller in this system. Node MCU development board is featured with Wi-Fi capability, analog pin, digital pins and serial communication protocols. Node MCU is a firmware on ESP8266.

C. Water Flow Sensor

The Water Flow Sensor is a device which is used to measure

the water flow. This sensor sits in line with your water pipeline and contains a pinwheel sensor to measure how much liquid has moved through it. The system makes of flow sensor to measure water supplied to each house.
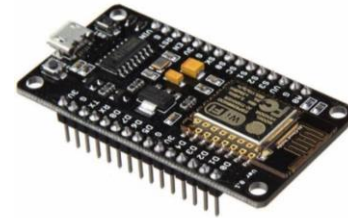

Fig. 3. NodeMCU

Fig. 4. Water flow sensor

D. Level Sensor

Level Sensor helps to decide if the water tank is empty or filled. If the tank is empty, water motor will turn on, if tank is full, the motor will turn off.
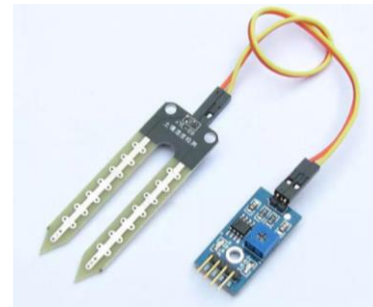

Fig. 5. Level sensor

E. Solenoid Valve

A solenoid valve is a simple electromagnetic device that converts electrical energy directly into linear mechanical motion. A solenoid valve is used to cut the supply of water of particular house when its usage exceeds the limit.

Fig. 6. Solenoid Valve

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398

F. Relay

Water pump, solenoid valve has high voltage. Node MCU cannot control such high voltages. So, we are using a relay as a switch to control high power devices.

Fig. 7. Relay

G. PIR Motion Sensor

The PIR motion sensor is used to detect movement. PIR stands for "Passive Infrared". In this system the lights are turned on/off depending on the presence of human in the room.

Fig. 8. PIR motion sensor

H. GSM

GSM is connected to microcontroller; it communicates with a mobile via a UART protocol. GSM is basically used for sending SMS to the user.

Fig. 9. GSM

4. Working
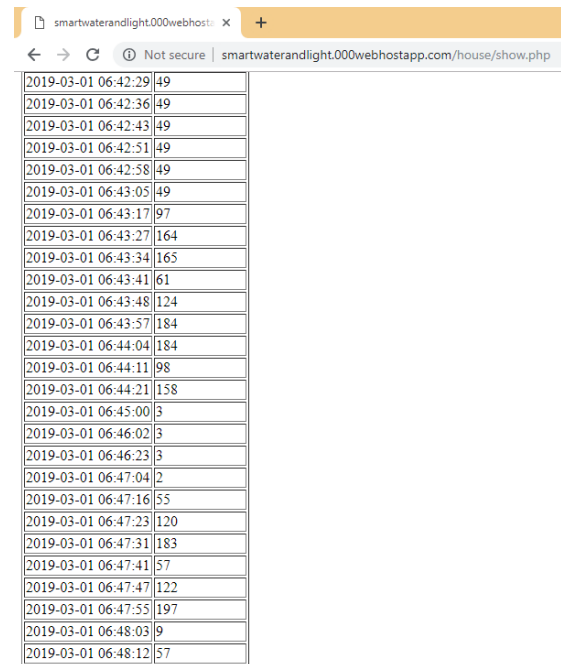
- The water monitoring system can be implemented in housing societies. Each House is given a particular water limit and if a user exceeds that limit, the solenoid valve will cut the water flow of that house. At 50% usage of water, the user will get a alert message on his phone through GSM. At 100% of water usage, again the user will get a message for alerting that water limit has exceeded. The water supply will again start after 12am that is on next day.
- The level sensors are placed in both the tanks that is upper and lower tank. If lower tank is empty, then water pump will not start even if upper tank is empty. Placing level sensor in lower water tank helps us protect our water pump from damage. If lower tank has water and upper tank is empty, then water pump will start automatically and will turn off when the tank is filled. This will avoid overflowing of tanks without any intervention.
- The water usage of every house is displayed on the webpage so that user can access the webpage at any time to check its usage.
- The Light Automation System can be used in big organizations, colleges etc. The PIR Motion Sensor detect the presence of human in room and according to that lights will be automatically switched on/off.

5. Result

The Webpage contains the data such as date, time and milli litres of water that is consumed by user. The water usage of one house is displayed on the webpage. The user can access the webpage at any real time and check its water usage.

Fig. 10. Water usage data displayed on webpage

6. Conclusion

The proposed system for water level monitoring and light automation comes under the field of Internet of Things (IoT). Our intention of this work was to establish a system which solve our water and energy wastage problem.

Our main objective in water monitoring was to provide required amount of water to a house and avoid excess amount of water usage. And also to prevent overflow of tanks in housing societies. The light automation system helps to save light energy from wastage.

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399

This idea can be further extended to monitoring quality of water by integrating ph sensors and turbidity sensors to the sensors used in this work. Light automation system can be extended to full home automation systems which involves making homes even smarter.

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