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Original Article

Water Management System using IOT

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Abstract *- This paper presents a system that will monitor and control the water supply, detects leakages, sends the statistics to the user and controls the flow of water. Sensors that are placed in the pipes will monitor the leaks and automatically turn off the supply using IOT. These are placed in the overhead tanks, which will monitor the water levels and send the data to the microcontroller. The flow of the water is regulated to minimize water usage. The data is sent to the cloud, where the user can access it.*

Keywords *- Water management, Sensors, IOT, Microcontroller, Cloud.*

I. INTRODUCTION

A water management system is an automated system to monitor the status and usage of water in a building. Water wastage is a huge problem in present society. These days when groundwater is scarce, we must take all the precautions needed to conserve water.

A. Objective

In residential buildings, where every day a large amount of water is being wasted due to negligence, this paper proposes an automation system where human involvement is reduced to a minimum and hence drastically reducing the amount of water that is being wasted in residential buildings.

B. IOT Implementation

IOT or the internet of things is a system of computing devices and sensors which can communicate over a network without the need for human interaction. The microcontroller that is used in this paper is a raspberry pi. The sensors send the data to the microcontroller, which analyses the data and performs the respective action needed.

II. PROBLEM STATEMENT

Overflowing water tanks contribute to the majority of wastage of water in residences. Most of the time, it is due to human error that tanks are allowed to overflow. So, by automating the process and by removing the human error from the picture, we can reduce the wastage of water by quite a bit.

Another reason for wastage of water is due to leaks that occur in pipes. These leaks might not be detected immediately, and by the time the leak is detected, a lot of water will already be wasted. Sometimes the leak might not be detected until after a long time-wasting a lot of water in the process. By placing sensors in the pipes, we can detect the flow of the water in pipes and immediately detect any leaks in the pipe and immediately notify the user. By using electrically controlled valves, we can cut off the water supply to minimize the wastage of water. The utilization of water can be minimized by reducing the flow of water from the tank itself.

III. EXISTING SYSTEM

In the existing system, everything is done manually by a person. When a water tank is empty, until someone checks the tank, there is no way of knowing if the tank is empty or full. If the tank is empty, he should manually turn it on and turn off the pump. Also, there is no way of knowing if the tank is full until it overflows.

It is also the same when it comes to leaks. Unless and until someone physically looks at a pipe that has a leak, it is impossible to tell if any leak has occurred in the system. And by the time someone notices, a lot of water will already be wasted.

A. Disadvantages of Existing System

- Everything is done manually.
- Problems are not detected immediately.
- Depending on the problem, sometimes the problem is neglected indefinitely.
- By the time any action is taken, a lot of damage is already done.
- There is a lot of room for human error.

IV. PROPOSED SYSTEM

We are proposing an advanced system to monitor and control water supply and leakage. A Water level sensor placed in the tank will monitor the water level, and it will send the data to the microcontroller. And based on the water level, the microcontroller will turn on or turn off the pump.

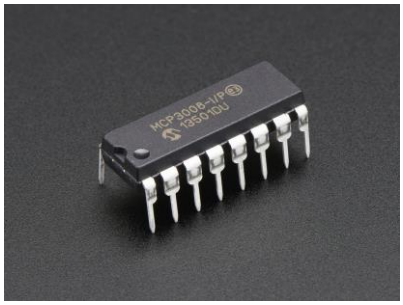
Flow sensors that are placed in multiple locations in the system will detect the flow rate of the water and send it to the microcontroller. The microcontroller will detect changes in the flow of the water and will find any leaks in the system. The microcontroller can also find the total usage of water in the residential building by analysing the data from the flow sensor and the send the usage statists to the user through a cloud platform.

A. Microcontroller- Raspberry pi 3 Model B+

The microcontroller that is used in this paper is a raspberry pi 3 model B+. The reason why a raspberry pi is used over other microcontrollers like Arduino is that the processing power of a raspberry pi is far superior to that of an Arduino. Raspberry pi has a much higher memory and can store a larger and much complex code than an Arduino. The number of instructions executed in a raspberry pi per second is also much higher than an Arduino.

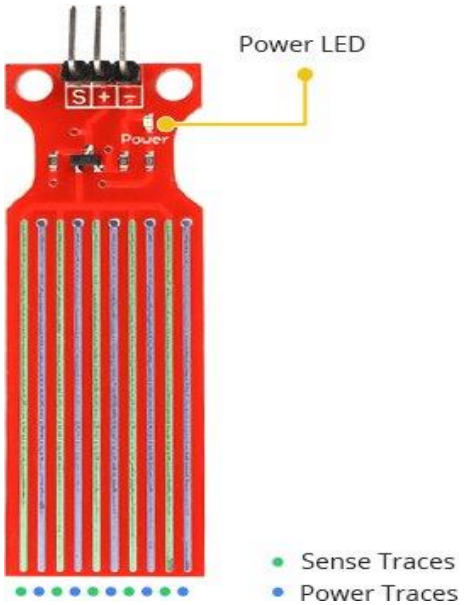
B. MCP3008

A Raspberry pi doesn't support analogue input. Most of the sensors that are mentioned in this paper output an analogue signal. So, we need an Integrated Circuit to convert all the analogue signals into digital signals. MCP3008 is an IC with 8 channels of 10-bit analogue input. This IC can convert the analogue signals from the sensors into digital signals, which is supported by a raspberry pi. The MCP3008 can convert up to 8 different analogue signals into digital signals at the same time.



C. Water Level Sensor

There are many types of water level sensors. One of the most famous types of sensor works by using a floating magnet to measure the liquid level. The sensor that is used in this paper works on the principle of resistance. The sensor has a series of copper traces. There are two types of traces, power traces and sense traces. These two types of traces are interlaced between each other such that there is a power trace between each sense trace. The water completes the circuit between the power and sense traces. The higher the water level, the lower the resistance. So, based on the resistance, the sensor can detect the level of the water. The sensor sends the data to the microcontroller, and the microcontroller will control the pump based on the sensor values.



D. Flow-Sensor

The flow sensor detects the speed at which the water is flowing in the pipe. The flow sensor contains a small turbine that is spun by the flowing water, and a charge is produced. The faster the flow of water, the higher the charge produced. So, by measuring the charge produced in the sensor, the flow of the water can be measured.

E. Solenoid Valve

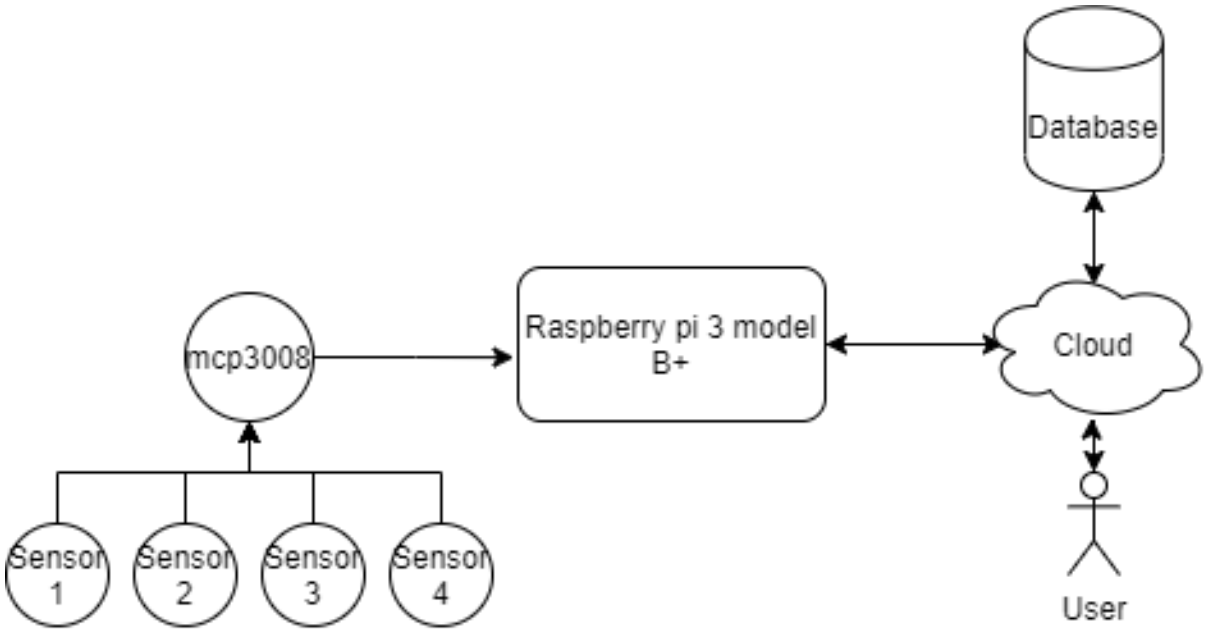
A solenoid valve is an electrically controlled valve. The microcontroller can directly control the flow of water in the system by using the solenoid valve.

V. METHODOLOGY

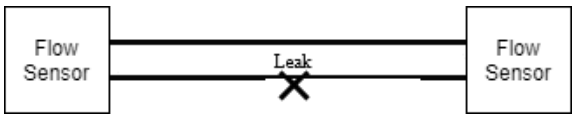
When water is flowing in a pipe, a leak will disrupt the flow of water. If the water is flowing through two flow sensors and a leak occurs in between the two sensors, the data from both sensors will be different. So, by strategically placing the flow sensors and by analysing the data from those sensors, we can locate the leak and immediately turn off the water supply.

A. Advantages of Proposed System

- Everything is automated.
- Any problem is detected immediately by the sensor.
- As soon as a problem is detected, the microcontroller takes immediate action.
- There is no room for human error.



The data from the water level sensor will allow the microcontroller to automatically turn on the pump when the water level is below a certain level and turn off the pump when the water level is above a certain level.



VI. IMPLEMENTATION

a) Gathering data

The microcontroller gathers the required data from the sensors. All the sensors in the system are connected to the microcontroller, and they send the data to it.

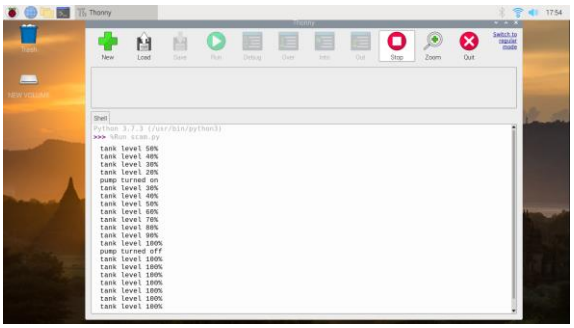
b) Analysing the state of the system

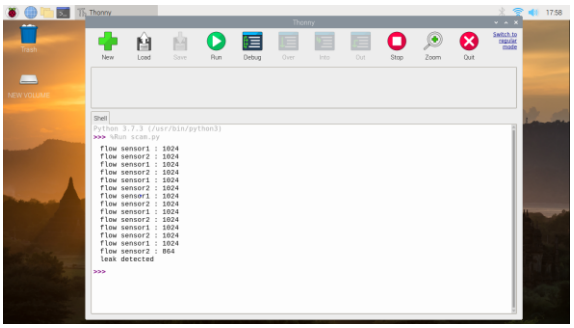
The raspberry pi uses the gathered data and analyses it to find out the state of the system.

c) Performing the necessary actions

The raspberry pi then determines the necessary actions that are required and then executes them

VII. FINAL RESULT





VIII. CONCLUSION

The main aim of this model is to reduce water wastage in residential areas. By automating the process and removing the factor of human error, this model can drastically reduce water wastage when compared to the conventional model.

IX. FUTURE SCOPE

More features like rainwater management automatic plant watering systems can be added in the future to improve upon this system.

X. REFERENCES

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