Domestic Water Conservation by IOT (Smart Home)

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Abstract - *Water wastage is the biggest problem in homes of a developing country like India. The water is supplied by the water pipes to individual houses in our country and these are stored in the water tanks placed on the roof. However, storage tanks have limited capacity, and after it is full, excess water is drained through sewage pipes. This is a big problem, as pure water is vital for every human being and it is very precious. Therefore, a system needs to be build which can stop the water flow to the tank once it is full. This can be achieved by placing a water level detecting sensor in the tank, which can send signals of water level to the smart home server, in turn which will take the decision to turn off the flow and inform the user on his mobile. All the devices will be operational over the Wi-Fi network. Hence this would give some feel of our future smart homes, additionally saving water automatically.*

Key Words**: e-Monitoring, Smart Homes, Automation, ESP8266, Raspberry Pi or Orange Pi, Internet of Things, Water Conservation**.

1. INTRODUCTION

In our world today there is a scarcity of drinking water. Even though we have 70% water and only 30% Land Mass, that water is not at all usable to human race. In Africa there are so many people who do not have access to safe drinking water. Recently in Shimla, a city in India has suffered from a huge water crisis. Therefore, it should be mandatory for everyone to use water as a non-renewable resource and use it as very precisely.

We can save a huge amount of fresh water if we are very mindful about our water storage, but in our day to day life it has become very difficult to maintain focus on filling water in the tank. We have become very lethargic and due to this a large amount of water is wasted every day.

If humans are not focused on water conservation, then we should leave this to the machines. Therefore, we can build an IoT Smart home system which can automate the whole process and on the positive side this can save billions of gallons of water everyday all around the world.

1.1 Problem Statement

When the water tank is full the water gets spilled out of the tank and is drained directly into the sewage without getting utilized. This can be achieved by using smart devices which can automatically restrict the water flow once the tank is full and can also inform the user by push notification.

1.2 Methodology

1.2.1 Water Level Sensor

This sensor detects the water levels and sends a range of binary data to ESP8266(a WiFi enabled microcontroller). ESP8266 manipulates this data and transfers it to the home server (may use Raspberry Pi). The home server in turn controls the water flow and notifies the user by push notification.

Fig -1: Water Sensor

+ → 3.3 V

- → GND

S → Analog signal port

1.2.2 ESP8266

This is a microcontroller which takes in the Analog signal from the sensor as RAW data and converts it to readable data. After this it sends this data over WiFi network through MQTT.

Fig -2: ESP8266

1.2.3 Raspberry Pi

A Raspberry Pi is a single board computing device or simply saying a small credit card sized single board computer that runs on a 5V external power supply. This was founded in UK for providing low cost computing solution for education but as time passed the Raspberry Pi grew stronger, faster and due to increasing community support we can find lots of compatible software. Hence at present Raspberry pi is capable enough to perform most of your task that your normal PC or mac can do with additional advantages. It can be used for IOT projects implementation as it only runs on 5V power supply and consumes only 9W of power therefore it has infinite possibilities to expand itself in many fields. In our project this will act as the home server on which we will install MQTT server and Home Assistant.

Fig -3: Raspberry Pi

1.2.4 Mosquito MQTT

The MQTT protocol provides a lightweight method of carrying out messaging using a publish/subscribe model. This makes it suitable for Internet of Things messaging such as with low power sensors or mobile devices such as phones, embedded computers or microcontrollers. This is used to send messages from the sensor to the home server over WiFi network.

Fig -4: Mosquito MQTT

1.2.5 Home Assistant

This is an open source home automation service which is installed on Raspberry pi which controls all the automations, message passing/receiving through MQTT, sending push notification to the user and taking input from the user.
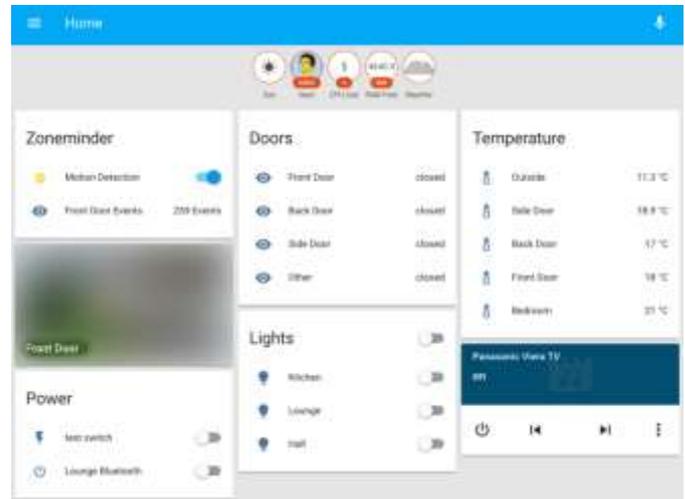

Fig -5: Home Assistant

2. Proposed Methodology

I live in an average Indian household, and I have seen that I lot of water is wasted just because the water pump which fills the water tank is not switched off as soon as the tank is full. This results in the leakage of water from the tank. Therefore, an idea was originated into my mind to automate the whole process using some basic circuits, sensors and home automation software.

This is an original idea as it is already said that need is the mother of all inventions. Therefore, saving the water and the electrical energy (which was supplied to the water pump) was my need and I had to implement this into my home. This system will become a part of future smart homes and the need for a human intervention will also be decreased, as this system can perform autonomously. This can refill the water tank when the water levels drop and can stop the water flow at an overflow condition.

The following flowchart will illustrate the function of this device.
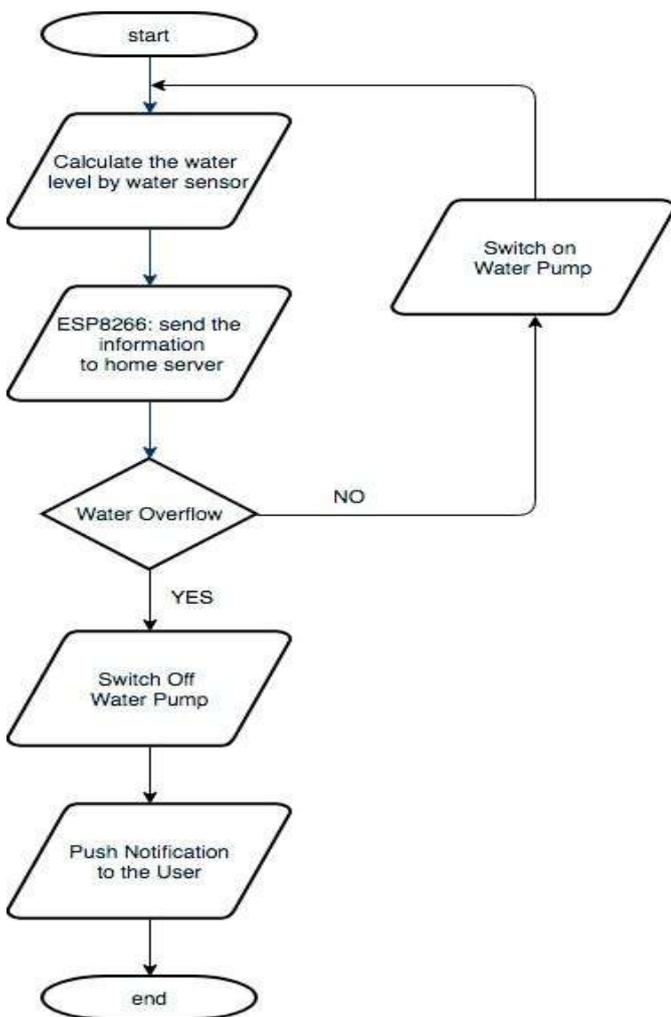
Fig -6: Working of the Water Conservation system

Flow Chart – The Flowchart above shows us about the processes involved in controlling the water flow to the water tank. This starts when the water sensor gets the water level and send this to microcontroller ESP8266, this in turn will send the modified values to our home server (Example-Raspberry Pi). Our home server will make a decision to turn off the water pump restricting all the inward water flow toward the tank and will also send a notification to the user through push messages on the mobile. On the other hand, if the water level drops the home server will turn on the water pump to fill up the water tank.

3. CONCLUSION

The objective of this project is to implement an autonomous system that can monitor the water levels in a tank. Therefore, this may save a lot of water and electricity, henceforth becoming a crucial member of modern smart home devices. This can also be used in large commercial water tanks which provides supply to a city or a factory. This will ensure that the tank is always full without compromising with the overflow issues additionally.

REFERENCES

[1]   https://www.arduino.cc

[2]   https://arduino-esp8266.readthedocs.io/en/latest/libraries.html.

[3]   https://www.tutorialspoint.com/arduino/arduino_water_detector_sensor.htm

[4]   https://arduino-esp8266.readthedocs.io/en/latest/libraries.html.

[5]   https://mosquitto.org

[6]   https://www.raspberrypi.org

[7]   https://www.tec2home.com/2017/09/what-is-a-raspberry-pi

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