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INNOVATIVE WATER MONITORING SYSTEM

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Abstract:

Southern states of India like Tamil Nadu, Water crisis is a big issue. Therefore, we reduce the wastage of water in education institutes like schools and colleges by using our modern-day Technologies in this field. Our device is placed in the washrooms where people come in large numbers but forget to turn off the water tap which leads to much more water crisis. Our device ensures that the water saved to the maximum level possible. Water supply is given to the area if a person is present inside the washroom else the water tap is turned off and even if the water tap is turned on our device switches of the main supply of water to the washrooms. Through this process, we'll be able to ensure the wastage of water to a minimal level so that water could be saved in large quantity in future. In order to achieve this we place Infrared sensors in the tap. If a person turns on the water tap in the wash basin then the Infrared sensor signals that someone is present and water flows. If no signal is detected from Infrared sensor that means there is no person nearby and hence the main water supply is turned off. A Solenoid valve is used to close the main pipe by detecting flow of water using water flow sensor. We also use an advanced algorithm to manage the time or the grace period for which the water supply will be given to the room in spite of absence of a person.

Keywords **—Infrared Sensor, Solenoid Valve, Water Flow Sensor.**

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1. INTRODUCTION

Water is essential for all living organisms but we humans tend to waste them a lot. Our intention is to save water by reducing the wastage in education institutions like schools and colleges by using our modern-day technology in in this field. Our intention is to stop this wastage by implementing the modern applications of IOT (Internet of things). Internet of Things helps the water industry on a great extent.

It implies connecting all the systems and players in the water supply chain and empowering decision-makers with important insights on the state of water resources and equipment used in this domain. Smart water technology brings transparency and improved control to the whole water supply chain starting from water tank to washbasin1. Smart water management implies the integration of systems and the adoption of a simple means to monitor, control and regulate the usage and quality of water resources and maintain the associated equipment (pipes, pumps, etc.).

By using systems, we mean a wide range of hardware and software instruments, including sensors, Data processing, and mobile control which connect people with water systems2.

2. PROPOSED SYSTEM

Our project handles with water management system. We have seen many water management systems, but they may fall in condition where it will be so costly to install or it will be damaged easily due to the places where there will be highly

crowded3. Our project will make reduce this risk main idea of the project is every room or for example a restroom in an organization or college anywhere, the water for the whole room will be provided to the single major pipeline. Our idea is to take control over that. To control that we need a single input that is whether there is people inside or not.

If it is a normal usual place, we can monitor human movements using cameras. But we can't even say the word bathroom and cameras at a time. So, we decided to use infra-red sensors in this process and this is not so new to adapt for our system because we have seen this in many water systems in many hotels and theatres. But they only use it automate the water flow without touch will be so costly. But we are not using it to automate the flow in the taps rather than we use it to automate the flow in that main pipeline as said before.

This will help in preventing water being wasted by closing the main valve for the particular room if there is no signals are detected from any of the sensors for a particular time if a signal is initiated the valves will be opened again. So if there is any leakage or if anyone opens the tap and left means this will protect from water being wasted from closing it within a short time. and we cannot leave it as it is, because we can't expect someone from outside come and close it. So we created an app in which we are not going to control anything but, we will be notified if any interruption or the taps are opened for a long time, respective to this intimation the person allotted to maintain this can take the necessary action. and many calibrations will be done to reduce unnecessary intimations.

3. SYSTEM MODULES

3.1.COLLECTION AND ANALYSIS OF SENSED DATA

The infrared sensors that has been attached to the taps will be activated when a person goes near it to use the tap4. When the device gets activated the main valve to the particular room will be opened. And if the sensors don't detect any signal then after a few minutes the microcontroller will automatically close the valve. This process will be repeated for every instance of the day until the device has been turned off.

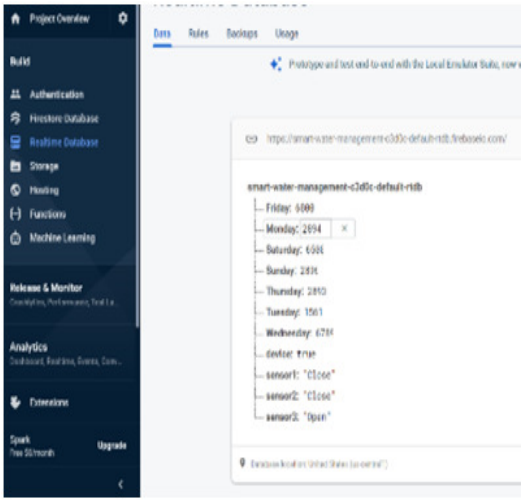

Fig 1: Collection and analysis of sensed data

3.2. ANOMALY DETECTION

The solenoid valve will be controlled according to the sense of Infrared sensors. If any of the sensor sense the movement of people, then the solenoid valve will be opened and remain still for the 5 minutes exactly from the moment that every sensor shows no sensed data at a time. After 5 mins of stillness, the solenoid valve will be closed. If the Water flow sensor sense flow of water during those 5 mins, that means even after no sensing of people, if the water flow means that represents the leakage of water at any means.

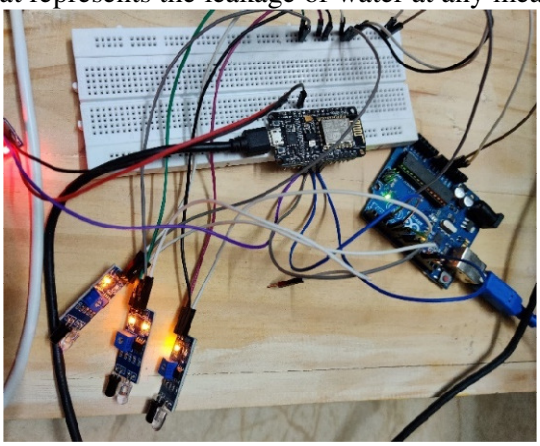

Fig 2: Setup to find anomaly detection

3.3.ADMINISTRATOR APPLICATION

Even though we have designed the system for the use of the people there are certain use cases where the person may not be present in front of the tap but the water flow must keep on going. In such cases to avoid the blockage of the flow of water we would provide a system where we could provide the water flow for a particular time period.

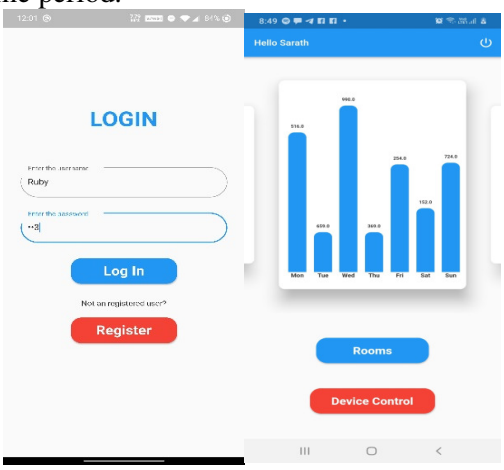

Fig 3: Application login & home page

During this time there will be an intimation given to the administrator of the system through an mobile app Regarding the flow of water for an excessive period of time without an intervention of person. The app also shows the where the leakage occurred for an easy tracing of the location to avoid all the unnecessary hurdles.

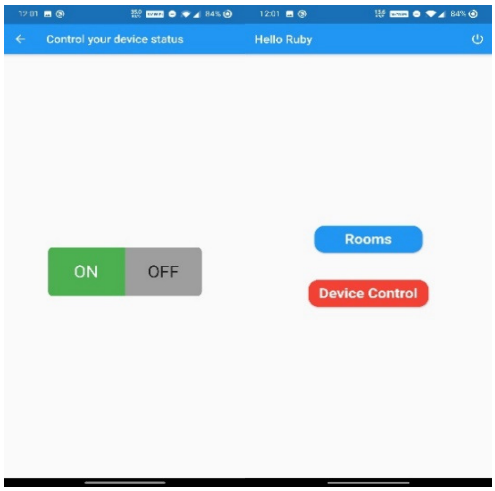

Fig 4: Application control page

4. ARCHITECTURE DIAGRAM

A restroom in an organization, the water for the whole room will be provided to the single major pipeline5. We are using infrared sensors whether a person is present or not and to automate the flow in that main pipeline.This will help in preventing water being wasted by closing the main valve for the particular room. If there is no signal detected from any of the sensors for a certain time and if a signal is encountered the valves will be opened again.We have also created an app in which we are not going to control everything along with we will be notified if any interruption or the taps are opened for a long time, respective to this intimation the person allotted to maintain this can take the necessary action.

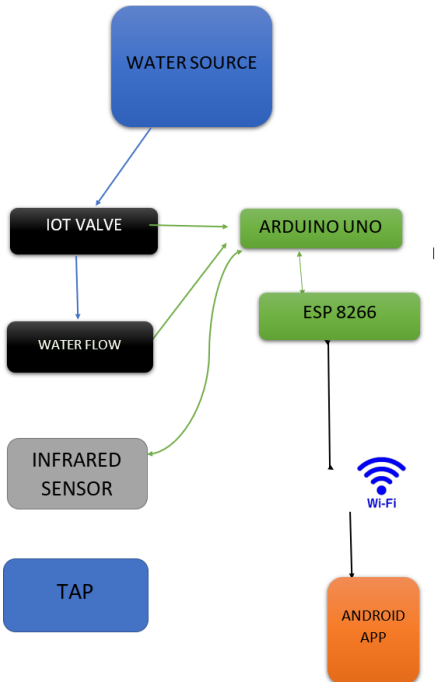

Fig 5: Architecture diagram

5. SYSTEM IMPLEMENTATION

The main purpose of our project is to pursuit of precision in water management are data collection, processing and variable rate values of application of inputs[6]. We have taken time to look at the available

data, how to collect the data, how to analyze data and Store the data values. The main advantage of this system is that the admin of this system can remotely monitor the system with the help of the technology Sensors set up across the accessories in the room will collect data on people movement and the time taken in accessing the appliances.

IR Sensor, the sensor that will get attached to the faucet structure plays the main role in implementing this system[7]. This sensor will sense whether anyone approaching the faucet to use water or not. The sensed data from this sensor used to find the time difference of active and inactive state of the whole system, which helps in closing the valve when the system is not in use for some period.

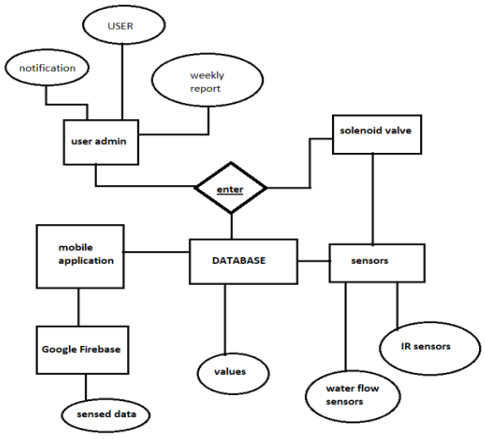

Fig 6 : Design flow

Water flow Sensor, this sensor will be connected very next to the Solenoid valve, which is used to control the flow of water, will sense the flow of water by the rotation of the blades inside the sensor. This water flow sensor has the primary usage in our system. The first one is check whether leakage is occurring in a room or not. This will be found by noticing the flowrate of water when the IR sensors sense whether the people movement is there or not. If the flowrate in this sensor is not zero during zero people movement, then we can finalize that there is a leakage of water in the room. The second usage is to produce a weekly basis analysis of usage of water, and this will be displayed in the app that we provided.

Solenoid Valve is the component that controls the flow of water through the system and the room8. This solenoid valve is not a complete IOT product it is controlled by a Relay 5v as it needs an external power supply. This solenoid valve is controlled based on the sensed value from the IR sensors. This valve will get opened when the people movement is sensed. If the sensor senses that more flow of the fluid is required, it allows the increase in current passing through the solenoid valve, which creates more magnetic field and more upwards motion of the plunger. This leads to further opening of the orifice and more flow of the fluid from the inlet port to the outlet. If the required flow of fluid is less, the sensor allows passage of the lesser current to the solenoid valve.

The value of rate and state of the system are displayed in the LCD display. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays, as in a digital clock. A character positive LCD with a backlight will have black lettering on a background that is the colour of the backlight, and a character negative LCD will have a black background with the letters being of the same colour as the backlight. Optical filters are added to white on blue LCDs to give them their characteristic appears. The LCD works on the principle of blocking light. While constructing the LCD's, a reflected mirror is arranged at the back light.

The sensors are interfaced with the Arduino board and wireless9. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable.

Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package is achieved. The Arduino Functions help the

programmer stay organized. Often this helps to conceptualize the program. Functions codify one action in one place so that the function only has to be thought out and debugged once. This also reduces chances for errors in modification, if the code needs to be changed. Functions make the whole sketch smaller and more compact because sections of code are reused many times. They make it easier to reuse code in other programs by making it more modular, and as a nice side effect, using functions also often makes the code more readable.

Firebase used to store the back-end data that is being sensed by the sensors push the notifications to the mobile application created by flutter. this is the only firebase that can be easily connected to the flutter because both are Google products.

The heading of the Acknowledgment section and the References section must not be numbered.

Causal Productions wishes to acknowledge Michael Shell and other contributors for developing and maintaining the IEEE LaTeX style files which have been used in the preparation of this template. To see the list of contributors, please refer to the top of file IEEETran.clsin the IEEE LaTeX distribution.

6.CONCLUSION

For future advancements it very well may be upgraded by building up this framework for large scale usages in working areas. Big scale companies with usage of large amount of water turning towards IOT to protect wastage of water. The projects are thus carried out using the Arduino board with the help of the WIFI module and finds its application in large constructions. Likewise, the framework can be coordinated to check the usage of water and the wastage of water happening during large scale usage. The sensors and microcontroller are effectively interfaced and remote correspondence is accomplished between different hubs. All perceptions and exploratory tests demonstrate that this undertaking is a finished answer for field exercises and water system issues. Execution of such a framework in the field can assist with improving the controlling of wastage of water.

7.FUTURE ENHANCEMENT

The main hurdle for our project is the fluctuations in the power supply and the power cuts. Once if the power supply goes off, the system will remain closed till the power supply continues to flow. So, our future enhancement is to add the technology that supports our product to get turned off when the current flow goes down. We planned to implement this feature by using products called Actuators which acts similarly like a capacitor, that stores a few amounts of current. In case, the electricity goes off, the actuators will provide the required electricity for the system for few moments. Meanwhile, our system turns off, so that the valves will remain opened till the electricity flows back.

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