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Smart Water Usage and Leakage Monitoring

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***Abstract*: In worldwide, the most common issue faced is water scarcity which is caused by many factors such as rise in amount of population, deforestation, reduced rainfall, global warming etc. which makes difficult for people to get water. To overcome this problem, the idea is to use an IoT application which can be used to fetch quantity of water that is supplied to each and every house hold and to detect the leakage of water across the pipes and to notify the particular person about that and get updates about the supply of water.**

***Keywords*: Internet of things (IoT), Raspberry Pi, Water flow sensor, Dip tray water detection sensor.**

1. Introduction

Inadequate of fresh water resources is the cause of water scarcity which affects every continent rated by World Economic Forum and that states one of the largest global risks which impacts the potential over next few years. Now, water monitoring day was established in 2003 by America's clean water foundation as a global educational outreach programme that aims to build public awareness and involvement in protection water resources around the world. The world monitoring day is celebrated on September 18. The leakage of water pipes during water distribution is due to the high pressure. The system consists of water flow sensor, drip tray water detection sensor, raspberry Pi which is connected in a pipe. This sense the data collected from the sensor when the water passes through the pipe is sent to the mobile application and stored in the firebase database. The application has a client and server side, in the server-side application the user can know about the leakage of water in the pipe and in the client-side the user can know about the quantity of water supplied and turn off the valve if the quantity exceeds.

2. Background

Internet of things is the technology where it connects machine to machine or things to things via internet anytime, anywhere and every time. Smart water usage and leakage monitoring which uses IoT technology plays a vital role in detecting water leakage by using various sensors like water detection sensor, tray detection etc.

Due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors and embedded systems, the definition of the Internet of Things has evolved. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of Things. In the consumer market, IoT technology is the most synonymous with "smart home" products, including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via ecosystem-related devices, such as smartphones.

3. Methodology

The system consists of different sensors and the raspberry Pi. Once the water flows through the pipe the sensors collect the information and store it in the database. The application then receives the data collected so that the client side and server-side user can get the information.

Here in the server-side application the user will get the information about the leakage of water, once it flows through the pipe. In the client-side application, the user comes across the quantity of water that is flowing through the pipe in their household to the tank and once the tank is full the user can turn off the water flowing to their house. Based on the quantity of water used by that house the bill will be generated.

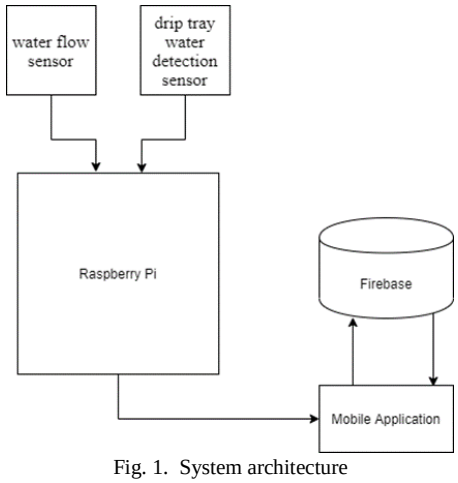

Fig. 1. System architecture

1. *Raspberry Pi* - The Raspberry Pi is a series of small single-board computers developed within the UK by the Raspberry Pi Foundation to push teaching of basic technology in schools and in developing countries. The first model became much more popular than anticipated, selling outside its target marketplace for uses like robotics. It doesn't include peripherals (such as keyboards and mice) or cases. However, some accessories are included in several official and unofficial bundles. All SoCs employed in Raspberry Pis are custom-developed under collaboration of Broadcom and Raspberry Pi Foundation. The Broadcom BCM2835 SoC employed within the primary generation Raspberry Pi includes a 700 MHz ARM1176JZF-S processor, VideoCore IV graphics processing unit (GPU), and RAM. It's grade 1 (L1) cache of 16 KB and grade 2 (L2) caches of 128KB. The number 2 cache is utilized primarily by the GPU. The SoC is stacked underneath the RAM chip, so only its edge is visible. The ARM1176JZ (F)-S is that identical CPU employed within the initial iPhone, although at an improved clock rate, and mated with a far faster GPU. The earlier V1.1 model of the Raspberry Pi 2 used a Broadcom BCM2836 SoC with a 900 MHz 32-bit; quad-core ARM Cortex-A7 processor, with 256 KB shared L2 cache. The Raspberry Pi 2 V1.2 was upgraded to a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, identical SoC which is utilized on the Raspberry Pi 3, but underclocked (by default) to identical 900 MHz CPU clock speed because the V1.1. The BCM2836 SoC isn't any more in production as currently 2016. The Raspberry Pi 3 Model B uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache. The Model A+ and B+ are 1.4 GHz.
2. *Water Flow Sensor* - Water flow sensors can measure the speed of flow of water either by measuring velocity or displacement. These sensors may measure the flow of water like fluids like measuring milk in an exceedingly dairy industry. There are various styles of water flow sensors available supported their diameter and method of measuring. An economical and most ordinarily used water flow sensor is Paddlewheel sensor. It will be used with water-like fluids. For the kind of applications where a straight pipe isn't available for inlet, Positive displacement flow meter is employed. This sort of water flow sensor will be used for viscous liquids also.
3. *Drip tray water detection sensor* - The sensor has been designed to stumble on the presence of water in drip trays and energise an inner relay to provide a volt loose contact sign to present alarm systems. The unit has no outside metallic parts and makes use of an optical sensor to detect the presents of water and therefore isn't liable to fake alarms from contact with the metal drip tray or different sensors via earth. Being IP sixty-six rated, the sensor may be submerged in water without any damaging effect. Sensors may be connected together to give a not unusual alarm inside an area or connected individually to furnished exact region of a leak.

4. Conclusion

The developed system provides the user with a real-time monitoring system for water consumption, but it may be used for other services like leakage detection and localisation. The system provides a long-range communication, though with more households using constant system, the coverage range is going to be increased since the system supports mesh configuration. Tools used for visualization are open-source, which makes them cheap to develop and integrate. A web-based interface is additionally developed that visualises real-time and historical water consumption. Moreover, the monitoring system can serve to assist users change their water usage and reduce water consumption, also on identify and fix abnormal water consumption.

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