Water Supply Control IoT System for the Faucet

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Abstract: The proposed system is an IoT system to control the water supply from the faucet. The system is to install with the faucet that facilitates in preventing wastage of water. The system is configured to detect sound waves generated by the water while dispensing from the faucet to the tea receptacle. A control unit is configured to analyse the sound waves to detect the level of water in the receptacle, and correspondingly the control unit instructs the flow valve to shut off, thus dispensing of water is stopped. Similarly, the sensor detects the falling of water directly on the ground, and the control unit instructs the flow valve to shut off to prevent water wastage. The proposed IoT system generally relates to faucets. More particularly, relates to a system to control the water supply from the faucet by monitoring dispensing of water, and automatically closing the faucet to prevent wastage of water.

Keywords: Internet of Things, Water Wastage Prevention, Water Control IoT System, Smart Faucet.

I. INTRODUCTION

Background description includes information that may be useful in understanding the present invention. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed invention, or that any publication specifically or implicitly referenced is prior art. Water is one of the most important basic needs for all living beings. But unfortunately, a huge amount of water is being wasted by uncontrolled use. The people generally open the tap to fill a bucket of water and forget to close it in due course of time. As a result, the water starts flowing out of the bucket causing the wastage of a lot of water. Moreover, flooding is very common and generally occurs at home when there are restricted timings for water supply in a day. As per human tendency, the tap remains turn on when the water supply is closed. When the water supply is resumed, flooding may occur, damaging the home appliances, building structures, furniture, etc. [1-3]

Numerous devices are available to regulate the amount of water that flows through a faucet or a shower head. The objective of these devices is to stop the flow of water from the faucet and/or shower head after a pre-determined period or after the person's hands or body is no longer in the vicinity of the faucet or shower head. However, no device is available to detect the overflowing of water from buckets and the falling of water on the ground directly. There is a need to provide a solution that overcomes the above-mentioned and other limitations of existing solutions and provides a system to be used with faucets for automatic control of faucets to prevent the wastage of water. [4]

II. OBJECTIVES OF THE PROPOSED SYSTEM

The proposed IoT system "Water Supply Control IoT System for the Faucet" have some objectives as listed herein below.

1) An object of the proposed IoT system is to provide a system to be used with water faucets to save water by preventing the wastage of water.

2) Another object of the proposed IoT system is to provide a cost-effective system, and easy to assemble.

3) Another object of the proposed IoT system is to provide a system to shut off the faucet automatically when the water is overflowing from a receptacle or also when directly falling on the ground.

III. SUMMARY OF THE PROPOSED SYSTEM

Various aspects of the proposed IoT system relate to faucets. This relates to a system to control the water supply from the faucet by monitoring dispensing of water and automatically closing the faucet to prevent wastage of water.

An aspect of the proposed IoT system disclosing a system to control water supply from a faucet, the system comprising may include a sensor coupled to the faucet for collecting a first set of sound waves reflected from a receptacle, the receptacle positioned below the faucet to receive water, a flow valve may be configured to control dispensing of water from the faucet, a control unit may be operatively coupled to the sensor, and the control unit may include a learning engine coupled with a memory, the memory storing instructions executable by the learning engine and configured to receive the collected first set of sound waves, analyse the received first set of sound waves to determine type of sound, classify the type of sound to evaluate level of water in the receptacle, generate a first control signal, upon detection of level of water above a pre-defined limit, and the first control signal may be transmitted to the flow valve, and the flow valve may be configured to be shut off upon receiving the first control signal. [5]

In an aspect, the sensor includes any or a combination of audio sensor, sound detector, microphone, and ultrasonic sound wave transducer means. In the proposed IoT system the flow valve is a solenoid valve, the sensor has been configured for collecting a second set of sound waves reflected from the ground when the water is falling on the ground. In an aspect, the control unit has been configured to analyse the received second set of sound waves to determine the type of sound, and correspondingly generate a second control signal, where the second control signal may be transmitted to the flow valve, and the flow valve is configured to be shut off upon receiving the second control signal and a power source may be provided to supply electricity to the sensor and the control unit, wherein the power source include any or a combination of AC power supply and DC power supply. [6-9]
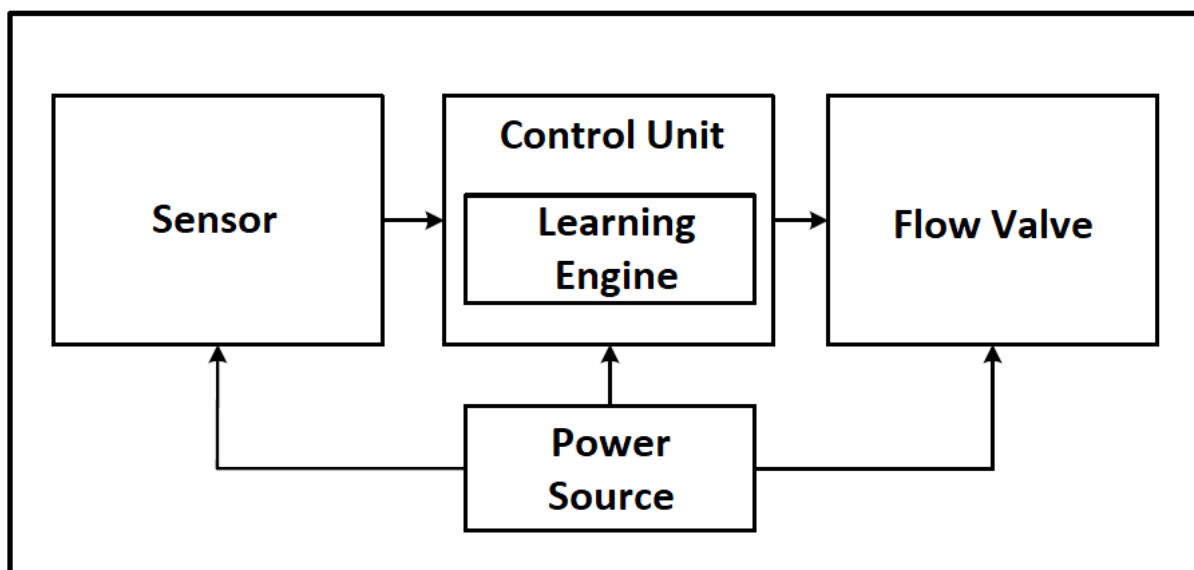
Figure 01: Block Diagram of Proposed System for Water Level Detection

IV. PROPOSED METHODOLOGY

The following is a detailed methodology for the proposed IoT system as per the proposed architecture. The proposed architecture is in such detail as to communicate the disclosure. In the following proposed methodology, numerous specific details are outlined in order to provide a thorough understanding of the proposed IoT system. The proposed IoT system herein relates to faucets, and the proposed IoT system relates to a system to control water supply from faucets by monitoring dispensing of water and automatically closing the faucet to prevent wastage of water.

Figure 01 illustrates a block diagram of a proposed system for water level detection, by an embodiment of the present disclosure. As illustrated in Figure 01, a system to be coupled with a faucet is disclosed. The system can include a sensor, a control unit, a flow valve, and a power source. The system can be configured to detect the sound of water and correspondingly control the flow valve to prevent the wastage of water.

In the proposed IoT system, the sensor has been included but not limited to likes, audio sensor, sound detector, microphone, and ultrasonic sound wave transducer means. The sensor has been configured to collect the first set of sound waves when the water from the faucet falls into the receptacle, and the second set of sound waves when the water directly falls on the ground. The receptacle of the proposed IoT system is a bucket, tank, drum, or any vessel which is filled by water dispensing from the faucet. The flow valve has been configured to control dispensing of water from the faucet. When the flow valve is turned ON, the water can be dispensed, when the flow valve is shut off, dispensing of water can be stopped. The flow valve is a solenoid valve. For example, the solenoid valve can be a direct-acting valve, pilot-operated valve, two-way valve, three-way valve, or four-way valve.

In the proposed IoT system, the control unit includes a learning engine configured to train a model to accurately detect wastage of water, by detecting overflow, and water falling on the ground. The learning engine includes machine learning algorithms. The sensor is a digital image-capturing device that can take on a variety of forms, such as a charged/coupled device (CCD) camera or a complementary metal oxide semiconductor (CMOS) camera. The camera can collect images of a pre-defined area, the collected images can be transmitted to the control unit for analysis. The control unit has been configured to extract water level information and the falling of water on the ground, and correspondingly the flow valve can be shut off to prevent water wastage.

In an exemplary proposed IoT system, when the water is full in the receptacle, or the water is directly falling on the floor, the system transmits a notification to a client device such as a smartphone, PDA, laptop, or personal computer using a communication unit. Examples of such wireless Internet technology include GSM, Wireless LAN (WLAN), Wireless Fidelity (Wi-Fi), Wi-Fi Direct, Digital Living Network Alliance (DLNA), Wireless Broadband (WiBro), Worldwide Interoperability for Microwave Access (WiMAX), High-Speed Downlink Packet Access (HSDPA), HSUPA (High-Speed Uplink Packet Access), Long Term Evolution (LTE), LTE-A (Long Term Evolution-Advanced), and the like. In addition, the communication unit has been configured to facilitate short-range communication. For example, short-range communication can be supported using at least one of Bluetooth, Radio Frequency Identification (RFID), Infrared Data Association (IrDA), Ultra-Wideband (UWB), ZigBee, Near Field Communication (NFC), Wireless-Fidelity (Wi-Fi), Wi-Fi Direct, and Wireless USB (Wireless Universal Serial Bus). [6-9]

In the proposed IoT system, a power source has been provided to provide electricity to the sensor, the control unit, and the flow valve. The power source includes any or a combination of AC power supply and DC power supply. For example, the power source can include any or a combination of rechargeable batteries, lithium (Li) ion cells, rechargeable cells, electrochemical cells, storage batteries, Lithium Polymer, Lithium Ion, Nickel Cadmium, Nickel Hydride, and the secondary cell. [9]

Figure 02 and Figure 03 illustrate exemplary views of the system implemented with a faucet, by the proposed IoT system. As illustrated in Figure 02, a faucet is with a sensor which is positioned on the faucet to detect the first set of sound waves collected from the water falling into a receptacle. A control unit has been coupled to the faucet that can be configured to analyse the received first set of sound waves, evaluate the level of water in the receptacle and correspondingly shut off the flow valve, upon detection of the overflow of the water in the receptacle.
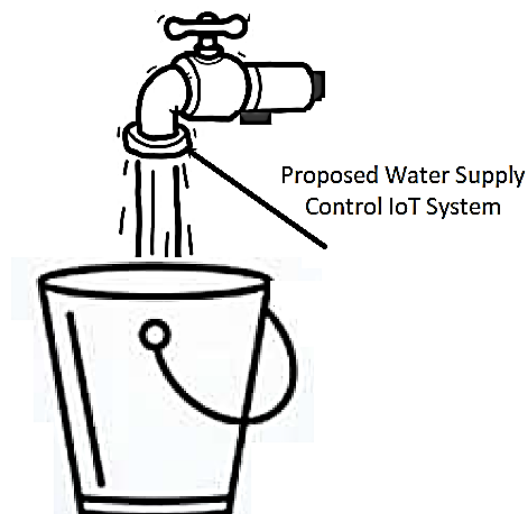

Figure 02: Faucet with Proposed Water Supply Control IoT System

As illustrated in Figure 03, a faucet is with a sensor which is positioned on the faucet to detect the second set of sound waves generated when the waterfalls on the ground. A control unit can be coupled to the faucet that can be configured to analyse the received second set of sound waves, to evaluate the falling of water on the ground and correspondingly shut off the flow valve, to prevent wastage of water.
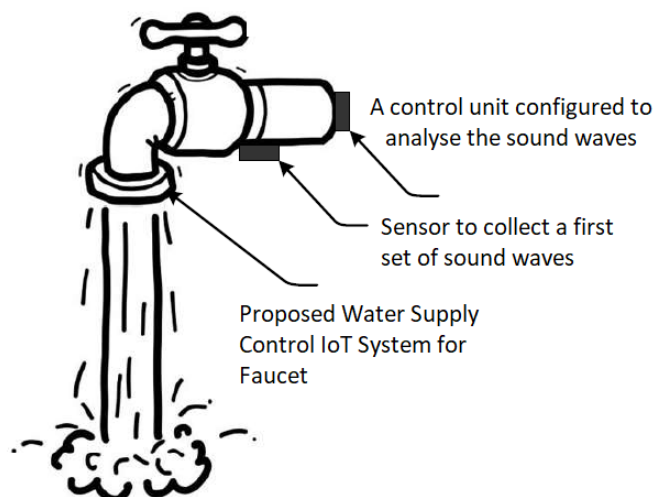

Figure 03: Faucet with Proposed water Supply Control IoT System and Sensors

V. APPLICATIONS OF THE PROPOSED SYSTEM

The proposed IoT system has the following advantages:

1. The system provides to be used with water faucets to save water by preventing wastage of water.
2. It is a cost-effective and easy-to-assemble system.
3. It is a system to shut off the faucet automatically when the water is overflowing from a receptacle and when the water is directly falling on the ground.

VI. CONCLUSION

The current water becoming an important issue for human survival hence prevention of water wastage is important. The proposed IoT system pertains to a system to control the water supply from the faucet. The system installed with the faucet facilitates preventing the wastage of water. The system is configured to detect sound waves generated by the water while dispensing from the faucet to the tea receptacle. A control unit is configured to analyse the sound waves to detect the level of water in the receptacle, and correspondingly the control unit instructs the flow valve to shut off, thus dispensing of water is stopped. Similarly, the sensor detects the falling of water directly on the ground, and the control unit instructs the flow valve to shut off to prevent water wastage. The present invention generally relates to faucets. More particularly, relates to a system to control the water supply from the faucet by monitoring dispensing of water, and automatically closing the faucet to prevent wastage of water.

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