Monitoring and Controlling of Water Discharge

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Abstract— The paper concentrates on controlling and monitoring of the home water discharge model. The model is focused on saving water and encouraging user to do so by turning the normal faucets into voice controlled one including sensing of flow rate, where there would be central hub picking the voices and sending the discharge data to the user's Android phone through an application.
Key words: Water Discharge

I. INTRODUCTION

The invention provides simplified methods and devices for conserving water by controlling water flow from plumbing fixtures using voice or sound commands. One aspect of the invention provides a method for conserving water that includes the step of: providing a faucet or showerhead or the like with voice or sound control of the amount of water flow, which control does not include control of temperature of water exiting the fixture. Another aspect of the invention provides a device for conserving water that includes a voice or sound command-responsive control unit that controls the amount of flow of water from a plumbing fixture such as a faucet or showerhead by actuating a valve. Valve states may include only open and closed, i.e., on and off, or may optionally include one or more intermediate flow positions.

The invention relates generally to the field of voice-controlled and voice-activated plumbing fixtures such as faucets, spigots and showerheads. Fresh water is a precious resource that is obtained from natural sources or is purified from non-fresh water sources such as sea water or waste water by any of a number of methods. The total fresh water resources of many areas are being stressed by growing demands due to increasing population. Water conservation refers to reducing the use of fresh or potable water, through technological or social methods.

To ensure availability for future generations, the withdrawal of fresh water from an ecosystem should not exceed its natural replacement rate. Water pumping, delivery and waste water treatment facilities consume a significant amount of energy. In some regions of the world (for example, California) over 10% of total electricity consumption is devoted to water management. Minimizing human water use helps to preserve fresh water habitats for local wildlife and migrating waterfowl, as well as reducing the need to build new dams and other water diversion infrastructure.

A number of technological measures have been shown to be effective in conserving fresh water. Showers account for about 20 percent of total indoor water use. By replacing standard 4.5-gallon-per-minute showerheads with 2.5-gallon-per-minute heads, which cost less than $5 each, a family of four can save approximately 20,000 gallons of water per year. Although individual preferences determine optimal shower flow rates, properly designed low-flow showerheads are available to provide the quality of service found in higher-volume models.

Faucet aerators, which break the flowing water into fine droplets and entrain air while maintaining wetting effectiveness, are inexpensive devices that can be installed in sinks to reduce water use. Aerators can be easily installed and can reduce the water use at a faucet by as much as 60 percent while still maintaining a strong flow. More efficient kitchen and bathroom faucets that use only 2 gallons of water per minute--unlike standard faucets, which use 3 to 5 gallons per minute are also available. Because flow rate is related to pressure, the maximum water flow from a fixture operating on a fixed setting can be reduced if the water pressure is reduced. For example, a reduction in pressure from 100 pounds per square inch to 50 psi at an outlet can result in a water flow reduction of about one-third.

Water flow from faucets, spigots, showerheads and the like is typically manually controlled, by an individual, and sometimes controlled using foot pedals. Voice-activated systems for controlling the have been described. The following projects are background to the present invention.

II. LITERATURE REVIEW

Implementation of speech recognition home control system using Arduino , the voice recognition is carried on using the Arduino board and its shield which consists of the suitable software and library necessary for the both dependent and independent voice recognition.

Control of Industrial Pneumatic & Hydraulic Systems using Serial Communication Technology & MatLab, The hydraulic and pneumatic valves are controlled using computer (MATLAB) with Arduino as the intermediate which proves that the hydraulic valves can be controlled using signals from the Arduino.

On-line monitoring system of water leakage detection in pipe networks with artificial intelligence, The discharge of the water is monitored using flow sensor and Arduino board, the data in the Arduino is then wirelessly transferred to computer.

Implementation of Smart Home Control by Using Low Cost Arduino & Android Design, The information transfer between the Arduino and the Android device is demonstrated and the information from the board is display over the device using software application

Eva, an automated faucet responds to hands or objects for activation below the spout and hand movements toward or away from spout for setting temperature and flow rates. OR, if standing within two feet of the spout, you can address voice commands like on or off, specific temperature settings and flow rates, or just say warmer, hotter, cooler or colder to adjust temperatures.

Pfister an handle-less faucet, one with a built-in LED task light to illuminate the work space, and the Auris, which the company says is the first in the industry to use voice control to activate features such as turning on and off hot, warm, or cold water, delivering precise amounts of

water, providing on-demand filtered or boiling water, and automatically filling a sink, all without the use of hands.

III. COMPONENTS OVERVIEW

The model is based on establishing a central hub which will be a Raspberry Pi 3 Model B, Raspberry Pi 3 being a standalone system operating under Linux provide insane flexibility for embedded tasks and so the Raspberry pi is going to control all other electronics within the model and establish connection with the user's Android phone.

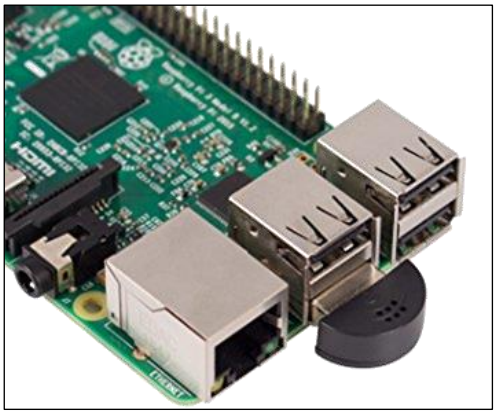
The Wi-Fi module integrated to each faucet node will be NodeMCU which can be programmed using the Arduino IDE and the regular Arduino coding language but additional library for the ESP8266 is needed to run the Wi-Fi module. With Wi-Fi connecting the NodeMCU is a standalone microcontroller with I/Os giving good flexibility and wide range of application.

To control the flow of water, the model consists of a normal open and shut control valve. The shaft of the valve is connected to a motor using gears to transmit the power from the DC motor to the valve and that is how the position of the valve is toggled to control the discharge of the water.

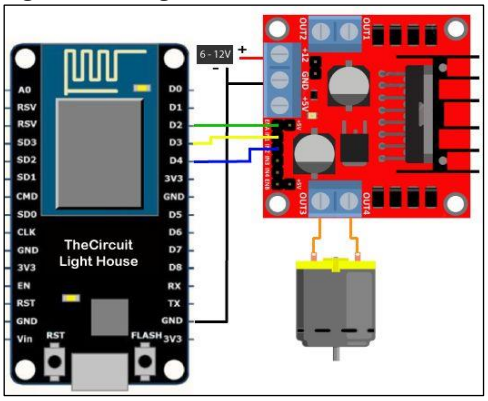
The connection between the Raspberry Pi 3 and the Android phone is through a Application created using Android Studio. The app being uploaded to the phone starts a TCP server and makes the connection and the transfer of data possible between the raspberry pi and the Android phone.

IV. DESIGN

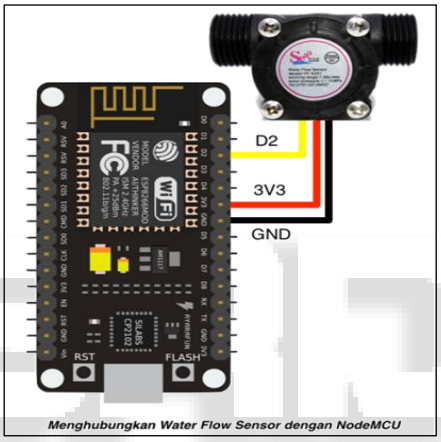
The Raspberry Pi 3 being the central hub consists of microphone to pick up commands from the user. The Raspberry pi runs the open source voice recognition software PIASuite which has plenty of features to customize. The software comes the continuous mode to pick up voice command continuously and to actively look for voice input. The different voice command is mapped to the corresponding commands in the Linux, specifically the commands are to start a TCP client connection and send a strip to the Wi-Fi module NodeMCU.



The NodeMCU is programmed to run TCP server which looks for the client to connect and get the string data and process accordingly. After receiving the string from the client (Raspberry Pi 3) the server (NodeMCU) operates the DC motor connected to it through a Motor Driver which helps in controlling the rpm of the motor with PWM signals. Thus the voice command to the hub now results in running of the motor hence toggling the valve position and controlling the discharge of the water.



The NodeMCU is also connected to the Flow Sensor which actually senses the flow rate of the out flowing water and so with the flow rate data the amount of discharge can also be calculated.



Menghubungkan Water Flow Sensor dengan NodeMCU

The data of discharge of the water is used to map the total discharge graph on the Android phone and also acts as feedback to the module controlling the motor rotation. From the feedback of the Flow Sensor the valve position can be determined corresponding to the specified amount of discharge.

V. CONCLUSION

In the present generation of lifestyle smartphones are a integral part of a person's everyday life, most interaction and gain of most information is through smartphone. Leveraging this importance of the smartphone this model

not only effectively control the flow of water and saving the wastage of water through improper discharge in the mechanical model, but also provides the user with the information of day to day usage of water thus emphasizing the importance of water in recent times where there is too much shortage and also encouraging the user to be keen on water usage and having of water. By this model water can be saved in a household in small amounts which will actually amount to a huge number when considering vast number of household in a region. In the future the homes will be turning into smart homes and this model can be integral part of the smart home system, with all the control in the users hands.

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