

Android Based Smart Water Pump Controller

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Abstract – This study presents a technology of controlling water pumps using smartphones. A basic model of an android based application is proposed by which water pumps can be turned ON and OFF with the help of wireless radio transceivers and Wi-Fi router. The android app can run in Android OS version upto 6.0.1, i.e. Android Marshmallow. The paper briefly shows the connections between the required equipments. A future prospect to integrate the app with support for controlling other electrical appliances is also reflected. The implementation of this proposal can be helpful to prevent wastage of water as well as wastage of electricity.

Key Words: Android Operating System, Router, Wi-Fi Network, Transceiver, Methodology, Application Interface.

1. Introduction

Everyday thousands of pumps are used to fill up water tanks. The process of switching on the pump and switching it off after the tank is filled is a manual process, i.e., someone has to check whether the tank has enough water filled, then he has to turn the pump ON to fill the tank up, then he also needs to see if the tank is filled up or if the water is overflowing, and turn the pump OFF accordingly. After a tank is filled up, lots of water is wasted before turning the pump off. A study shows, the average household can leak more than 10,000 gallons of water each year. This enormous wastage of water is a concern at the time when water level has gone down below the critical level making it almost impossible to get drinkable water at numbers of places all over the world. It is also seen that even though the tank is filled up, there is no one to switch the pump off. The result of it, a huge wastage of water, is needless to mention. This

paper proposes a technology to stop this age-old practice. Moving on to another perspective, smartphones are widely used technology in today's daily life. Apps have made daily life more convenient. From information sharing through instant messaging to payments of all kinds of bills is just one touch away. Taking smartphone as the basic tool and as a step ahead towards Digital India, this paper shows a way how to prevent the water wastage using Smart Pump Controller app for Android based platform. One can use this android application to check water level of a tank and turn the pump on and off from his house or even from anywhere in the world remotely.

2. Android Operating System

Android is an Operating System which is highly popular among the smartphone users now a days. It is very easy to use and operate in Google and Linux based system. A comparative study based on usage data in the Figure1 suggests how android is populated in the recent years over other Smart Phone operating System according to source of IDC market study.

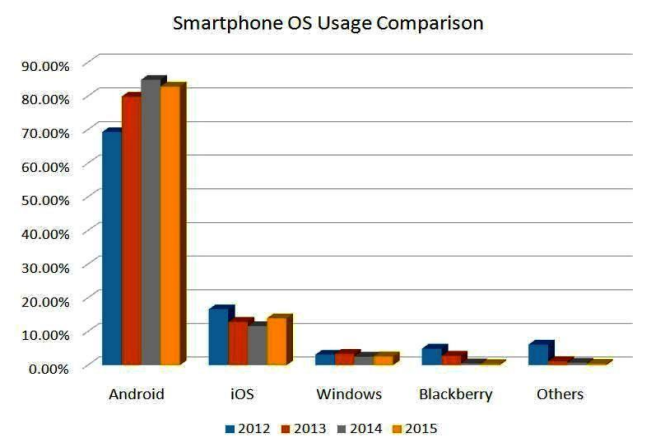


Figure1: Comparison of Different Mobile Operating Systems Year wise.

3. Router

The networking device, router, is normally used to connect different network with different network IDs. Each port of a Router connects to a network with a given network ID with different host IDs. It also connects different MAC schemes like Ethernet and Token Ring with different network protocols like IP and IPX. A Router separates networks into different collision domains and different broadcast domains shown in Figure2. Here Bridge and switch walking as a intermediate between Router and post computers.

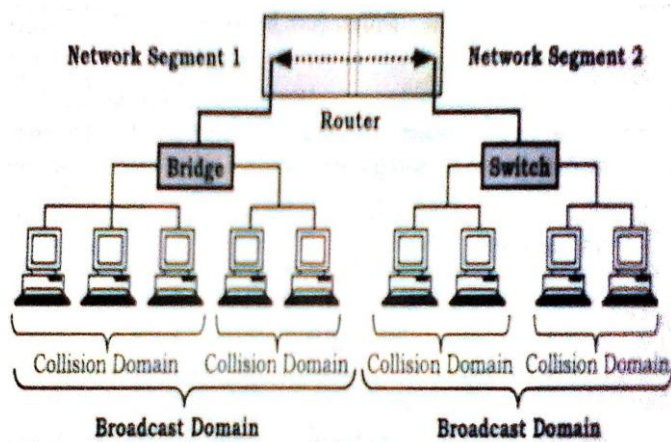


Figure 2: Routers configuration diagram

4. Wi-Fi Network

Wi-Fi or Wireless Fidelity is a shared networking system working on high frequency range to serve the networking demands through logical connection inside a house or office with access point specification and uninterrupted service to any devices like laptops, printers, scanners, joystick, desktop, mobile phone etc.



Figure 3: Diagram of a Wi-Fi based network

5. Transceiver

Transceiver is a communication equipment which is used to send electromagnetic waves with some message from source to destination. Now a days Transceiver used to transmit and receive signals simultaneously for a communication channel. Figure 4 shows a Transceiver with a communication antenna.



Figure 4: Image of a Transceiver

6. Methodology

To accomplish the process mentioned earlier, the following equipments are needed:

- i) a water level detector
- ii) two wireless radio transceivers
- iii) a digital on/off switch
- iv) a Wi-Fi router
- v) an active internet connection
- vi) smartphone with Smart Pump Controller application installed.

Steps to be followed:

6.1 A water level detector is needed to be fitted with a water tank. The detector will detect upto what percentage of the tank is filled with water or empty.

6.2 A wireless radio transceiver is to be connected to the detector.

6.3 The transceiver should be connected to a Wi-Fi router. The transceiver will fetch the water level information from the detector and will transmit wirelessly. If the smartphone is connected to the same router, the app can access the data sent by the transceiver directly from the router.

6.3.1 The second part is to control the pump. In order to control a pump, i.e. turning it on and off, a digital switch is to be attached with the main power supply of the pump.

6.3.2 The switch is also integrated with a transceiver which is connected to the same router. One can instruct the switch to turn the pump ON or OFF from the application.

If the Smartphone is not connected to the same Wi-Fi router, the communication between the application and the stationary system in the pump and the tank will be done via internet.

It is to be noted that the user needs to have an active internet connection and power supply to the equipments should be ON during this process.

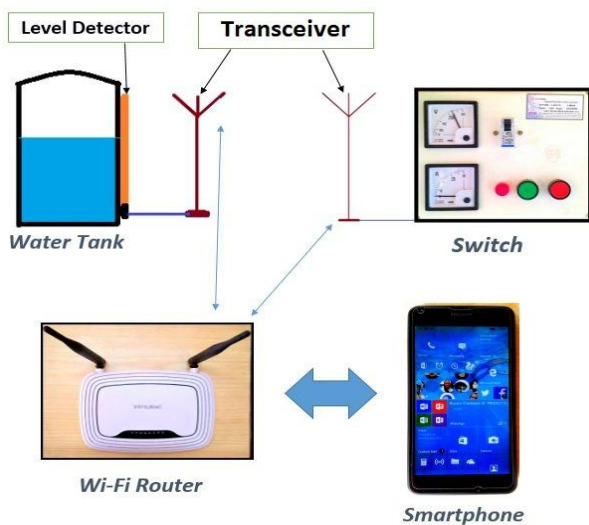


Figure 5: Schematic Diagram

7. Application Interface

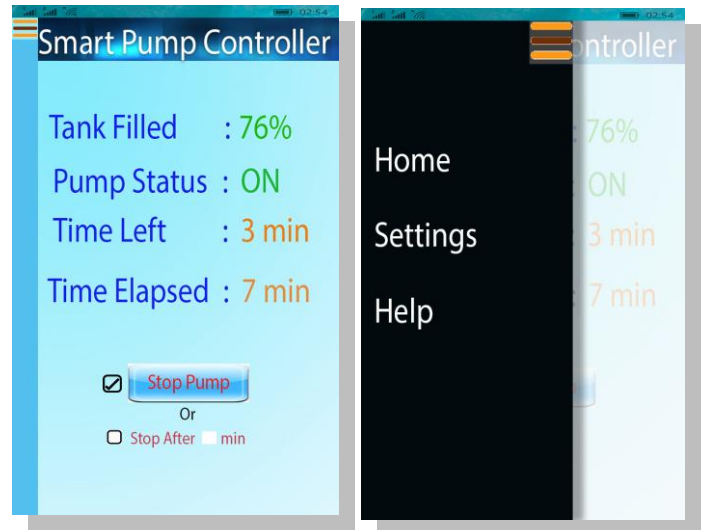


Figure 6: Home interface

Figure 7: Hamburger menu

A typical application interface is shown in the Figure 6 and Figure 7.

Figure 6 shows the Home screen where the user can view the water level percentage, pump status, i.e. whether the pump is running or not, time left to fill up the tank and time elapsed after the pump was turned ON. For more flexibility, the user can also switch the pump OFF tapping on the Stop Pump button or may choose to stop the pump after a certain amount of time. The app can automatically switch the pump OFF as soon as the water level reaches 100%.

Figure 7 shows the hamburger menu where Home, Settings and Help menus are included. One can customize the app interface and accessibility from the Settings and can get information about the app and tutorial from the Help menu.

The application is also intended to update periodically with new features and bug fixes, if any. The app can be downloaded and updated for free.

8. CONCLUSIONS

This paper has proposed a technology which can be used to control pumps used in household and buildings to fill up water tank, and in turn prevention of wastage of water. The user can control the pump even on the go, remotely from anywhere. The method is easy and user friendly. All one needs is to install the mentioned equipments in order and have the application in the smartphone. The application can be developed for other platforms like Windows, iOS, Blackberry etc.

Apart from savings of water, there is future prospect of this proposal. All the household electrical appliances can be controlled with the help of one smartphone application. For that, the switches of all the appliances will be wirelessly connected to a router, similarly as in the pump switch. One can switch the appliances ON or OFF using the smartphone application. This can be helpful to check whether any light, fan etc. has remained ON even if there is no one to use them in a room or a house or a building. It may help to prevent wastage of electricity. The system can also be integrated with the ability to measure the daily or monthly electricity usage which may be helpful to reduce electricity bill by optimizing consumption. Additionally, the gas cylinders, used for cooking, can be equipped with necessary hardware to control them from the mobile application to turn them ON/OFF. It will be beneficial in houses, restaurants and hotels to make sure that the gas cylinders are duly turned off and to avoid unexpected accidents due to gas leakages.

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BIOGRAPHIES



Souvik Paul has completed his B.Tech in CSE and M.Tech in ECE from M.C.K.V Institute of Engineering in the year 2007 and 2010 respectively. He has worked in Infogen Global and SPG Solutions. He has acted as Assistant Professor in CSE dept. of Calcutta Institute of Technology. He is now teaching in THE HERITAGE ACADEMY as Assistant Professor of BCA(H) dept. His research interest in AD HOC network, GPS, AI, Remote Sensing.



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