IoT BASED HARDWARE REALISATION FOR WATER AND ELECTRICITY SAVING APPLIED TO HOUSEHOLD APPLICATION

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Abstract

The aim of this article is to conserve water and electricity used in household application particularly in lavatory with next generation technology that is IoT (Internet of Things). Further study on saving of the existing lavatory that should be improved in terms of electricity and water consumption. The microcontroller ATmega328 is used to interface the switch of light, exhaust fan and the inlet valve of water supply. The PIR sensor is used to detect the motion of user inside the lavatory. This will reduce human efforts to control the switch manually by applying this innovative idea in real life scenario, this design can be successfully brought into implementation. The saving in term of water and electricity is presented as results of improvement.

Key words: IoT, Microcontroller, PIR, Energy Saving.

1. Introduction

The Water & Electricity Saver for Lavatory was implemented because many researches are pointing to the problem of energy and water saving [1] - [3]. Many time the user, especially children and teenagers, forget to switch off the light as well as taps are kept open in the lavatory. Due to this excess amount of water and electricity is consumed.

In many places such as hospitals, colleges, offices etc. it has been found that electrical appliances are kept ON always, this result wastage of electricity. Similarly, wastage of water is also a big problem; hence this article will provide a perfect solution to the society. Also the slogan 'Save water, Save Energy & Save Earth' will be attained.

2. Microcontroller and node MCU hardware realisation

In this article atmega328 can be used because of their advantages as compare with other microcontroller like small in size, cheaper in cost and easy to burn. the atmega328 is an 8 bit microcontroller which has 32k flash memory, 2k internal sram and 1k eeprom. it has 28 pins. node mcu is a microcontroller which having in build wi-fi and microcontroller capabilities. which will be very useful to make wireless connection between iot based water power saver setup and smart mobile phone, so that it is very easy to observe the utilization of electricity and water consumption on daily basis [4] – [7].

3. Sensor information

In this article PIR sensor is used PIR stands 'Passive Infrared Sensor'. As it is a passive device, it does not emit or generate energy. PIR sensor detects the motion when there is change in the temperature or any movement in the respective region hence it is also called as movement detector. It work entirely by detecting the energy that is radiated by other object like human or animal. The diagram shows the PIR Sensor Module. The white cap is a group of Fresnel lens. The range of detection of the sensor is wide approx 3 meters to 10 meters [8] – [10].

The IC used is BISS0001, it has two potentiometer, one is sensitivity potentiometer with a range of 7m. Other one is control time delay with delay of 0.3 sec to 5 min. It need 3-5 volts and in this article used 5 volt. Its movement detection range is also depending upon its orientation it means how it can be installed [11].

![Fig. 1 : PIR sensor module](source: bestengineeringprojects.com)
4. Principle of working with Solenoid valve

Solenoid valve is an electromechanical device. It is used to control the flow of water. It operates on 12V DC. When electric current is provided the magnetic field is generated around the coil [12] – [13]. This will pull the coil up and allow water to flow [3].

![Solenoid valve wiring](source: web.cecs.pdx.edu)

Fig. 2: Solenoid valve wiring (source: web.cecs.pdx.edu)

5. System Description and General Discussions

The article mainly depend upon the following main components such as microcontroller ATMEGA 328P PU, PIR sensor and solenoid valve. Here there is a need to control the operation of exhaust fan and water supply. In this article PIR sensor is used to detect the motion of user, according to the detection of sensor switch will operate. The IC 555 will generate the delay. The supply will remain ON until the user is inside the lavatory. The sensor output will be given to the microcontroller arduino for further process.

The microcontroller ATMEGA 328P PU operates when 5V power is given. For interfacing the exhaust fan and the light to the microcontroller use relay, and the relay will be operated using relay driver which gives signal to the microcontroller ATMEGA 328PU.

6. Conclusion

By comparing the readings of electricity and water consumption, before and after the IoT based water saver installation, it is expected that the consumption of electricity was reduce from 129 units to 57 units and that of water was reduce from 6250 litres to 2851 litres.

Even though the above outcome is achieved, still further improvement could be carried out and make the device more effective. The overall performance of device is good, but by making some advancement we can make the system fully automatic. If user want to control all the working globally, it can be possible by using NODE MCE ESP 8266 device. It means that further automation is possible with the help of next generation technology that is (IoT) Internet of Things.

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