Save electricity for lavatory

[1]Prof. Y. S. Kale, [2]Akash Sonewane, [3]Akhil Nair, [4]Bhagyashree Palandurkar, [5]Sakshi Acharya, [6]Shruti Raut

Dept. of Electronics & Telecommunications
Yeshwantrao chavan College of engineering ,Nagpur,India

Abstract

The aim of this article is to conserve water and electricity used in household applications, particularly in lavatories with next generation technology that is IoT (Internet of Things) and further study on characteristics of the existing lavatory that should be improved in order to further minimise electricity and water consumption. The microcontroller ATmega328 is used to interface the switch of exhaust fan and the valve of water supply. The PIR sensor comes in use for detecting a user inside the lavatory through his/her body movement. This will reduce human efforts to control the switch manually. By applying the 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.

I. INTRODUCTION

The Water & Electricity Saver for Lavatory was implemented because many researches are pointing to the problem of energy and water saving. Water shortage is a big menace in today's world. The number of cases of droughts and water scarcity, that occur annually across the globe, are on an all time rise. Shortage of potable water and a looming energy crisis is what the world would be staring at in the near future. In these times, even the minimal of efforts will go a long way in ensuring sustainability of our world. A smart lavatory is just the small effort, we as engineeers with our best of technical knowledge ,came up with and ensure we are do our best.

Many times in a lavatory, 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 electronics appliance are kept on standby mode. This result in wastage of electricity. Similarly, wastage of water is also a big problem. Hence this project will be proved as a boon to the society. Also the slogan 'Save water, Save Energy & Save Earth' will be attained.

II. MICROCONTROLLER AND NODE MCU HARDWARE REALISATION

In this article Atmega328P PU 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 32Kb flash memory, 2Kb 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.

III. 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 working is entirely based on detecting the energy that is radiated by other objects like human or animal. The diagram shows the PIR Sensor

Module. The white cap mounded on top is a group of Fresnel lens. The range of detection of the sensor is wide approx 3 meters to 10 meters.

The IC used is BISS0001. It has two potentiometers. 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 also depends upon its orientation, which means it has to be installed properly .

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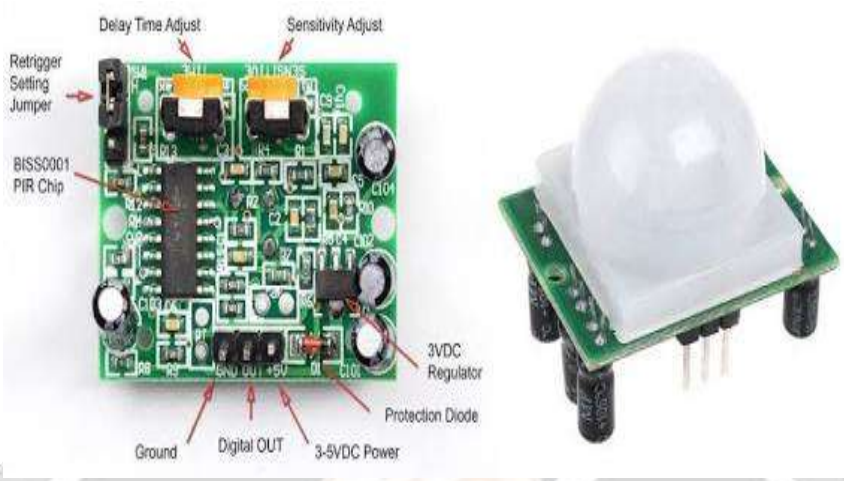
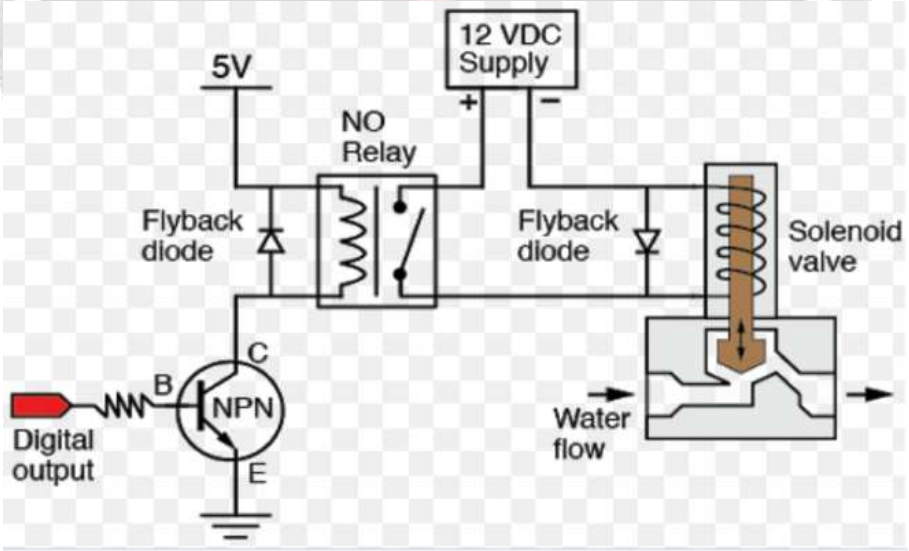


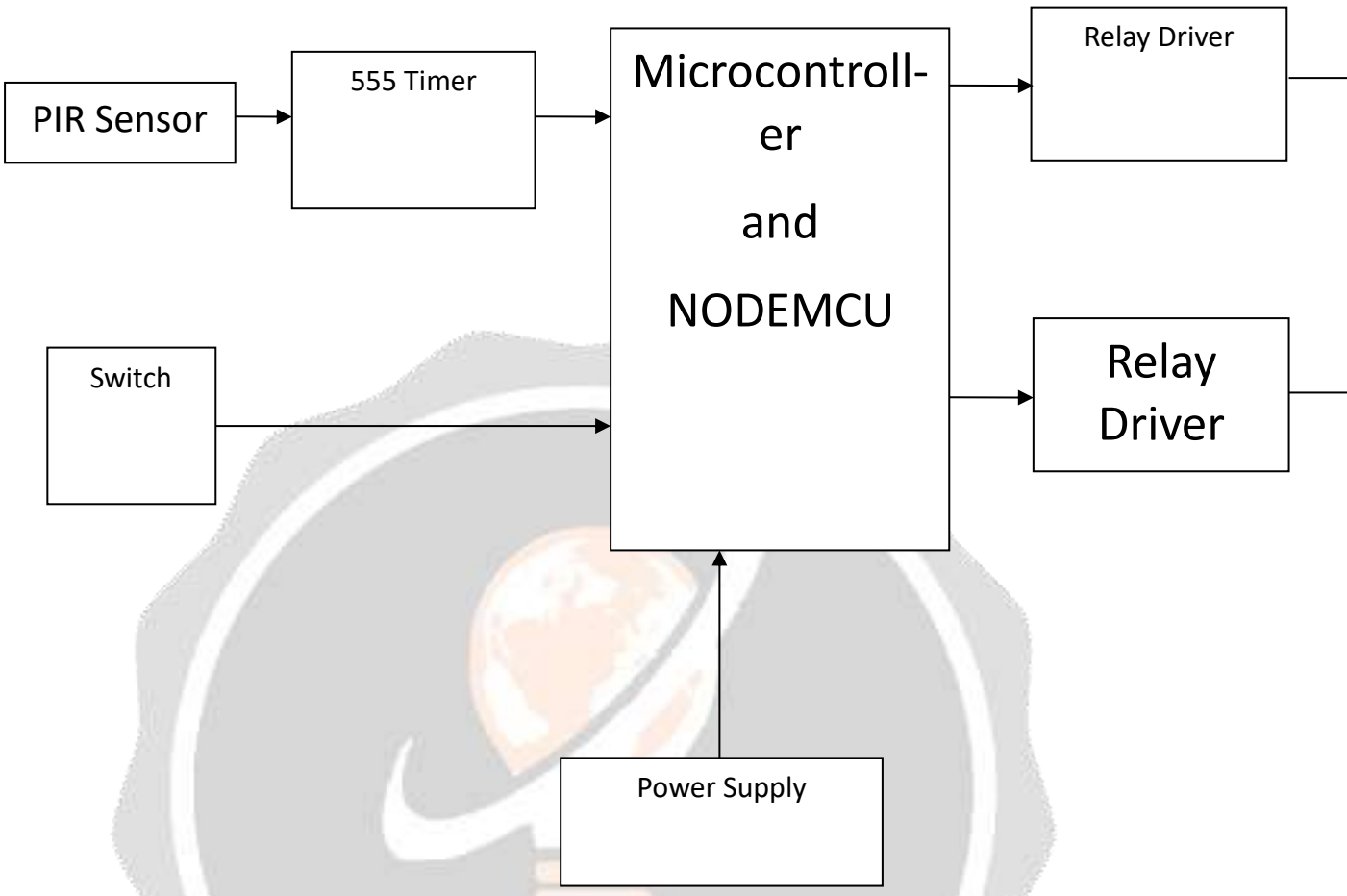
PIR Sensor Module

IV. PRINCIPLE OF WORKING WITH SOLENOID VALVE

Solenoid valve is a device operated electromechanically. It is typically used to control the flow or direction of water or any fluid flowing through the fluid power system. 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].



V. SYSTEM DESCRIPTION AND GENERAL DISCUSSIONS



The above block diagram shows the circuitry of the project. The main components are microcontroller, PIR sensor and solenoid valve supply. Here we need to control the operation of light and water supply. We have connected the PIR sensor which will 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 will operate when 5V power is given. For interfacing the exhaust fan and the light to the microcontroller we use relay. Relay will be operated using relay driver. Relay driver are connected to the microcontroller.

When the user enters, it will be sensed by the PIR sensor. These pulses will instruct the microcontroller to switch ON the electricity as well as water supply. Hence the solenoid valve will open and water will be supplied. Once the user leaves the lavatory and if he fails to switch OFF the main switch, the supply will be automatically OFF after 3 min. While the whole functional characteristics of the water and electric supply would be continuously displayed on the device connected to the NodeMCU. This system is tested at YCCE (Yeshwantrao Chavan College of Engineering) lavatory for duration of Two month. During the first month IoT based water saver was not installed and the electricity consumption and water reading were measured, it is observed that electricity sub-meter show total meter reading for one month is 129 Units and Flow meter show total meter reading for one month is 6250 litters. After the installation of IoT based water saver for the duration of one month it is observed that the electricity sub-meter show total meter reading for one month is 57 units and flow meter show total meter reading for one month is 2851 litters. So the conclusion is that without IoT based water saver more electricity and water required and with IoT based water saver the requirement is drastically reduced. In terms of percentage the wastage of water was reduced more than 50% and the electricity was reduced more than 50%.

VI. 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.

VII. REFERENCES

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