Smart Socket Using IR (Infrared) Sensor & Arduino-Nano Microcontroller

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Abstract— the title of the paper is "SMART IR SOCKET" where a power socket prototype is being developed. Besides that, control systems will also being develop in order to control and obtain the operation detail of the socket such as date and time. AVR microcontroller has playing the role as main source to control the power socket via the power line modem in the project. No more additional wire just plugs and use, easy to use and install, one power socket provide power and communication needed are all the purpose of the implementation of this project.

I. INTRODUCTION

The recent developments in technology which permit the use of radio frequency (RF) technology such as Bluetooth, and radio spectrum have enabled different devices to have capabilities of communicating with each other. Radio frequency (RF) is a new technology, which has at its center, the goal of eliminating wired communication among electronic devices. Instead of connecting with wires, every appliance has small RF transmitters/receivers. The radio frequency used (2.4GHz) is so high that the range of transmission will be small (about 30 feet). This is important because the range is so small, that it can be used in apartments without much interference to your neighbors or from them. These are few reasons that make Bluetooth technology ideal for home automation. This analogy motivated the idea behind this work. Modern homes provide electricity to electrical devices through the last element of the power supply chain, the power sockets, which have been regarded traditionally as a mere junction. In fact, power sockets have not evolved as fast as other everyday devices, although they seem to be one of the best positioned candidates to be improved as smart homes are becoming increasingly popular

II. COMPONENTS

A) Power Supply

This unit is very important part of the project. We use +5v regulated supply which is obtained from regulator LM7805 IC. The power supply unit consists of different unit like – Transformer- step down converts' high voltage ac main voltage

C) ARDUINO-

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get

ac. Rectifier – this converts ac to dc but the dc obtained is varying dc. First two number shows positive voltage & last two number shows magnitude of voltage. Output Current up to 1A.

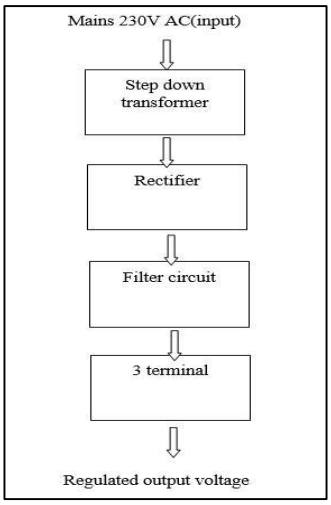

Fig. 1: Power Supply

B) Infrared sensor (TSOP1738)

The TSOP 1738 is a member of IR remote control receiver series. This IR sensor module consists of a PIN diode and a pre amplifier which are embedded into a single package. The output of TSOP is active low and it gives +5V in off state. When IR waves, from a source, with a centre frequency of 38 kHz incident on it, its output goes low. Lights coming from sunlight, fluorescent lamps etc. may cause disturbance to it and result in undesirable output even when the source is not transmitting IR signals. A band-pass filter, an integrator stage and an automatic gain control are used to suppress such disturbances.

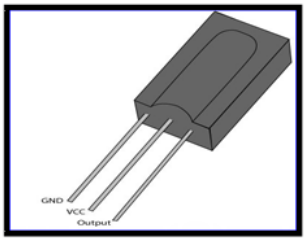

Fig. 2: Infrared Sensor

started.. You can tinker with your UNO without wiring too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

Fig. 3: UNO Arduino

D) Relay Module

For the relay module, we have used a 5V relay module which nicely integrates a relay on a board, along with all the required components to control the relay from the Arduino board. This is a picture of the relay module I used. Relays are most commonly used switching device .To Control (On/Off) Heavy loads at a pre-determined time/condition. Used in safety circuits to disconnect the h load from supply in event of failure. For Home Automation projects to switch AC loads. Relay has three high voltage terminals (NC, C, and NO) which connect to the device you want to control. The other side has three low voltage pins (Ground, Vcc, and Signal) which connect to the Arduino

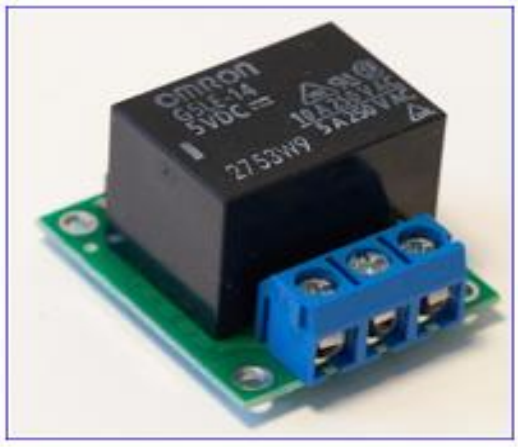

Fig. 4: Relay Module

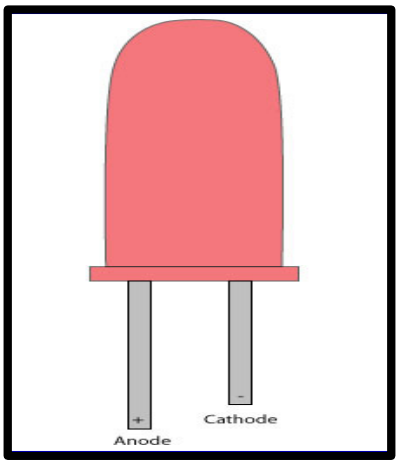

Fig. 5: LED

E) LED

Light emitting diodes (LEDs) are semiconductor light sources. The light emitted from LEDs varies from visible to infrared and ultraviolet regions. They operate on low voltage and power. LEDs are one of the most common electronic components and are mostly used as indicators in circuits. They are also used for luminance and optoelectronic applications.

F) TRIAC BTA12

Available either in through-hole or surface mount packages, the BTA12, BTB12 and T12xx Triac series are suitable for general purpose mains power AC switching.

Features:

[1] Medium current Triac
[2] Low thermal resistance with clip bonding
[3] Low thermal resistance insulation ceramic
[4] for insulated BTA High commutation (4Q) or very high

III. SYSTEM INFORMATION

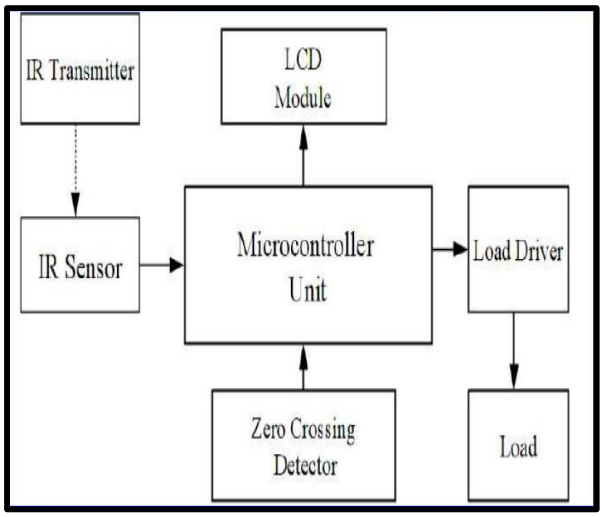

Fig. 6: System Block Diagram

This project contains two components which are the hardware and software components. On the hardware part, the IR transmission function needed to be developed with the pic microcontroller in order to control appliances through power Interfacing of power line modem with pic microcontroller is the main part of the hardware while the software part requires designing a control system panel that is able to interact with the hardware. All the operation of the prototype with control interface is using the IR communication.

Infrared (IR) is a wireless mobile technology used for device communication over short ranges. IR communication has major limitations because it requires line-of-sight, has a short transmission range and is unable to penetrate walls. IR

transceivers are quite cheap and serve as short-range communication solutions. Because of IR's limitations, communication interception is difficult. In fact, Infrared Data Association (IrDA) device communication is usually exchanged on a one-to-one basis. Thus, data transmitted between IrDA devices is normally unencrypted.

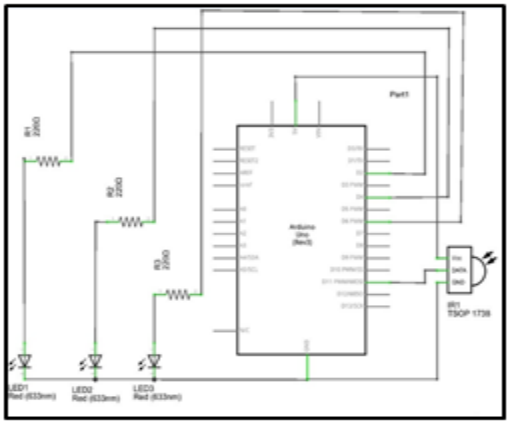

Fig. 7: Circuit Diagram

This simple RF transmitter, consisting of a 434MHz license-exempt Transmitter module and an encoder IC, was designed to remotely switch simple appliances on and off. The RF part consists of a standard 434MHz transmitter module, which works at a frequency of 433.92 MHz and has a range of about 400m according to the manufacture. The transmitter module has four pins. Apart from "Data" and the "Vcc" pin, there is a common ground (GND) for data and supply. Last is the RF output (ANT) pin. This circuit complements the RF transmitter built around the small 434MHz transmitter module. The receiver picks up the transmitted signals using the 434 Mhz receiver module. This integrated RF receiver module has been tuned to a frequency of 433.92MHz, exactly same as for the RF transmitter. Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as as microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package. A infrared remote control, or IR remote, uses infrared waves to transmit a signal to an electronic device.IR remotes are very common; they're used in devices such as garage door openers, remote control toys and remote car-entry key, remote wall sockets, etc. An IR remote encodes commands in binary form. The commands are sent via the infrared waves to devices on the receiving end e.g. a DVD player that decode the commands and send them to the right place (volume up/down, etc.). However, can only go 30 feet (9 meters) and need line of sight. Instead of sending out light signals, an IR remote transmits infrared waves that correspond to the binary command for the button you're pushing. A infrared receiver on the controlled device receives the signal and decodes it. The problem with IR remotes is the sheer number of infrared signals flying through the air at any given time. This lets the infrared receiver on the intended device know when to respond to the signal and when to ignore it.

IV. RESULTS

IR remote wall socket is one of the most common real world digital wireless device that help to determine the state of our electronic device, either ON or OFF. Some electronic device do not have a power switch to them ON or OFF. Such device depends only on wall socket to switch tem on or off. Due to IR wall socket standby energy consumption of appliances get reduce. This helps saving the energy. We can operate this IR remote wall socket from any location within 100 meter. It limits the charging time of mobile/laptop/camera battery charger by using timer function of smart socket.

V. CONCLUSION

In this paper we propose a design which reduces the standby power considerably. The MCU in the proposed Socket control the power supply by considering user approach and working status of appliance, which is new and more benefit than the products available in market. The proposed low standby power socket consumes only 0.5 W. Additionally, our design, which is equipped with ZigBee module for smart metering application. The proposed system is easy to set up.

VI. REFERENCES

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