

Journal of IR Remote Controlled Home Automation using Arduino

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Abstract – Traditionally electrical appliances in a home are controlled via switches that regulate the electricity to these devices. As the world gets more and more technologically advanced, we find new technology coming in deeper and deeper into our personal lives even at home. Home automation is becoming more and more popular around the world and is becoming a common practice. The process of home automation works by making everything in the house automatically controlled using technology to control and do the jobs that we would normally do manually. Home automation takes care of a lot of different activities in the house. The main objective of this project is that we are controlling our home appliances using a simple circuit. That circuit consist of a IR module. That receive the signal from our TV/VCD remote. Output of that sensor goes to the clk of IC4017 that is used to shows the status of our home appliances either in on/off state. Output of the IC is given to transistor which amplifies the signal and then through a diode. The appliance to be controlled is connected between the pole of the relay and neutral terminal of mains. It gets connected to live terminal of AC mains via normally opened (N/O) contact when the relay energises. Our project is a Remote Operated Home Appliance or Remote controlled Home appliance. The circuit is connected to any of the home appliances (lamp, fan, radio, etc) to make the appliance turn on/off from a TV, VCD, VCR, Air Conditioner or DVD remote control. The circuit can be activated from up to 10 meters. It is very easy to build and can be assembled on a general-purpose PCB. The circuit essentially consists of a transmitter consisting of a 555 IC, the receiver consisting of an IR module, CD4017 IC, LED's to indicate the reception of the IR radiations, otherwise indicating the ON/OFF state, relay and other components.

Index Terms – Transistor, Relay, Automation, Infrared, Sensor.

1. INTRODUCTION

The aim of the proposed system is to develop a cost effective solution that will provide controlling of home appliances remotely and enable home security against intrusion in the absence of homeowner. The home appliances control system with an affordable cost was thought to be built that should be providing remote access to the appliances and allowing home security. Though devices connected as home and office appliances consume electrical power. These devices should be controlled as well as turn on/off if required. Most of the times it was done manually. Now it is a necessity to control devices more effectively and efficiently at anytime from anywhere. In this system, we are going to develop a remote control based home/office appliance. Remote control for home appliances is

an absolute necessity in our fast-paced life. As a result, much important has been given to this aspect and a range of remote controls are prevalent today. One of the most common is that which makes use of IR radiations at particular frequencies. Our product is a Remote Operated Home Appliance or Remote controlled Home appliance. The circuit is connected to any of the home appliances (lamp, fan, radio, etc) to make the appliance turn on/off from a TV, VCD, VCR, Air Conditioner or DVD remote control. The circuit can be activated from up to 10 meters. It is very easy to build and can be assembled on a general-purpose PCB. For this purpose we make a circuit that consist of a IR module, CD4017 IC, LEDs to indicate the reception of the IR radiations, otherwise indicating the ON/OFF state, relay and other components.

2. RELATED WORK

A smart home covers several theoretical and practical approaches that deals with living today and in the future. There are various ways and methodologies to automate home through wireless communication technology. Some of them are as follows:-

(a) A proposed methodology to automate home by using android for mobiles. The use of android mobile phone's inbuilt facility was discussed i.e. Bluetooth to automate home along with the use of an ATMEL 89C51 and 8 bit microcontroller.

(b) Another proposed methodology was about controlling home appliances through remote operated master switch via infrared technology. They had introduced a unique remote control circuit to permit the automatic control of switches and switchboards from a remote location that does not require any internet network or mobile network or battery. A completely hardware based system.

(c) Another proposed a solution of home appliance controlling by the use of IR remote control signal decoder. Discussion about the use of NEC555 timer IC, decade counter, Triac along with IR sensor to automate home. It was also a hardware based project.

(d) Another paper shows another way to automate home through a PC Internet-Uno microcontroller based home automation system. this paper shows an another way to automate home through a PCInternet-Uno microcontroller

based home automation system. The proposed system has two operational modes.

3. PROPOSED MODELLING

After considering all the aforementioned techniques, we have designed a system that aims to control the home electrical appliances using IR sensor and arduino board microcontroller. The proposed system has no limitation of network and coverage. It also focuses on the elderly people, disabled, normal beings and those people who face difficulties in speaking. It is affordable and easy to install.

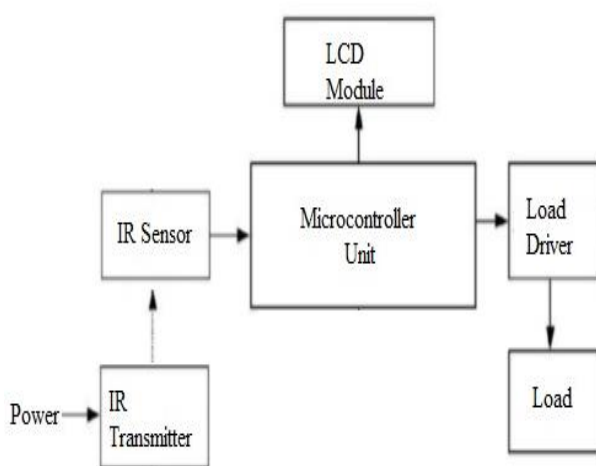


FIG 1.1 DIAGRAM OF PROPOSED SYSTEM

In the proposed scheme, IR based wireless communication technology is implemented along with arduino board. The IR sensor is in-built in remote which send the coded infrared signal (as chosen by the user) to the IR module at the receiving section. The IR Receiver module is connected to the controlling unit i.e. arduino. The IR Receiver module passes the coded data to the arduino board. The arduino board then compares the received code with the codes stored in it and then decode it. On the basis of decoded data/signal it produces the relevant outputs i.e. switch ON/OFF of the desired appliances. No more than 3 levels of headings should be used. All headings must be in 10pt font. Every word in a heading must be capitalized except for short minor words as listed in Section III-B.

4. WORKING OF THE CIRCUIT

Connect this circuit to any of your home appliances (lamp, fan, radio, etc) to make the appliance turn on/off from a TV, VCD or DVD remote control. The circuit can be activated from up to 10 meters.

Working of the IR module :The 38 kHz infrared (IR) rays generated by the remote control are received by IR receiver

module TSOP1738 of the circuit. Pin 1 of TSOP1738 is connected to ground, pin 2 is connected to the power supply through resistor R5 and the output is taken from pin 3. The output signal is amplified by transistor T1 (BC558). Arduino is a pre-burned microcontroller using arduino IDE software, in which codes are designed and written is usually dumped into it via computer.

IC CD4007 : The amplified signal is fed to clock pin 14 of decade counter IC CD4017 (IC1). Pin 8 of IC1 is grounded, pin 16 is connected to Vcc and pin 3 is connected to LED1 (red), which glows to indicate that the appliance is off. The output of IC1 is taken from its pin 2. LED2 (green) connected to pin 2 is used to indicate the on state of the appliance.

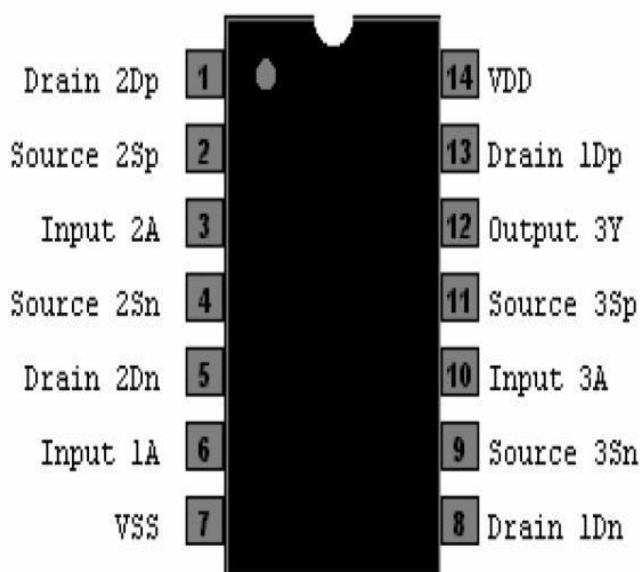


FIG 1. 2 IC CD 40007

Diode 1N4007 : Diode 1N4007 (D1) acts as a freewheeling diode. A freewheeling diode is put into a circuit to protect the switching device from being damaged by the reverse current of an inductive load(relay).

Relay: The appliance to be controlled is connected between the pole of the relay and neutral terminal of mains. It gets connected to live terminal of AC mains via normally opened (N/O) contact when the relay energizes. In short we can say relay is like a switch which is necessary to control a circuit A relay is an electrically operated switch.

Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

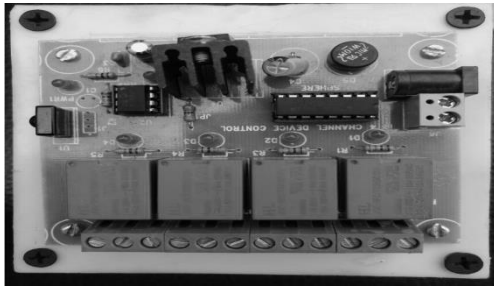


FIG 1.3 Designed hardware image

The TSOP receiver is a 3 pin IR receiver which detects 38 KHz frequency and generates a low voltage output to the timer IC's trigger pin, with the timer working in monostable operation. The output of the mono toggles the J-K flip flop, whose Q output drives the relay through BC547 NPN transistor (Q1). LED-D1, LED2-D2, and LED3-D6 are used to display the status of each output stage during circuit operation. Back-EMF diode D5 is used for protection. Transistor Q1 is configured as an open-collector output device to drive the relay rated at 12V DC. The circuit can draw the power from voltage regulator 7805. Capacitor C3 is soldered close to the IR sensor's pins to avoid noise and false triggering. Capacitor C2 and resistor R1 also avoid false triggering of mono stable NE555. The mono stable acts as a 1-second hysteresis unit to restrict the flip-flop from getting re-triggered within one second. To activate any other load use the relay coil terminals in series. The 555 Timer is triggered with a low logic signal and produces a high logic pulse to the clock signal of the JK Flip-flop and the K input of the F/F. The J input is also connected to high logic; hence the output of the Flip-Flop which was at logic low signal gets toggled to high logic output, causing the transistor to be switched on and the cathode of the LED gets connected to ground along with the other end of the relay. Thus current flows through the relay coil and it gets energized causing the armature to deviate from its normal position and complete the circuit joining the AC source to the lamp (load) which starts glowing as current passes through it. Thus by pressing the required button on the remote, we can switch on the lamp. All the mathematical equations should be numbered as shown above.

5. CONCLUSIONS

In this paper, the proposed technique i.e. home automation through IR sensor and arduino board microcontroller has been

discussed and its application for home appliances successfully demonstrated. The system is cheap, reliable, and easy to install and operate. The proposed system is however, applicable to automate the appliances of single room only as IR sensor requires line of sight (LOS) to communicate. The same concept can also be extended further to automate multiple rooms by using the combination of IR and RF sensors and the range can also be extended to few more metres by using higher range IR and RF sensors.

6. FUTURE WORK

This is a very smart and intelligent system approvable for all the age groups and has a variety of uses in almost all the areas where instruments need to be automated and controlled as per the human need and enhance facility.

This instrument is basically used to regulate and overcome all the obstacles .

It is possible that the operating range and the instrument operability in terms of number of instruments can be modified .

It can be used in the case of a number of devices and applications such as TV, VCR, camera, CD speller, radio, lamp, fan, music system or even simple tasks.

REFERENCES

- [1] S. M. Anamul Haque, S. M. Kamruzzaman and Md. Ashraful Islam1 "A System for Smart-Home Control of Appliances Based on Timer and Speech Interaction" Proceedings of the 4th International Conference on Electrical Engineering & 2nd Annual Paper Meet 26-28 , pp. 128-131, January, 2006J. Breckling, Ed., The Analysis of Directional Time Series: Applications to Wind Speed and Direction, ser. Lecture Notes in Statistics. Berlin, Germany: Springer, 1989, vol. 61.
- [2] Prashant Chakole and Dr. Pradip B. Dahikar "RF Remote Control of Power Line Devices Using Embedded System" proceeding of International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, Issue 3, May 2013
- [3] Rifat Shahriyar, Enamul Hoque, S.M. Sohan, Iftekhar Naim, Md. Mostafa Akbar and Masud Karim Khan "Remote Controlling of Home Appliances using Mobile Telephony" Proceedings of the International Journal of Smart Home Vol. 2, No. 3, July, 2008.
- [4] Tam Van Nguyen, Dong Gun Lee, Yong Ho Seol, Myung Hwan Yu, Deokjai Choi, "Ubiquitous Access to Home Appliance Control System using Infrared Ray and Power Line Communication", ICI 2007, 3rd IEEE/IFIP International Conference in Central Asia, Tashkent, Uzbekistan, vol 1, pp1-4,26-28 Sept.20
- [5] Malik Sikandar Hayat Khoyal, Aihab Khan, and Erum Shehzadi "SMS Based Wireless Home Appliance Control System (HACS) for Automating Appliances and Security". Issue in Information Science and Information Technology Vol 6., Pp 887-894, 2009.
- [6] Mr. Pawan Sharma, Mr. lokesh Mehta "SPY Night Vision Robot with Moving Wireless Video Camera & Ultrasonic Sensor"