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Wireless Electrical Appliances Using IR Sensors

G. Mani Muthu Rajan, S. Kumaresan, S. Loganathan V. Gopala Krishnan

UG Students, Department of Mechatronics Engineering
Paavai Engineering College,
Namakkal-637018, Tamil Nadu, India.
*Correspondence author, E-mail address: manimuthurajan.4@gmail.com

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ABSTRACT

The main objective of Home automation is to provide a wireless communication link of home appliances to the remote user. The main fact of this work is to make such a system which controls the home appliances remotely. In modern days, we have to use various high-tech machineries and equipment's to get our jobs done and make the life easier. Smart home is one of these types of system assembled with home appliances which we wish to control smartly from remote location. Some products are commonly available which allow home appliance controlling through t.v remote which is undoubtedly emerging. But it lacks the true sense of real portability and security, making the remote home appliance controlling a limited term than it is assumed to be. In search of a true remote and adequately secure solution to be really effective and practicable, Infrared technology is more valuable than any other solutions for small purpose. A unique remote control circuit is used to pass the automatic control of switches and switchboards from a remote location that does not require any internet network as well as mobile network or battery. The remote control circuit of this invention permits such control with only one low-power control wire per switch. The remote transfer a tone using an infrared light-emitting diode. This tone is decoded by a receiver having a TSHOP, considering the receiver only switches via relay when the tone is received.

Keywords: Infrared Technology, Remote Control, Switch Boards, Light emitting diode.

INTRODUCTION

Home automation is not a new thought in today's world, it is used to provide convenience for user to remotely control and monitor the appliances and it provides a finer use of electricity. The efficient use of electricity makes the HOME automation to play an vital role in daily life. As by the growth of PC (personal computers), internet, mobile phone and wireless technology compose it easy for a user to remotely access and controls the appliances. A lot of research has been done and many solutions have been suggested to remotely access the HOME appliances. Some of them used internet, wireless technology to convey and control home appliances, others used Bluetooth and GSM technology for controlling the home appliances but all execution is not efficiently useful because some require a mobile device or internet which is not commercial for domestic uses as well as it required a network so these devices is not properly work when there is no network or signal strength weak. Advanced method reduces the wiring and complexity of the system. It has no drawback of network, coverage and any GSM network; it provides

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flexibility to the system. It is mainly focused on the elderly people, stables and for the people who are unable to stand up or face difficulties in speaking. It is affordable to everyone, moderate and easy to install. As there is no wired communication between the remote user and appliances control width and the electronic devices used to check are easily available making it a cost effective solution.

In these research paper, A circuit is construct to switch on/off any home or industrial appliance by using the TV/DVD remote controller. The circuit can be regulated up to a distance of 5-10 metre depending on the remote used. The circuit consist of a step-down transformer X1 (6V-0-6V, 250mA secondary), 5V regulator 7805 (IC1), two 5V, 1 change-over (C/O) relay, a timer NE555 IC (IC2), an Infra Red receiver module (IRX1 TSOP1738) and some discrete components. The circuit is connected to any of the home appliances to make the appliance turn on/off from a VCD, VCR, Air Conditioner or DVD remote control. The circuit can be triggered from up to 10 meters. It is very easy to build and can be massed on a general-purpose PCB. Remote control efficiency the operation of fan regulators around the home or office from a distance.

The "Home Intelligence" system is based on the use of a network of sensors and intelligent circuitry attached to the domestic appliances and disrupted by the different rooms in a home space. We can save our time, energy and manage to take behaviour on switch over of all the room appliances. They probably depend upon somebody to help them out so that they would unlax for a while; the important thing is that the elderly and disabled persons just to wait for getting the service. Home appliances to control over radio waves around your home automatically it are not an imagination now this dream is come to an existent. The paper presented here is a research work on the radio waves to control power line devices using embedded system. In this exploration work we considered the power line devices as the home appliances.

COMPONENT DESCRIPTION & IR RAYS

(a) IC CD4017:

The 4017B is an integrated circuit which has been achieved to count pulses. It has 16 pins and lookslike any other 16 pin integrated circuit. They can be worn in timing circuits and are often used to switch on and off LEDs or motors or other circuits. The 4017B is most suitable when combined with a timer such as a 555 based circuit.

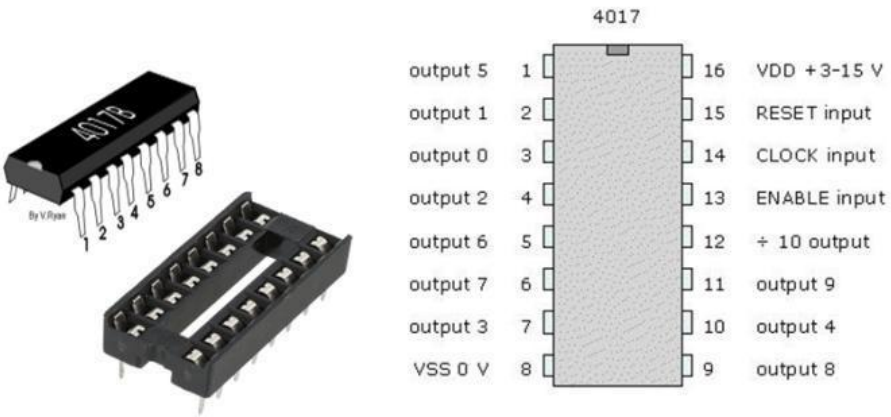

Fig. 1decade counter IC 4017B pins

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(b) IR TSOP 1738:

The TSOP 1738 is a unit of IR remote control receiver series. This IR sensor module consists of a PIN diode and a pre amplifier which are installed into a single package. The output of TSOP is active low and it gives +5V in off state. When IR waves, from a origin, with a frequency of 38 kHz incident on it, its output goes low. It has three terminals as positive negative & output. TSOP1738 notice only 38KHz modulated IR light (ideally). TSOP1738 is a very popular and commonly used infrared sensor. It is regularly used remote control system applications.

(c) SPDT Relay:

SPDT means Single Pole Double Throw Relay. A relay is an electrically operated switch. Current flowing through the coil of the relay generates a magnetic field which attracts the lever and changes the switch contacts. There are 5 Pins in a relay. Two pins A and B are ends of a coil that are kept inside the relay. The coil is wound on a small rod that gain magnetized whenever the current passes over it. COM/POLE is always connected to NC(Normally connected) pin. As current is passed over the coil A, B, the pole gets connected to NO(Normally Open) pin of the relay.

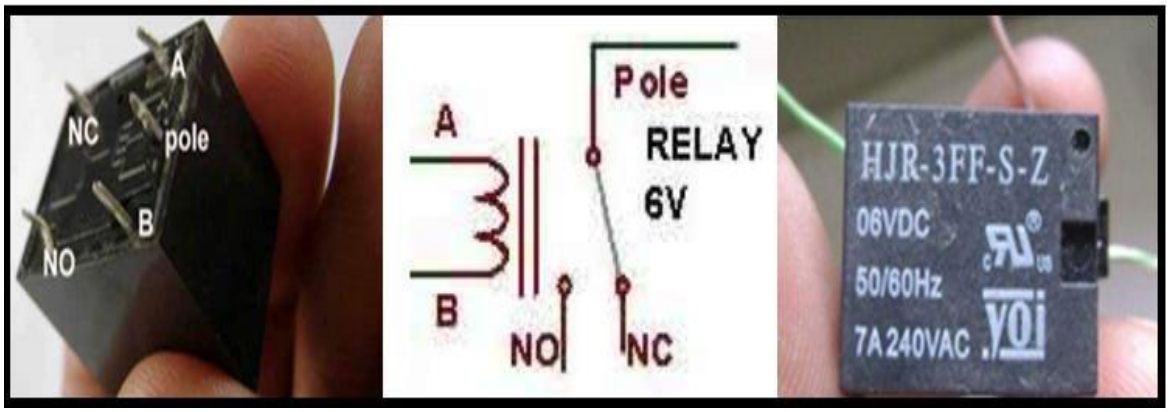

Fig. 2 SPDT Relay

(d) Infrared Rays:

Infrared (IR) light is electromagnetic radiation with deep wavelengths than those of visible light,extending from the simple red edge of the visible spectrum at 700 nanometers (nm) to 1 mm. as by The I.R transmitter the light signals are pulse width modulated and are accommmodated in the 38 KHz frequency. Infrared radiation is the region of the electromagnetic spectrum among microwaves and visible light. Infrared band of the electromagnet corresponds to 430THz to 300GHz an0d a wavelength of 980nm.

Table 1

Name	**Wavelength**	**Frequency (HZ)**	**Photon Energy (ev)**
Infrared	700nm – 1mm	430 THz- 300GHz	1.24 mev – 1.7 ev

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BLOCK DIAGRAM & WORKING

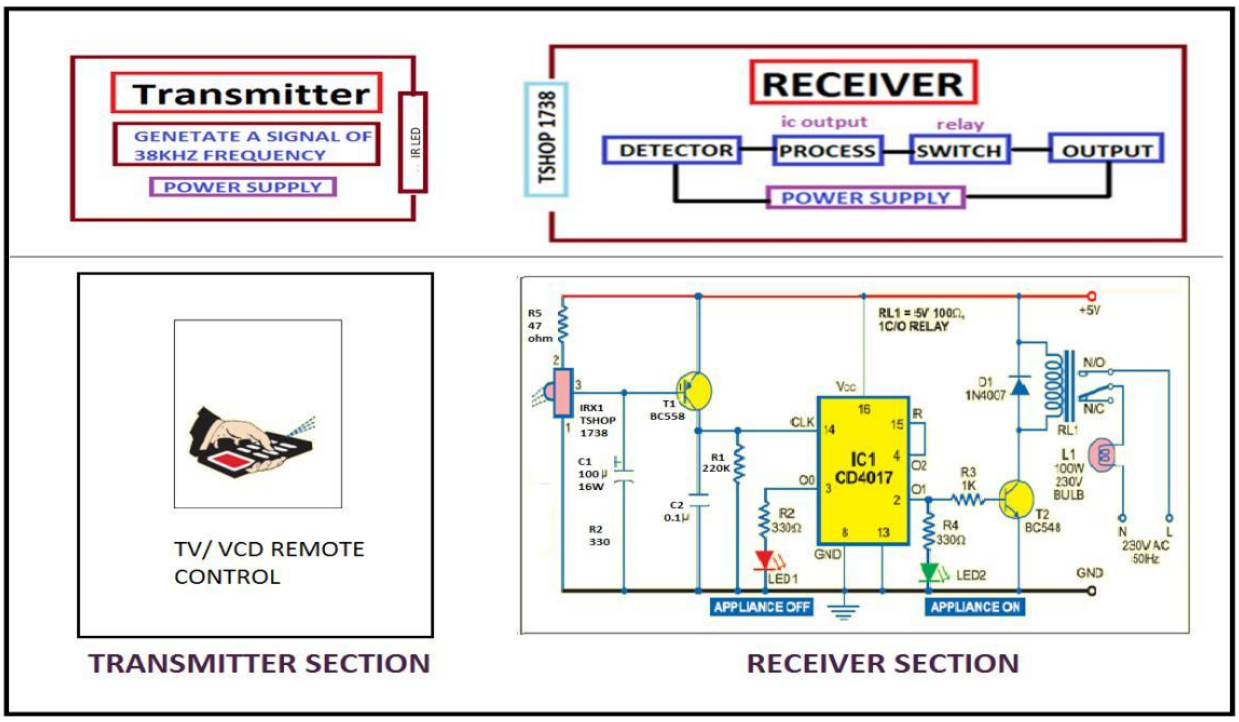

Fig. 3 Block diagram & circuit diagrams

Connect this circuit to each and every of your home appliances to make the appliance turn on/off from VCD or DVD remote control. The circuit can be switched on from up to 10 metres. The 38 kHz infrared (IR) rays generated by the remote control are accepted by IR receiver module TSOP1738 of the circuit. Pin 1 of TSOP1738 is connected to ground, pin 2 is connected to the power supply over resistor R5 and the output is taken from pin 3. The output signal go on amplified by transistor T1(BC558).The amplified signal is fill to clock pin 14 of decade counter IC CD4017 (IC1). Pin 8 of IC1 is grounded, pin 16 is allied to Vcc and pin 3 is connected to LED1 (red), which glows to designated that the appliance is „off.“ The output of IC1 is taken against its pin 2. LED2 (green) connected to pin 2 is used to indicate the „on“ state of the appliance. Transistor T2 (BC548) connected to pin 2 of IC1 drives rela y RL1. Diode 1N4007 (D1) acts as a freewheeling diode. The appliance to be composed is connected between the pole of the relay and neutral terminal of mains. It gets connected to live terminal of AC mains by normally opened (N/O) contact, when the relay energies. Using remote control for home appliances is a great choice. They can be common to on and off the appliances like TV, AC, DVD player, motor etc. with the help of our TV remote. LED's can be common to on and off. IF LED1 is glowing, it means device is off and if LED2 glows than the device connected is on. That is a low cost simple remote control circuit is based on the CD4017 counter IC which receives trigger pulse through IR sensor and switch on the relay. Since, the device is connected to relay it is again switched on. Upon receiving the second pulse motor turn into off. You can control your toy car from 5 meters range.

This is a simple remote control circuit positioned on infrared sensor IC TSOP1738. TSOP1738 contains photo detector and pre-amplifier both in packs. It is a three terminal device. Pin 1 is for ground, Pin 2 is for power supply and pin 3 is as output. Pin diagram of TSOP1738 is exposed below. Take care while connecting the pins of TSOP1738. Wrong lead supply of TSOP1738 may lead to sensor

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damage. It takes clock signal from the clock input and turn on the 10 output in sequence every time when it receives clock input pulses. It is the most popular IC and is extremely useful in project such as Light Chaser, Matrix Die. Assembled the circuit as shown in circuit diagram and apply power supply. When you try the remote, 38 KHz infrared rays (IR) is generated via remote control (which used as transmitter) and these rays are collected by TSOP1738 which act as receiver in our circuit. Then these weak signals at output pin 3 of TSOP1738 are amplified by transistorT1. Instantly, these amplified signals are fed into the clock input pin 14 of IC2. Therefore when you press each and every button on of the remote, clock input pin 14 goes high which provides a clock pulse for the working of IC2. After this receiving the clock input CD4017 starts its counter from zero (as it has inbuilt counter) and it advances little by little each time pin 14 goes high. Like first we get output from pin 3 that is Q0 and LED1 will glow. When you click the button over from remote, pin 2 of IC2 will become high and LED2 will glow. Indicating that the device is on. You have to attach a relay at the outputs. One end of relay need to be linked to collector of transistor T2 and another end of relay must be connected to supply.

DESIGN

The remote controller is depend on SAMSUNG-S3F80PB microcontroller. The programming is done in assembly language using openice compiler. The programming appearance of the remote controller implemented are as follows:

a. **Direct code set up**
   If a valid code has been enrolled, the visible LED will blink twice. Upon entry of an invalid code there shall be one long blink. Beyond entry of the invalid key sequence or invalid code remote control shall default to the previously programmed valid ID.

b. **Software blink back**
   It helps to point out the software stored in the RCU. When we enter the software blink back feature code it will blinks the LED number of times, by estimate the LED blink we find the software number.

c. **ID Lock and Unlock**
   It is used to lock and unlock the remote controller, here we are assigning some id number, when we enter that id number remote get lock and unlock. When ID lock is empower into a specific Mode, software should block the all function from that Mode, if user struggle to use function under this condition the software will generate an error after the last key is pressed. Whenever a function is in a specific Mode and then ID is locked to that Mode, the functions under that Mode hold onto not are delete-able unless the ID Lock is unlocked.

d. **Power Toggle**
   It most leased to send power signals like power on or power off the devices. In india we are using off and on buttons, but in other countries we are testing digit 1 for on the devices.

e. **Back light enable and disable**
   In remote possess some backlight LED, using this we are enabling and disabling the LED glowing.

f. **Brand set enable and disable** It helps to choose the different brand TV, DVD, VCR, Air conditioner codes from the respective brands, in RCU

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memory have set of brand sets and codes by permissive this feature we choose the code sets.

g. Factory test mode

In this mode remote controller test all the keys running properly, Press 1 and 3 simultaneously within 6 seconds of inserting batteries to insert the Factory Test Mode. Upon entering FTM, the CABLE LED will flash four times to indicate the remote is in the factory test mode. FTM hold onto be permitted by the software when a Low Voltage condition is detect, the remote will generated a long blink (error blink).

h. Manufacturing reset

It helps to restart the all manufacturing codes and keep the flash memory as empty. Once the RCU will be under goes manufacturing reset RCU not work.

i. Operational reset

In this it restart the remote control unit and reset all previous and present operations, codes.

j. Mode mover

In this RCU having various modes for different devices, here it helps to shift mode from one mode to another mode to control devices.

k. Blink out

This is used to get retaliation on the device code selected. The number of blinks after pressing each 1, 2, 3 and 4 keys is the 4 digit ID code set up for this mode. There is an approximate 0.5 seconds delay between each blink. There is 0.5 second time delay after each key press.

l. Volume lock and Unlock

The user can all over lock the volume controls to one source mode. When the Volume Lock feature is selected by the programmer, it will be stored in the FLASH so that it is maintained permanently.

m. Channel lock and unlock

The unit shall blink two times upon vitality locked and blink 4 times when unlocked. The unit shall time out after 10 seconds during programming.
Discharges the channel controls function to follow the mode selected. If no channel control key exists for the current device it will chase the pick on the functional key-chart.
When the Channel Lock feature is selected by the programmer, it will be reserved in the FLASH so that it is retained permanently.

n. Learning

To recuperate success, the learning process should be conducted in an area where there is a low level of IR emission.
High elevation of natural light and incandescent lights could interfere with a learning event. The source and target (learner) remotes need to be no more than 1 to 2 inches apart during a learning event and the IR LED of the two units should be aligned with each other.

IMPLEMENTATION

We implement the remote controller and programming appearence listed above in two separate components of the system. The first component is the hardware muddled in modifying devices to be able to operate. The second

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component is the software which muddled in making such programming features possible and operates properly.

Figure.4 shows the block diagram of remote controller. It has microcontroller, 8*8 key pad, back light led's, mode led's and learning circuit. Details of pin configuration of the RCU.

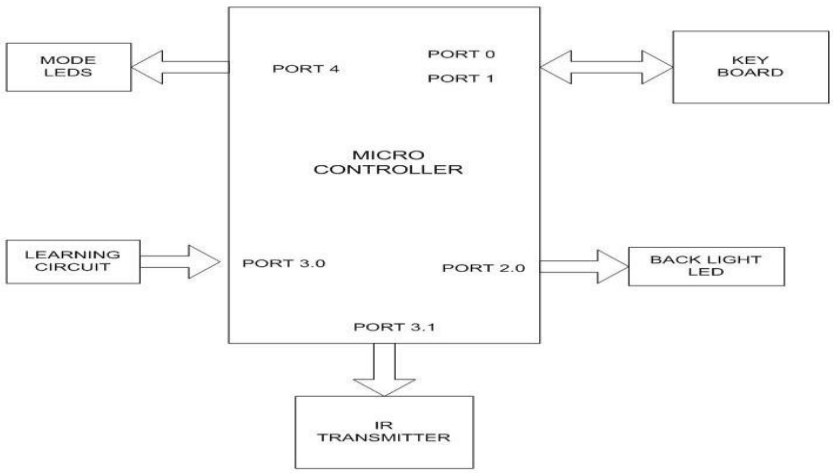

Fig.4:Remote controller unit

RESULT

The fundamental hardware test is done. Verification of key data in particular code set is done using IR Maestro, after compelling the key each key sends signals and that signals will be verified. Transmission of signal is verified using signal viewer. Programming components are developed .Result are verified.

CONCLUSION

Remote controller is one of the applications of electronics to develop the facilities of life. It gives one the ability to regulate multiple home appliances from a distance in a period of the specification. Using this RCU we can control the multiple devices with extra added programming components. A single IR remote controller can be used to manipulate the different kinds of home appliances; as they were compatible which leads to the wastage of resources.

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