International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

Design a monitoring system using RF and IR Devices

Dr. Kesavan Gopal[1], B. Sai Prasanna [2]
Professor[1], Assistant Professor[2]
Department of ECE
MREC

AbstractThis work presented here is to controlled independent home electrical appliances through RF based remote system. From any place without any line of sight around the house, RF based wireless remote control system can change the state of the electrical appliances either in on state or off state. The controlling circuit is built around RF transmitter and RF Receiver modules which are operating at 434 MHz along with encoder IC HT12E and decoder IC HT12D with few passive components. The four different channels at the encoder are used as input switches and the four channels at the decoder output are connected to the appliances through a relay. Here the transmission technique is amplitude shift keying (ASK) and the circuit is powered with 9 V. The main objective of this work is to build the circuit without any programming skill and to make it work without line of sight requirement using the RF technology

Index Terms- IC HT12E, IC HT12D, RF transmitter, RF receiver, relay, ASK.

I. INTRODUCTION

Wireless data transmission is used in numerous applications. Infra-red data transmission is employed in short-range communication among computer peripherals and personal digital assistants. These devices usually conform to standards published by IrDA, the Infrared Data Association. Infrared is the most common way for remote controls to command appliances. IR does not penetrate walls and so does not interfere with other devices in adjoining rooms and there is a distance limitation of 8 to 10m for this IR transmission. As this Infra-red communication has some distance limitations we people are going for Radio frequency (RF) communication for long range applications. Since there is no availability of RF remotes we people are going to use this IR remote and RF modules for distance communication. Remote controls and IrDA devices use infrared light-emitting diodes (LEDs) to emit infrared radiation which is focused by a plastic lens into a narrow beam. The beam is modulated, i.e. switched on and off, to encode the data. The receiver uses a silicon photodiode to convert the infrared radiation to an electric current. It responds only to the rapidly pulsing signal created by the transmitter, and filters out slowly changing infrared radiation from ambient light. Our design converts the infrared signal emitted by the remote control into an RF signal, transmits this RF signal through the air from the user to the electronic device, receives the RF signal at the other end, and converts the transmission back into an infrared signal that can be interpreted by the device. By using an RF transmission, line-of-sight is no longer needed between the user and the device. However, the original infrared remote control is still initiating the signal, which allows for full functionality of all of the features included with the electronic equipment. We are living in the Embedded World. You are surrounded with many embedded products and your daily life largely depends on the proper functioning of these gadgets. Television, Radio, CD player of your living room, Washing Machine or Microwave Oven in your kitchen, Card readers, Access Controllers, Palm devices of your work space enable you to do many of your tasks very effectively. Apart from all these, many controllers embedded in your car take care of car operations between the bumpers and most of the times you tend to ignore all these controllers. In recent days, you are showered with variety of information about these embedded controllers in many places. All kinds of magazines and journals regularly dish out details about latest technologies, new devices, fast applications which make you believe that your basic survival is controlled by these embedded products. Now you can agree to the fact that these embedded products have successfully invaded into our world. You must be wondering about these embedded controllers or systems. What is this Embedded System? The computer you use to compose your mails, or create a document or analyze the database is known as the standard desktop computer. These desktop computers are manufactured to serve many purposes and applications. You need to install the relevant software to get the required processing facility. So, these desktop computers can do many things. In contrast, embedded controllers carryout a specific work for which they are designed. Most of the time, engineers design these embedded controllers with a specific goal in mind. So these controllers cannot be used in any other place. Theoretically, an embedded controller is a combination of a piece of microprocessor based hardware and the suitable software to undertake a specific task. These days designers have many choices in microprocessors/microcontrollers. Selecting a right microprocessor may turn out as a most difficult first step and it is getting complicated as new devices continue to pop-up very often.Our objective is to develop a system in which we make use of the IR signal to emit out the particular message stored in the microcontroller and send that to the destination using the RF transceiver modems and display it on the LCD. An

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

easy to use user interface is provided in the form of an IR remote and an LCD display. This design can be effectively implemented at terminal bus stops, railway stations and even the hospitals with the minor changes as required depending upon the environment where we are going to use.

II. LITERATURE SURVEY

With the advancement of technology, number of equipment and modern household appliances increases to make life easier and comfort. Operating them manually is a tedious job and again hectic sometimes. If one can control devices like TV, fan, light or a music system with a remote from a distance place just by pressing the button, life will become simpler. Home automation is becoming very common these days as technology advances to reduce manual work. To switch on or off the devices one has to move to the switch board which is inconvenient even for an able person. If all this manual work is replaced by a single remote control even the aged and disable person can do the task like a normal person. Much related work has been reported for the same function by different groups with different approaches. Multiple home devices switch can be control with a designed system using microcontroller as heart of the circuit with android based mobile phone. Here the mode of controlling devices is by sending command wirelessly through Bluetooth [1]. IR remote control has a very wide application in the field of electronics. IR based remote control for controlling multiple home appliances with microcontroller is also reported for the same function [2], [3]. Another approach is by GSM based for home automation. This is done by sending short sms code from a mobile handset. Here it has a wider coverage area. So to control any house hold appliances from a distance place within the network area coverage sending a short sms code will either ON or OFF the devices at home [4], [5]. All these work is carried out for the same function in a different way by using different technology. Some use Bluetooth technology other use GSM technology or IR technology. Each technology has its own advantages and disadvantages over the other but they all serve the common purpose to replace manual work. The main objective of this work is to create another system to control multiple appliances by using RF technology. One of the main advantages of RF based remote control is that it can operate the appliances without the requirement of line of sight within its specified range efficiently

III. PROPOSED WORK

The presented approach has three major parts to get the desired output i.e. Transmitter, Central unit and Receiver. In the transmitter part we are going to use an IR remote to transmit the command.The Central unit is the heart of this project. It consists of a Microcontroller. An IR receiver is interfaced to the controller to receive the command. The Microcontroller now processes the command and transmits the corresponding data to the Receiver unit using RF module. The Receiver unit contains one RF module to receive the data from central unit and a Microcontroller to collect data from RF receiver and to display the data on LCD.

BLOCK DIAGRAM:

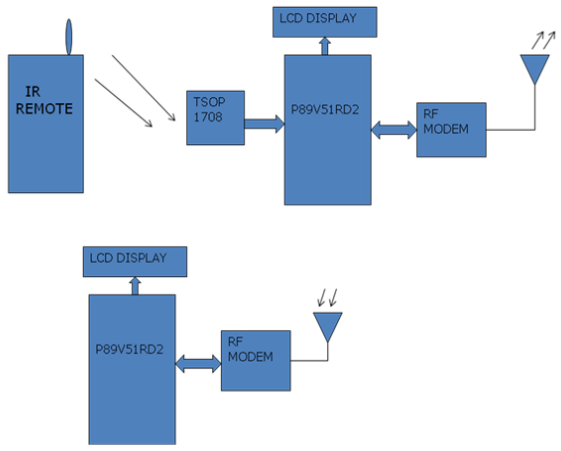

Figure 1 Block Diagram

The functional description of each block is

IR REMOTE

In our project we are using an RC5 standard IR remote controlas the transmitter to emit out the necessary IR signals that are to be received By the IR receiver for producing the IR signal required for communication.

IR RECEIVER:

The IR receiver is used to receive the IR signal, this circuit is designed to receive signal with use of IR receiver module (TSOP1738). The 5V DC power supply is given to the receiver. The IR receiver module (TSOP1738), which gets 5.1V power supply through, receives the transmitted signal of about 36 kHz.

MICROCONTROLLER

The embedded controller forms the heart of the circuit. Input parameters are fed to the controller through IR receiver. The results are viewed in LCD connected to ports of the microcontroller. The controller compares the signal and displays the appropriate message.

LCD INTERFACE

A standard character LCD is probably the most widely used data visualization component. The LCD used in this board can display 2 lines of 16 characters each. The LCD here displays the appropriate messages according to the input received by the microcontroller.

RF MODULE

The RF module is used to transmit as well as receive the data. The Low Power Radio Modem is an ultra low power transceiver, mainly intended for 315, 433, 868 and 915 MHz frequency bands. It has been specifically designed to comply with the most stringent requirements of the low power and data communication applications.

POWER SUPPLY

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

The input to the circuit is applied from the regulated power supply. The a.c. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating d.c voltage. So in order to get a pure d.c voltage, the output voltage from the rectifier is fed to a filter to remove any a.c components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

Working Operation

Frequency-shift keying is the simplest (binary) form of frequency modulation (FM) which is used for digital modulation in which the two binary values are represented by two different frequencies near the carrier frequency. Normally the carrier is shifted low for a 1 (called a mark in old telegraph terms) and high for a 0 (space). Conceptually, the transmitter could consist of two oscillators (on frequencies f1 and f2), with only one being connected to the output at any one time. Unless there are special relationships between the two oscillator frequencies and the bit clock there will be abrupt phase discontinuities of the output waveform during transitions of the message. A carrier is generated by an integrated circuit oscillator. The desired modulation is applied to this carrier by means of other integrated circuits. This modulated carrier is then transmitted by a simple transistor oscillator circuit working at the Very High Frequency band. This transmitted signal is then received by a frequency modulation receiver built around a single integrated circuit. The recovered carrier is fed to demodulation circuits to extract the modulation. Finally the modulated data is displayed on an array of light emitting diodes. Test points are brought out so that the various waveforms are displayed using a cathode ray oscilloscope. Here our main focus is on FSK modulation because RF Modem uses FSK modulation for wireless transmission of data to control the devices.

FSK MODULATION

The serial data stream drives a transistor which connects an extra capacitor across the main timing capacitor of the carrier generator. While the data line is low, the transistor base does not receive current and so the transistor is an open circuit. While the data line is high, the transistor base receives current and so it behaves as an open circuit. While the transistor is open, the oscillator has only one capacitor in circuit and so it outputs a high frequency. When it is on, both capacitors are effectively in parallel and so the frequency is reduced. Thus the frequency of the carrier oscillator is changed in accordance with the serial data stream, resulting in Frequency Shift Keying. FSK describes the modulation of a carrier (or two carriers) by using a different frequency for a 1 or 0. The resultant modulated signal may be regarded as the sum of two amplitude modulated signals of different carrier frequency .

FSK TRANSMITTER

A set of eight DIP switches set the data pattern to be transmitted. This is converted to a serial stream by a shift register. The TTL parallel in, serial out shift register, 74LS165 has been used for this purpose. Framing bits are added using additional circuitry. A four bit Counter and dual four input NAND gates are used to add one start bit at the head of a sequence and seven stop bits at the tail. This uses the 74LS93 and 74LS20. The bit clock and the carrier are generated by Schmitt trigger inverters inside a 74HC14. A timing resistor is connected across the input and output of the inverter. A timing capacitor is connected from the input to ground. The capacitor is continuously charged and discharged from the output of the gate, through this resistor, and so a square wave is available at the output and a triangular wave can be seen.The bit clock is a few hundred hertz and the carrier is at about ten kilohertz. This ensures that a radio receiver intended to receive audio programs can process the modulated signal.

FSK RECEIVER

Two tone decoder circuits tuned to the two different frequencies transmitted as a result of modulation are used. When the circuit is operating correctly both of them will output complementary signals. If one of the signals is lost, for example due to varying propagation conditions of the radio wave, the other signal still carries useful information. In order to make use of either or both decoded signals, a combiner circuit is used built around operational amplifiers. A quad op-amp type LM 324 is used in order to economize on board space and number of components. The recovered signal is finally converted to standard digital levels.

Hardware Description

The P89V51RD2 is an 80C51 microcontroller with 64 kB Flash and 1024 bytes of data RAM.A key feature of the P89V51RD2 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate (12 clocks permachine cycle) or select the X2 mode (6 clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI. The Flash program memory supports both parallel programming and in serial In-System Programming (ISP). Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible. The P89V51RD2 is also In-Application Programmable (IAP), allowing the Flash program memory to be reconfigured even while the application is running.

IV. Results

Our project design has been verified for its effectiveness and ease of use. The system was tested by verifying that the IR remote control did not have line-of-sight for the IR controlled unit and that the RF signal operated the device. Thus, 360 degree of range was tested. The IR/RF communicator also operated without error, error being defined as the propagation of an erroneous signal causing malfunction. The model is tested module wise and also with all the modules integrated together on various ICs and supporting components. Thus we have finally developed a working prototype model.

Figure 2 circuit diagram

V. Conclusion

Physical concepts are the creation of the human mind, and are not, however it may seem, determined by our external world".Significant utilization of RF technology helped us to create an intelligent gate way for converting IR signal to RF signal for long distance communication. Considerable effort has been made to present material at such a level that there is consistent progression from concepts to design considerations without getting mired in too much theoretical detail.

This paper can be developed in many ways in near future as per the environments such as all the educational institutions, terminal bus stops, railway stations, hospitals and also at other places.

References

1. Belgi Y.G.1, Avatade P.G.2, Deshmukh P.V.3, Sakhare A.M.4, Shinde A.J.5 and Prof. Patil J.M.6 "Android Based Appliances Control System" International Journal of Emerging Technology and Advanced Engineering. Vol 3, issue 12, pp. 681-683, Dec 2013.
2. Abu Farzan Mitul1, Fida Hasan Md Rafi1, Md. Manirul Islam1, Mohiuddin Ahmad1. International Conference on Electrical, Computer and Telecommunication Engineering, pp. 511-514, 01-02 December 2012 (ICECTE2012), RUET, Rajshahi-6204, Bangladesh.
3. Santosh.M.Nejakar "Wireless Infrared Remote Controller for Multiple Home Appliances" International Journal of Electrical and Electronics Research. Vol. 2, Issue 1, pp. 25-35, Month JanuaryMarch 2014.
4. Sindhuja Alla, B.Kiran Babu "Remote Control of Electrical Appliance using Wireless Technology GSM" International Journal of Science and Research. Volume 2 Issue 4, pp. 498-500, April 2013.
5. Mohd Helmy Abd Wahab, Norzilawati Abdullah, Ayob Johari, Herdawatie Abdul Kadir "GSM Based Electrical Control System for Smart Home Application" Journal of Convergence Information Technology Volume 5, Number 1, pp. 33-39 February 2010.