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Design and Implementation of RF based Wireless Home Automation System

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Abstract – *Home Automation is not a new concept. The main objective of this project is to develop a Home Automation system with RF controlled Remote. As Technology is advancing so houses are also getting smarter. Modern Houses are gradually shifting from conventional switches to centralized control system, involving RF control switches. This technology is very easy and mandatory specially for the physically handicapped people, it is very simple to use. Remote Controlled Home Automation system provides a simpler solution with RF technology in which RF remote is interfaced to the microcontroller on transmitter side which sends ON/OFF commands to the receiver where loads are connected. By operating the specified remote switch on the transmitter, the loads can be turned ON/OFF remotely through wireless technology. The microcontroller used here is 8051 family. The loads are interfaced to the microcontroller using Transistors and Relays.*

Key Words: Microcontroller, Relays, Radio Frequency Transmitter and Receiver

1. INTRODUCTION

Home Automation is the housing extension of building automation system. This system is actually automation the residential activity. The trendies of Home Automation has increased tremendously in recent years for the reason of higher usability and simplicity by using remote control (Key fob), smart phones and tablet connectivity, Wi-Fi, GSM, Bluetooth, Zig-bee, etc. This inability to access and control the appliances from remote location is one of the major reason for energy loss. There is a grave need to conserve energy in each way possible. A web or an android application is used by the consumer to give instruction to these systems.

The home Automation systems provide mutual interoperability among various electronic, electrical and power appliances as well as interactive interface for people to control their operation. These features are very useful to optimize and to economic energy consumption whereby saved energy during some few years could make more money than Home Automation systems implementation cost easier, especially for elderly persons and persons with disabilities.

Throughout the history, we have continuously strived to automate tasks in the home in order to make our lives easier. These systems exist of course, but these are many non-interoperable, expensive and often wired systems. Wiring complicate implementation of the home automation in building which are already built especially in Historical ones.

The goal of this project is to develop a secure Home Automation system that will allow consumer to remotely operate electric home appliances e.g. turning ON/OFF lights in the users home.

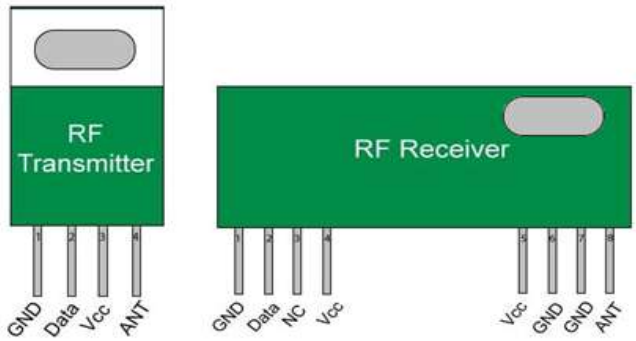
The consumer interacts with the home automation system through computer. This will provide a consumer to access and interact with the electronic appliances in the home.

Examples of practical uses for such home automation system are smart house, smart range wireless network.

2. METHADOLOGY

The main component of the RF based Home Automation is the RF Module. An RF Module is a small electronic circuit which is used to transmit or receive data wirelessly. RF Modules are often used in consumer applications where you need to remotely control some machines or appliances without making any physical contact with them. RF modules do not require line-of-sight operation. Hence, they are often used instead of infrared remote controls. Depending upon the type of application, the RF module is chosen.

For example, in case of short range wireless control applications, we can use ASK modulated RF Module of frequency 315 MHz or 433 MHz RF module generally comprises of an RF Transmitter and an RF Receiver. RF Transmitter is used to transmit the data while the RF Receiver is used to receive the data. Here is the Pin Configuration of the RF Transmitter and Receiver Modules.



RF Communication between the Transmitter and Receiver modules works on the principle of Serial Communication. In order to transmit or receive the data serially through RF module, we need to interface two ICs named HT-12E and HT-12D.

2.1. Block Diagram

RF remote that is interfaced to microcontroller on transmitter side .It sends ON/OFF signals to the receiver. Receivers are connected with loads that can be turned ON/OFF by operating remote switches.

The block diagram of both receiver and transmitter is given below:

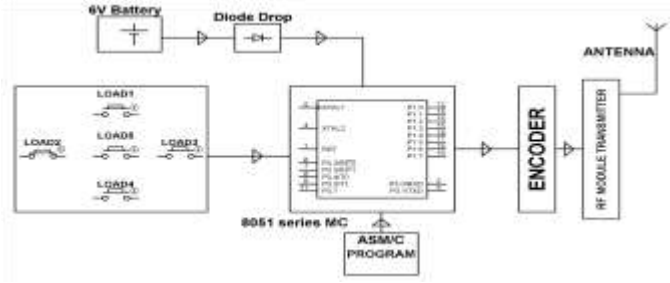


Fig. Block Diagram of Transmitter

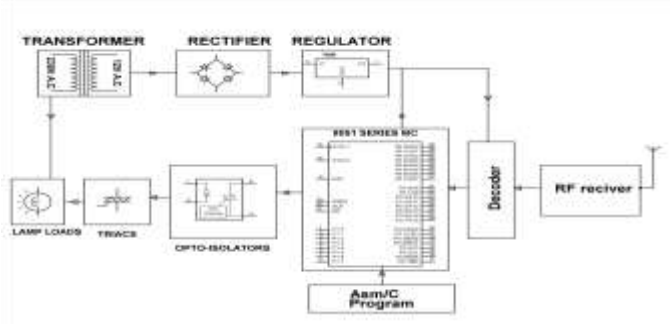


Fig. Block Diagram of Receiver

2.3. Transmitter Unit Flowchart

The transmitter flow chart comprises of five processes and one conditional statement. The operation commences when the circuit is initialized and ready for input signal as expressed in the flow chart shown in figure 2.8. The switch input button is triggered on, which converts the input signal (16-bits binary word) and transmits it in hexadecimal signal (8-bits word). When the conditional statement is true, the conditional statement ensures that the transmitter comes ON and transmits a signal through radio frequency to the receiver. However, if the conditional statement is false, the relay is energized and reproduce hexadecimal equivalent of switch binary inputs by C based conversion which acts as a loop or feedback.

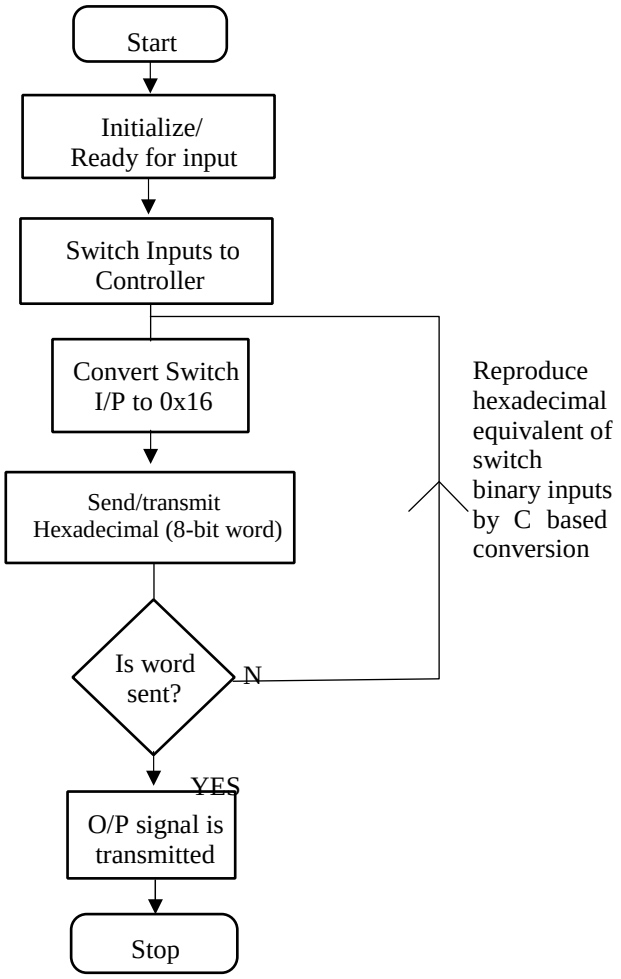


Fig. Transmission Unit Flowchart

2.4. Receiver Unit Flowchart

The receiver flow chart comprises of four processes and one conditional statement. The operation commences when the circuit is initialized and ready for receiving signal as indicated in the flow chart shown in figure 2.9. As soon as signal is sent from the transmitting unit, it is broadcast at frequency 435MHz. At the receiving unit, the antenna picks the signal, send it to controller which converts data from hex to binary and trigger relay/switch to start the generator and initiate automatic changeover.

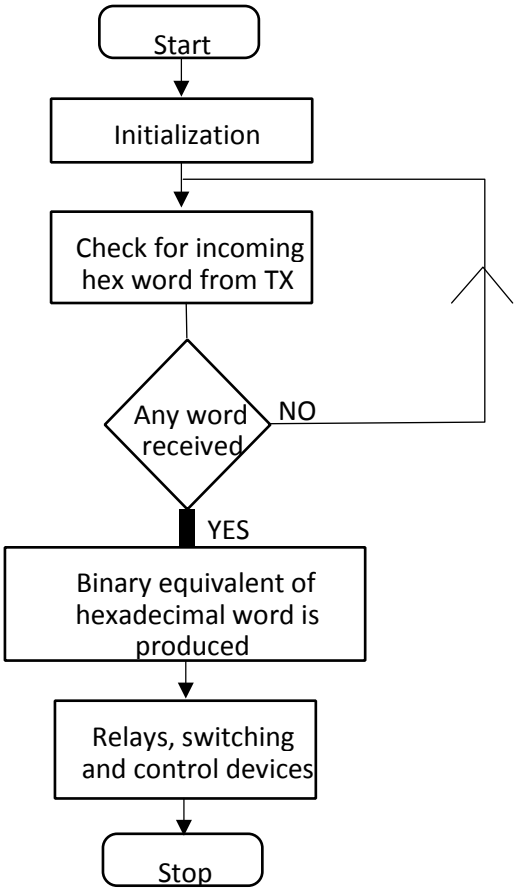


Fig. Receiver Unit Flow Chart

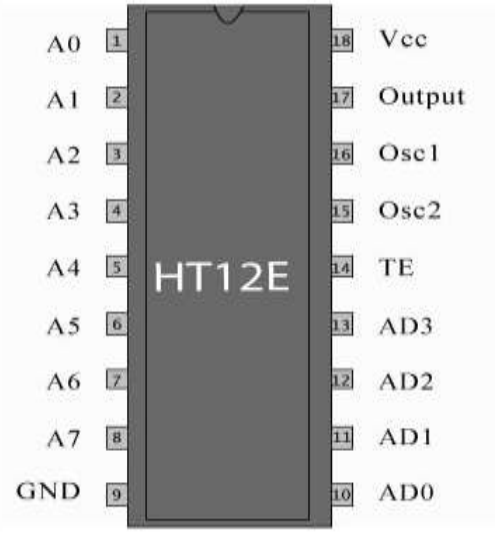
2.5. Relay Driver

In general, while designing electronics projects the loads are controlled (switched ON or OFF) using microcontroller block. But, for this purpose the circuit requires relays for controlled switches and isolation from high voltage operating appliances as well. Depending on the signals received from the microcontroller or other control circuits the relay controls the load. The required current to run the relay coil is more than can be supplied by microcontrollers .So, drivers provides sufficient current relay needs to operate.

2.6. HT-12E IC

The HT-12E is an encoder IC which is used with the RF transmitter for encoding the conventional n-bit data i.e. 4-bit, 8-bit or 16-bit data in to serial data for data transmission.

Here is the pin configuration of this IC.

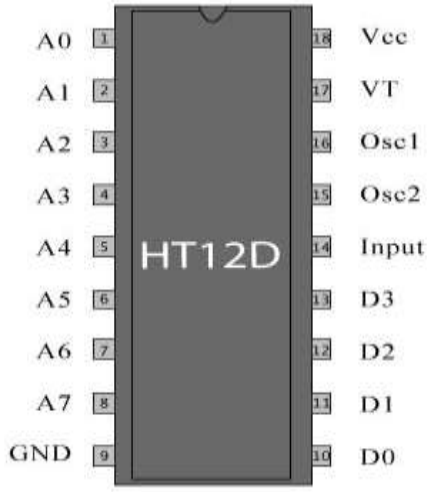


This encoder IC has 2^12 series encoders integrated in it. This IC is mainly used in RF communication. This IC converts 12-bit parallel data to serial data. Out of the 12 bits, 8 bits are the address bits and 4 bits are data bits.

2.7. HT-12D IC

The HT-12D is a serial decoder IC which is used with RF receiver for decoding the received serial data back to original parallel data.

Here is the pin configuration of this IC.



Similar to the encoder IC, the HT-12D Decoder IC has 2^12 series decoders integrated in it. It can decode 12-bit serial data of which 8 bits are the address and 4 bits are the data bits.

3. CONCLUSIONS

This project could be design in nature by using handy portable key fob family. The cost of the project is also not that high and it is also take less time to consume. This project can be useful for the people who want to use unconventional

way to use switches and that can help to reduce exceeding use of energy and power, such as electricity. So overall it could be a beneficiary project for the practical, busy and urban life. However, this project can be upgraded by using GSM modern, which can control home appliances by sending an SMS. Benefits of using this technology is there will not be any range limitation compared to RF technology.

REFERENCES

[1] Laur I., "Microcontroller based home automation system with security", International Journal of Advanced Computer Science and Applications, vol. 1, no. 6, pp. 60-65, 2010.

[2] D. S. Tudose, A. Voinescu and M.-T. Petrareanu, "Home automation design using 6LoWPAN wireless sensor networks", Proceedings of the 7th IEEE International Conference on Distributed Computing in Sensor Systems (DCOSS '11), (2011) June, pp. 1–6.

[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 January-March 2014.

[4] Kim Baraka, Marc Ghobril, Sami Malek, RouwaidaKanj, AymanKayssi," SmartPower Management System For Home Appliances And Wellness Based On Wireless Sensors Network And Mobile Technology", ,2015 XVIII AISEM Annual Conference, 978-1-4799-8591-3/15©2015 IEEE

[5]YunCui, MyoungjinKim, YiGu, Jong-jinJung, and HankuLee, "Home Appliance Management System for Monitoring Digitized Devices Using Cloud Computing Technology in Ubiquitous Sensor Network Environment",Hindawi Publishing Corporation International Journal of Distributed Sensor Networks Volume 2014, Article ID 174097