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RF Remote Control of Power Line Devices Using Embedded System

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Abstract: This paper describes the remote controlled operation of home automation systems. The continuous standardization process that is lowering the prices and making devices more useful and easier to use for the end user. Smart homes and environments have been discussed and hyped for many years now, and despite technological advances, future visions and dreams the concept of a smart home remains distant and unfamiliar. People are becoming increasingly more mobile in this fast paced society as has been seen by the number of cell phones in existence [1]. We believe that the home of the future will have the capability of being completely controlled by some remote device. Using of radio frequency (RF) remote control controls the home appliances.

Keywords: Embedded System.

I. INTRODUCTION

The concept of “home automation” or “smart home” is not new. The concept of “automation” has existed for many years. It began with a student connecting two electric wires to the hands of an alarm clock in order to close a circuit of a battery and Light bulb. Later, companies developed automated systems of their own to control alarms, sensors, actuators and video cameras and, in so doing, created the first automated buildings. The term “intelligent home” followed. Due to the obvious advantages of these systems, their influence on the conventional home was predictable and finally, in 1988, the term *domestics* were coined. “*Domestics is the application of computer and robot technologies to domestic appliances. It is a portmanteau word formed from domus (Latin, meaning house) and robotics*” definition of *Domestics* could be the interaction of technologies and services applied to different buildings with the purpose of increasing security, comfort, communications and energy savings[2]. In fact, integrated home systems have been offered since the 1960s. It is capable of controlling devices can be used in supermarkets, petroleum plants, fusion lasers, slot machines and single family homes. The ever-increasing complexity of home appliances and services, combined with the difficulties encountered by a great portion of the population to handle complex equipment including the inability of elderly and disabled people to use it, renders the creation of intelligent, intuitive and flexible interfaces that facilitate the human-machine interaction, an endeavor of great importance. The “*Home Intelligence*” system is based on the use of a network of sensors and intelligent circuitry attached to the domestic appliances and distributed by the different rooms in a home space. Sensors are used to monitor temperature. Intelligent circuitry control the entire home space, each one verifying the correct or incorrect behavior of the corresponding appliance, according to user’s comfort settings, and when working as master, monitoring the correct behavior of the “*Home Intelligence*” system. The sensors are placed anywhere, according to the end user wishes. Each circuitry is connected between the power line and a domestic appliance [3]. The first thing that comes to mind when folks think of home automation are robots, flashing lights, complicated electronics and a general feeling that their home is less of a warm home and more of a cold science experiment. However, in most homes today, we can easily find some simple forms of automation such as: Garage door openers remote controls, Irrigation /sprinkler control systems, Motion activated lights, Security systems, Programmable thermostats, Programmable light timers. If we want to keep going with automation, we can throw in dishwasher, clothes washers and dryers, ovens, microwaves, cars, lights and switches.... The list goes on and on [4]. We may not think of a dishwasher or light switch as home automation, but compared to washing dishes by hand and striking a match to light a candle every time when we enter a room, it’s definitely automation. However, each of these things was designed to help us to do some complicated, strenuous, unpleasant, or repetitive action automatically. Imagine the possibility of controlling all the home appliances within your reach so that, you can save your time, energy and affords to take actions on switch over of all the room appliances. You do not have to go and check with each room in your home whether your appliances are unnecessarily consumes energy. The problem is not for the youngsters but the old aged and disable persons may face this problem of simply to switch ON and OFF the appliances. They probably depend upon somebody to help them out so that they would relax for a while; the



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important thing is that the elderly and disabled persons just to wait for getting the service. Home appliances to control through radio waves around your home automatically it is not an imagination now this dream is come to an existence. The paper presented here is a research work on the radio waves to control power line devices using embedded system. In this research work we considered the power line devices as the home appliances.

II. OBJECTIVE

The objective of the research is to control the power line devices wirelessly. The radio waves are used to control the power line devices on the free bandwidth. The main objective is to overcome the problems with the existing system. To enhance the facilities in the embedded system like range, actively operate the power line devices through the radio waves, to display the current status of the device either to switch ON or OFF as well as the date, month, year and time with the alarm system. It should be a small and light weight gadget to handle smartly and can operate it with any age group. Along with the minimum complexities and carry over to operate around the home area.

III. HYPOTHESIS

The idea behind to control the home appliances wirelessly and existed in terms of infrared control but, to control it with the radio waves was the assumption that to convert this in to the reality in small scale. The garage door opener is the best examples to understand this. The theoretical concept to be converts this in to the real time utilization.

IV. EXPERIMENTAL WORK

Description of Transmitter in Block level

The transmitter is used as a remote to control the 16 power line devices and use to send the selected devices using the 3 keys interfaced with the microcontroller through a transmitter module and an antenna. The Main microcontroller based transmitter unit is shown in fig.1.

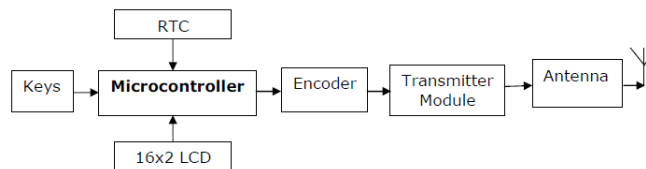


Fig.1 Block diagram of a Transmitter section

An LCD is also interfaced with the microcontroller and the selected devices are use to display with 16x2 LCD as well as the updated status of the devices whether the devices are ON or OFF. The end user can easily understand of what is going to control through this LCD display. A microcontroller is programmed for the accessing of the information which is already stored in to the internal memory of a microcontroller. A RTC is also connected with a microcontroller for to update the date and time for the end user by 24x7. An encoder is connected to the microcontroller for to encode the required information before transmitting and fed to the transmitter module which is works on the 433.92MHz frequency and send this encoded information to the receiver through a helical antenna as shown in the above fig. 1.

Description of Receiver in Block level

The receiver module is divided in to two sections-

- i) Receiver module and
- ii) Driver module

i) Receiver module

A receiver module is used to receive the information sent by the transmitter on the same frequency through an antenna. A receiver is then circuited with the decoder module and to decode the information. This decoder is interfaces with the microcontroller. In the microcontroller having another program of identifying of an information sent by the transmitter. Following fig. 2 shows the block diagram of a receiver section shown bellow-

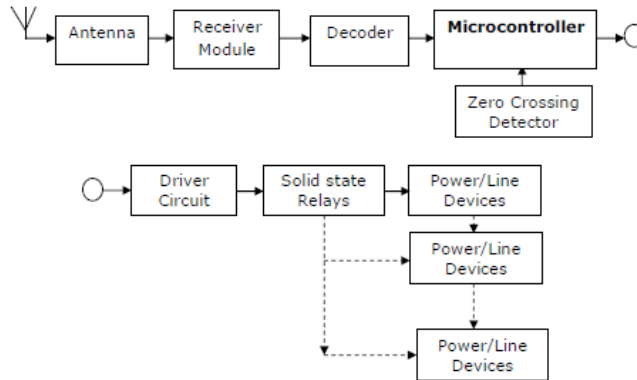


Fig. 2 Block diagram of a receiver section

ii) Driver module

A driver module is used to drive the power line devices which also shown in the above block diagram. Which includes the driver circuitry is used to drive the solid state relay. And these relays are used to drive the power line devices. Total number of 16 devices can drive by this module.

Controlling through the PC:

Another facility of controlling the devices through the PC is also added advantage. Following fig. 3 shows the screens of panel controlling can also be possible.

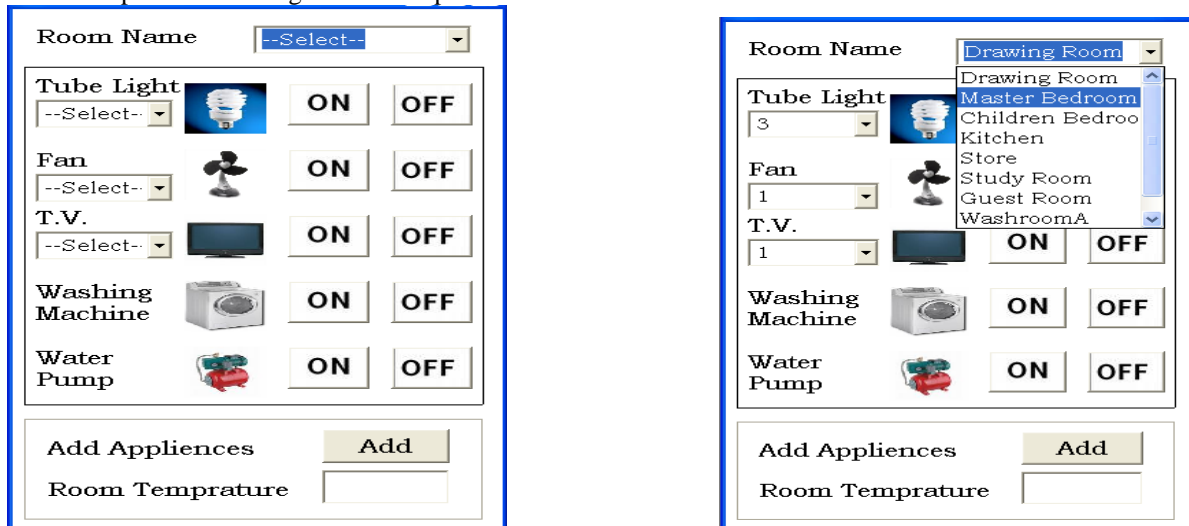


Fig. 3 : Panel controlling

V. RESULT

The Radio waves to control power line devices using embedded system based on remote controller with only 4 keys of smart selection with date and time facility of day-night and actual status of the device whether it is switch ON or OFF updates with the 16x2 bright LCD display at the battery operated transmitter. To control the home appliances system connected with the receiver system wirelessly is designed and implemented successfully for six (6) devices and worked well for the transmission and receiving approximately 500 meters range with the operating frequency of 433.91MHz. The instrument is designed and implemented successfully in physical existence and ready to use.

VI. CONCLUSION

The power line devices to control from the radio waves was a unique study, which concentrated on finding out how a smart home we have considered would function in everyday life and what kinds of functionality it should provide to its users. This practical study revealed results that have been discovered in theoretical laboratory tests successfully. It would seem that the most desirable functions of a smart home are indeed various user interfaces that allow more flexible control of the home. The home should also contain learning and adaptive functions,



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which would gradually allow users to leave some functions to the Home Controller. However as long as there are no compatible devices in the market it seems that there is a long way to go before smart homes really become commonplace. After this study the smart home instrument still continues at the university laboratory for development. In this paper work the power line devices are controlled from wireless technology. With this arrangement we can control over the switch ON and OFF as well as minimizing and maximizing the fans speed (rpm) with the speed 0-3 on four speed controls also. This is the most important part of this research to control FAN speed wirelessly. Such intelligent instruments are very much helpful for the old and disabled persons. It also helps to minimize the energy consumption. Another important application of this instrument is it can control appliances from anywhere around the 500 meter periphery and very much compatible and easy to handle by any age persons. It can also show the status of the devices whether ON or OFF, speed of fan, time and date updates on the LCD display connected at the transmitter device which would be on the users hand. It requires very less space and energy consumption as well as light weight.

In this paper work the power line devices are control from wireless technology. With this arrangement we can control over the switch ON and OFF as well as controlling of the fans speed (rpm) too. Such an intelligent instruments are very much helpful for the old age and disabled persons as well as which helps to save the energy consumption. Another important application of this instrument which can control it from anywhere in the periphery about 500 meters tested and very much compatible and easy to handle. Which can also show the status of the devices whether ON or OFF, speed of fan and the date and time. It requires very less energy consumption and alerted for 24 hrs. The biggest challenge smart home researchers face is the lack of standardized or completely missing communication interfaces in home electronics. This problem can be alleviated by using adapters and converters, however there are limits on what each interface can do and usually some functions remain unavailable. Another practical obstacle becomes obvious when installing networks and devices in older buildings. Even wireless networks require power cabling and equipment need their own installation space. In cases like these it is advantageous to use existing cabling (phone and power lines, cable ducts etc.) as much as possible. For energy savings control of heating, ventilation and air conditioning (HVAC) would be a must, unfortunately in most apartment buildings it is not possible to sufficiently affect the temperature inside a single apartment or even in a room. Problems regarding how adding new devices should be worked out depend largely on the infrastructure used.

VII. FUTURISTIC USE OF AN INSTRUMENT

This is a very smart and intelligent instrument useful 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 to regulate and overcome all the obstacles for control over the instrument. It is possible that the operating range and the instrument operability in terms of number of instruments can be increased up to 4096 with the proper channelization. Even the number of instruments can be operated with the number of RF receivers by a single RF remote control device.

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