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Home Automation Using Radio Frequency Communication

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ABSTRACT—
Home Automation using Radio Frequency communication provides wireless solution in many places to control the devices with the help of radio frequency which is a complete network in itself.TLP434A is the RF transmitter used in this application which works at the frequency of 433.92 MHz This is the smallest transmitter used in remote control projects and takes 2to 12 V with 5 V range of up to 200m.12 V battery to operate the antenna.

Keywords- Radio Frequency Transmitter, Receiver, Current State, Awareness

INTRODUCTION

Home Automation System Using RF projects deals to provide a wireless solution for home to maintain their devices and home appliances such as fan, bulb, ac, tv, etc. Radio frequency is used as wireless platform, which works only for a shorter distance which is approx 100 m in range. TLP434A is the RF transmitter used in this application which works at the frequency of 433.92MHZ for remote control projects. This unit takes 2 to 12 v with 5v. 12V battery is used for antenna.
Operates at data rates of up to 4.8 KHz and the operational current is 4.5mA. The data will be sent in the text form of pre defined commands which will be displayed on LCD display and will control the home appliances using RF communication.

RF Communication

Radio Frequency (RF) remote controls are easier to use because they do not require line of sight and does not required to be aimed at the equipment. The RF remote can also be operated from a distance. Held in the hand like a cell phone, the buttons are pressed in the same straightforward manner.
In many ways RF communication is one of the best solutions for remote control communications. It offers greater range to control the appliances. It is not only one directional and allows the control of devices in rooms of a home at a suitable range. The worldwide acceptance of 2.4GHz RF makes it a perfect choice for most of our OEM (Original Equipments Manufacturer) customers.
The distance over which radio communications works depends on various aspects other than wavelength, such as transmitter power, receiver quality, type, size, and height of antenna, mode of transmission, noise, and interfering signals. The study of radio frequency transmission allows estimates of useful range to be made.
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Specific Circuit Elements

PERIFERAL INTERFACE CONTROLLER

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, originally developed by General Instrument's Microelectronics Division. PIC stands for “Programmable Interface Controller".

PICs are most commonly used by developers and hobbyists alike due to its low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability, portability, less complex.

Devices called "programmers" are used to get program code into the target PIC such as PICKIT2. There are many programmers for PIC microcontrollers, ranging from the extremely simple designs which rely on ICSP to allow direct download of code from a host computer, to intelligent programmers that can verify the device at several supply voltages. Many of these complex programmers use a pre-programmed PIC themselves to send the programming commands to the PIC that is to be programmed. The intelligent type of programmer is needed to program earlier PIC models (mostly EPROM type) which do not support in-circuit programming.

Features of different PIC controller are shown in the following table:

TABLE 1-1: PIC16F87XA DEVICE FEATURES

Key Features	PIC16F873A	PIC16F874A	PIC16F876A	PIC16F877A
Operating Frequency	DC – 20 MHz	DC – 20 MHz	DC – 20 MHz	DC – 20 MHz
Resets (and Delays)	POR, BOR (PWRT, OST)	POR, BOR (PWRT, OST)	POR, BOR (PWRT, OST)	POR, BOR (PWRT, OST)
Flash Program Memory (14-bit words)	4K	4K	8K	8K
Data Memory (bytes)	192	192	368	368
EEPROM Data Memory (bytes)	128	128	256	256
Interrupts	14	15	14	15
I/O Ports	Ports A, B, C	Ports A, B, C, D, E	Ports A, B, C	Ports A, B, C, D, E
Timers	3	3	3	3
Capture/Compare/PWM modules	2	2	2	2
Serial Communications	MSSP, USART	MSSP, USART	MSSP, USART	MSSP, USART
Parallel Communications	—	PSP	—	PSP
10-bit Analog-to-Digital Module	5 input channels	8 input channels	5 input channels	8 input channels
Analog Comparators	2	2	2	2
Instruction Set	35 Instructions	35 Instructions	35 Instructions	35 Instructions
Packages	28-pin PDIP 28-pin SOIC 28-pin SSOP 28-pin QFN	40-pin PDIP 44-pin PLCC 44-pin TQFP 44-pin QFN	28-pin PDIP 28-pin SOIC 28-pin SSOP 28-pin QFN	40-pin PDIP 44-pin PLCC 44-pin TQFP 44-pin QFN

Power Supply

In this project we need a 5v DC power supply for all electronics used in the project. This requires step down transformer, bridge rectifier, voltage regulator, and filter circuit for generation of 5v DC power.

REGULATOR IC (78XX)

All electronic circuits' works well with DC supply. The DC voltage supply required by these electronic circuits is derived by transforming and rectifying the standard AC supply. Voltage regulator is used to stabilize the voltage and attenuate the ripple.

Usually we connect the voltage regulator at the output of the filtered DC to get a fixed output.

It can also be used in circuits to get a low DC voltage from a high DC voltage (for example we use 7845 to get 5V from 12V).

There are two types of voltage regulators
1). Fixed voltage regulators
2). Variable voltage regulator
In fixed voltage regulators there is another classification 1. +ve voltage regulators 2. -ve voltage regulators

RF Working
Wireless communication involves the transmission of information over a distance without help of wires, cables or any other forms of electrical conductors.
The transmitted distance can be anywhere between a few meters (for example, a television's remote control) and thousands of kilo-meters (for example, radio communication). When an RF current is supplied to an antenna, it gives rise to an electromagnetic field that propagates through space.
s = 300/f
The frequency of an RF signal is inversely proportional to the wavelength of the EM field to which it corresponds.

LCD Working
TFT LCD display provides simple and fast reading/writing of data to and from the LCD. This data will write an ASCII Byte out to the LCD's screen. The ASCII code to be displayed is Sixteen bits long in first row and another sixteen in second row of the LCD.
If the data sent in the first row is not of sixteen bits then spaces will be includes in order to prevent garbage value.
The "Enable" Clock is used to initiate the data transfer within the LCD. Sending parallel data as either four or eight bits are the two primary modes of operation. While there are secondary considerations and modes, deciding how to send the data to the LCD is most critical decision to be made for an LCD interface application.
Eight bit mode is best used when speed is required in an application and at least ten I/O pins are available. Four bit mode requires a minimum of six bits. To wire a microcontroller to an LCD in four bit mode, just the top four bits (DB4-7) are written to.
The "RS" bit is used to select whether data or an instruction is being transferred between the microcontroller and the LCD. If the Bit is set, then the byte at the current LCD "Cursor" Position can be read or written. When the Bit is reset, either an instruction is being sent to the LCD or the execution status of the last instruction is read back (whether or not it has completed).
Reading Data back is best used in applications which required data to be moved back and forth on the LCD (such as in applications which scroll data between lines).In our Project we have permanently grounded R/W pin which means we are not retrieving any data from LCD.

The LCD can be thought of as a "Teletype" display because in normal operation, after a character has been sent to the LCD, the internal "Cursor" is moved one character to the right. The "Clear Display" and "Return Cursor and LCD to Home Position" instructions are used to reset the Cursor's position to the top right character on the display.
To move the Cursor, the "Move Cursor to Display" instruction is used. For this instruction, bit 7 of the instruction byte is set with the remaining seven bits used as the address of the character on the LCD the cursor is to move to. These seven bits provide 128 addresses, which matches the maximum number of LCD character addresses available.
Eight programmable characters are available and use codes 0x000 to 0x007. They are programmed by pointing the LCD's "Cursor" to the Character Generator RAM The last aspect of the LCD to discuss is how to specify a contrast voltage to the Display. I typically use a potentiometer wired as a voltage divider. This will provide an easily variable voltage between Ground and Vcc, which will be used to specify the contrast (or "darkness") of the characters on the LCD screen. You may find that different LCDs work differently with lower voltages providing darker characters in some and higher voltages do the same thing in others.

ADVANTAGES

a) Multiple devices Can be controlled with less efforts
b) Robustness and reliability under difficult environmental conditions.
c) Minimizing the hassles of wire utilization during data transmission
d) It does not require line of sight. RF communications incorporate a transmitter and/or receiver.
e) Can also be applied to modules across a huge variation of functionality and capability
f) The read time is typically less than 100 milliseconds
g) Range of the system can be increased as per needs

APPLICATIONS

Principle areas of applications of RFID include:
1. Lighting (bulb,fan,ac,etc)
2. Intercoms
3. Domotics
4. Household appliances control electronically controlled lamps can be controlled for brightness or color to provide different light levels for different tasks. Lighting can be controlled remotely by a wireless control or over the Internet. Natural lighting (day lighting) can be used to automatically control window shades and draperies to make best use of natural light allows communication via a microphone and loud speaker between multiple rooms. Integration of the intercom to the telephone, or of the video door entry system to the television set, allowing the residents to view the door camera automatically Domotics is the study of the realization of an intelligent home environment any household appliance can be monitored and controlled automatically or remotely, including cooking appliances, swimming pool systems, and others..

Certain specific applications of RF include:
Inventory and asset Management

CONSTRUCTION AND TESTING

The construction was initially carried out on a breadboard to check for desired output and to ensure that it is working properly. All errors were checked and tested in order to obtain the desired result/output.
Component were then removed and transferred to a Vero board strip treated with chromium solution and soldered into place and all discontinuous point were cut out to avoid short-circuiting.

TESTING OF PROJECT

With the knowledge of operation of the system was tested step by step to the transistor output and the load was connected across the collector terminal of the transistor.

PROBLEMS AND ISSUES

Problems	Solutions
Motion detector has very small output voltage	Used operational amplifier to increase signal level
Need to create -12 VDC supply from +12 VDC	Used 555 timer
LCD display on EVAL board not working	Using LEDs for debug
Receiving RS-232 input on Microcontroller	In Progress: adjusting timer, voltages, and parameters of Rx8 module
Errors when building OS solutions for eBoxII	In Progress: working with lab TAs to troubleshoot

FUTURE DEVELOPMENT

1. We can send this data to a receiver at a specific distance
2. We can add the module of GSM to locate the position of various receivers within the range.
3. Large no of appliances can be controlled
4. It can be enhanced to control machines in industries at large scale

CONCLUSION

By introducing the concept of radio frequency in the field of communication we can make our communication more efficient and faster, with greater effectiveness we can display the messages with less errors and maintenance can also control the appliances using radio frequency. This model can be used in small industries where various electronic equipments can be controlled wirelessly with less effort. It can be setup at public places like railways, airports, home etc. It is cost efficient and very easy to handled

REFERENCES

1. TAMM, G., TRIBOWSKI, CH. RFID (in German). Berlin: Springer, 2010. p. 41 – 44. ISBN 978-3-642-11459-5
2. Jacob Millimans & Christos C. Halkias, Integrated Electronics: Analog & Digital Circuits and Systems, TMH
3. 'An RFID-based object localisation framework', Int. J. Radio Frequency Identification Technology and Applications, Vol. 3, Nos. 1/2, pp.2–30.
4. Bolotnyy, L. and Robins, G. (2007b) 'Multi-tag RFID systems', International Journal of Internet Protocol Technology, Vol. 2, Nos. 3/4, pp.218–231.
5. Chae, H. and Han, K. (2005) 'Combination of RFID and vision for mobile robot localization', IEEE International Conference Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP 2005), Melbourne, Australia, pp.75–80.
6. Chawla, K., Robins, G. and Zhang, L. (2010a) 'Object localization using RFID', IEEE International Symposium on Wireless and Pervasive Computing (ISWPC 2010), Modena, Italy, pp.301–306.
7. Estrin, D., Culler, D., Pister, K. and Sukhatme, G. (2002) 'Connecting the physical world with pervasive networks', IEEE Pervasive Computing, Vol. 1, No. 1, pp.56–69.
8. Finkenzeller, K. (2003) RFID-Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification, 2nd ed., Wiley and Sons Inc.