International Journal of Engineering Research in Electronic and Communication Engineering (IJERECE) Vol 2, Issue 2, February 2015

Direct Sequence Spread Spectrum Power Line Communication For Home Automation

[1] Hema Singh [2] Sunita Siyag[3] Kriti Parashar
Department of Electronics and Communication
[1][2]RCEW,JAIPUR [3] MAIET,JAIPUR
[1]Hemasingh303@gmail.com [2]sunitasiyag7@gmail.com [3]kritiparashar16@gmail.com

***Abstract*— The power line communication is used for transferring data over low voltage power line, where electrical power is transmitted over high voltage transmission line distributed over medium voltage & used inside the building at lower voltages. This technology can be extensively used in centralized electric meter reading, remote monitoring of electrical equipment, building automation and security control, stage lighting and street lighting control applications, information displays To overcome the electromagnetic strong polluted channel a direct sequence spread spectrum concept s used with its inherent processing gain.To achieve a simple design to adapt the spectrum to the channel by chip-shaping and use sub optimum detection scheme to avoid synchronization loops.**

I. INTRODUCTION

The electric power-line is found in most buildings, so no infrastructure is needed compared with other communication systems.There are many household applications that powerline communication can serve. These applications can be divided into two groups: those that use low data rate transmissions between transmitters and receivers, and those that use high data rate transmissions.The first group includes mainly control applications, such as remote handling of electrical appliances. The second group includes data transmission applications, such as local area computer networks. In between we can think of cheaper devices than high rate modems that can provide other services than those supported by low rate modem sequence and digitally up-converted. This modulated signal is then D/A converted and transmitted over the channel Power line carrier communication modem is an OEM module which carries data on a conductor used for electric power transmission – i.e the AC lines. PLCC offers a “no new wires” solution because the infrastructure is already established. This module can be integrated into and become part of the user's system. A pair of these Modems connected on the same phase and neutral line of the power network can provide bidirectional data communication at a baud rate up to 2400 bps. The PLCC modem is built around the PIC16 MCU from Microchip Technology. It is a simple modem around which a host of applications can be built. The unit can be easily integrated into other systems to successfully transmit data over the power lines.

II. WORKING

This circuit contains PC on one side and microcontroller based relay switching drives on another side. We send the data using program prepared in Visual Basic (VB) through serial port. This serial port is connected to PLM. This PLM is assigned supply of 230v mains. On the receiver side, same circuit is connected to power line on the same phase. This circuit receives data from the PC attached with the circuit which is connected to PIC microcontroller. Whenever it gets data (for ex) A, microcontroller reads the data and ON the first relay. When it gets B, 1st relay becomes OFF. When it gets D, the second relay becomes OFF. Thus this process is carried out. Visual Basic contains the program of scheduling and manual switching operation. As this program starts, some atomization functions starts performing for the atomization industry. The PC side circuit is connected to MAX 232 for the voltage. shifting. On the other side of microcontroller, relay driver is connected to relay circuit. First, we prepare the program for microcontroller serial baud rate i.e. 600 bits/sec. This program is also applicable for PC side. Then serial values come to microcontroller. This microcontroller reads the value and compare it whether these are A, B, C or D. When it finds equal, particular task i.e. relay ON/OFF is carried out.

A. Processing gain:

To achieve most of the claims made for the spread spectrum it is necessary that the bandwidth over which the message is spread be very much greater than the bandwidth of the message itself. Each DSBSC of the DSSS signal is at a level below the noise, but each is processed by the synchronous demodulator to give a 3 dB SNR improvement. The total improvement is proportional to the number of individual DSBSC components. In fact the *processing gain* of the system is equal to the ratio of DSSS bandwidth to message bandwidth.

B.A DSSS generator:

To generate a spread spectrum signal one requires
1. A modulated signal somewhere in the RF spectrum
2. A PN sequence to spread it

There are two bandwidths involved here: that of the modulated signal, and the spreading sequence. The first will be very much less than the second. The output spread spectrum signal will be spread either side of the original rf carrier (ω0) by an amount equal to the bandwidth of the pn sequence.

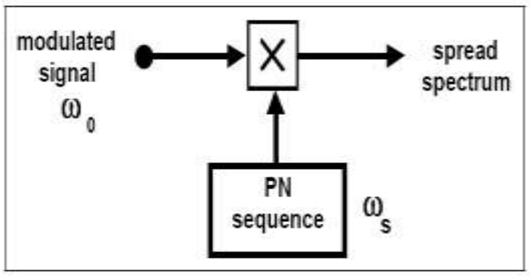

Figure 1: basis of spread spectrum

most of the energy of the sequence will lie in the range dc to ω_s, where ω_s is the sequence clock. the longer the sequence the more spectral components will lie in this range. it is necessary and usual that $\omega_0 >> \omega_s$, although in the experiment to follow the difference will not be large

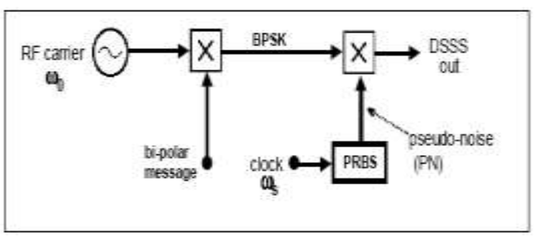

Figure 2: a spread BPSK signal

The modulated signal can be of any type, but typically digitally-derived, such as binary phase shift keyed - BPSK. In this case the arrangement of Figure 1 can be expanded to that of Figure 2.

A digital message is preferred in an operational spread spectrum system, since it makes the task of the eavesdropper even more difficult The arrangement of Figure 2 can be simplified by noting that, if the clock of the bipolar message is a sub-multiple of the clock of the PN sequence, then the module two sum of the message and the PN sequence can be used to multiply the RF carrier, generating a DSSS signal with a single multiplier. Such a simplification will not be implemented in this experiment.

III. PROBLEM FORMULATION:

a) Radio signal cannot be confined easily so they possess a higher security threats.
b) Radio signal suffer from unknown and unpredictable adjacent channel interference.
c) Radio spectrum is highly congested and there are few free channels available .Although some frequency are freely available in ISM. Such as 433Mhz &2.4GHz but with adjacent of wireless device and protocol such as wi-fi,Bluetooth and zig-bee the spectrum for these frequency is highly congested.

IV. APPLICATIONS

I. Home & Industrial Automation.
II. Automatic Meter Reading.
III. Lighting Control.
IV. Status Monitoring and Control.
V. Low Speed Data Communication Networks.
VI. Intelligent Buildings.
VII. Power Distribution Management.

V. CONCLUSION

The concept of Direct sequence spread spectrum was proven to be a solution of the communication ver electric power lines .Power line communication is not so powered because of less inventions due to that cost required to design transceiver at each station is very high. So, in future improvement include the implementation of closed loop feedback system on one or more control channel and our system enable automatic logging ,schedule control capability and schedule data recording facility.

REFERENCE

[1] Dhiraj S. Bhojane, Saurabh R. Chaudhari, , Eshant G. Rajgure, Prakash D. More / International Journal of Engineering Research and Applications . IEEE Power line communication vol2 , feb.2012..

[2] R. De Gaudenzi, M. Luise, R. Viola, “A Digital Chip Timing Recovery Loop for Band-Limited Direct-Sequence Spread-Spectrum Signals”, IEEE Transactionson Communications, vol. 41, No. 11, Nov. 1993.

[3] J. Meel, “Spread spectrum (SS)”, De Nayer Institute.

[4] Jacob Milliman Christos C.Halkias: