

Power Line Communication based Home Automation

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ABSTRACT

The power line module is a dedicated device, "which is used for transferring data over low voltage power line, where electrical power is transmitted over high voltage transmission line distributed over medium voltage and used inside the building at lower voltages." Most PLC's technologies limits themselves to one set of wires (for ex. premises wiring), but some can cross between two levels (for ex. both distribution network and premises wiring). Proper distribution network i.e. transformer prevents propagating the signal which is generated or produced due to multiple PLC technologies to be bridged to form very large network. Power line communication or power line carrier also known as power line digital subscriber line (PDSL), mains communication, power line telecom (PTL) or broadband over power lines (BPL) are systems which carrying data on a conductor i.e. "power line communication". 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 application, information displays and it can also play a role in the final leg of internet connection in special circumstances.

Keywords: Liquid Crystal Display, LED: Light Emitting Diode, PCB: Printed Circuit Board, DC: Direct Current

ARTICLE INFO

Article History

Received: 10th February 2016

Received in revised form :

11th February 2016

Accepted: 18th February 2016

Published online :

18th February 2016

I. INTRODUCTION

Home automation is a common field of interest for engineers, researchers and of course, consumers. Today, home automation systems are commonly found in many homes across many countries around the world. Such systems not only offer a high level control over home appliances, but also try to reduce the wastage of electricity. Existing Home Automation Systems requires additional installation and maintenance cost. Power Line Carrier communication (PLCC) is a popular technique employed in home automation systems that reuses household electrical wiring for communication. This technology is nothing but transmission of digital signals over conventional AC lines. It saves cost, space, power and maintenance of the system.

This project is based on data transmission over the power line. The power line modem uses the power line cable as communication medium. It is convenient as it eliminates the need to lay additional cables. The modem at the transmission end modulates the signal from data terminal through RS-232 interface onto the carrier signal in the power line. At the receiving end, the modem recovers the data from the power line carrier signal by demodulation and sends the data to data terminals through RS-232 interface. The power line modem is a dedicated device, which 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. Most technologies limits themselves to one set of wires(for ex. premises wiring), but some can cross between two levels(for ex. Both distribution network & premises wiring). Proper distribution network i.e. transformer prevents propagating the signal which is generated or produced due to multiple PLC technologies to be bridged to form very large network. Power line communication or power line carrier also known as power line digital subscriber line (PDSL) mains communication, power line telecom (PTL) or broadband over power lines (BPL) are systems which carrying data on a conductor. 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 and it can also play a role in the final e.g.. of Internet connection in special circumstances.

II. OBJECTIVE

The objective of this paper is to build a home automation system using a PLCC modem and applying microcontroller to control and automate variable home appliances. The technology is expected to create new opportunities in home automation using power line communication module. Power line communication have long life span. This new technology is remarkably cheap with low operating cost. Today this technology is popular in cities. This technology is noise free. Favourable distance covered by using this technology.

III. PROPOSED SYSTEM

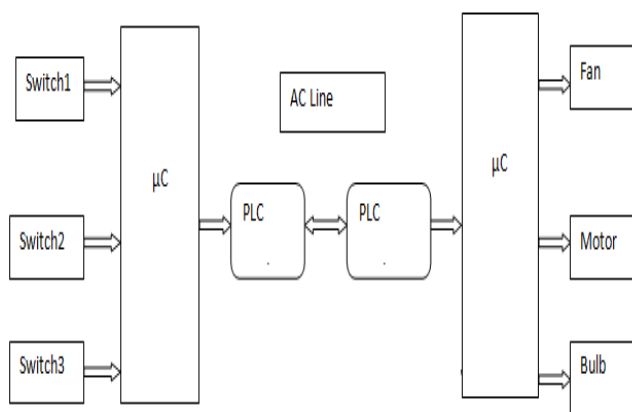


Fig No 1. Power line communication based home automation

In this paper data is being transferred over AC line from one node to another node, which is encoded and decoded by PLC modem. Received signals will then send to another microcontroller with respect to incoming signal, status of information signal, several devices are operated. Fig No.1 shows block dig. of power line communication based home automation.

Both transmission line reception stages are controlled either by the master clock of the microcontroller, or by the on chip reference oscillator connected to a crystal. This holds for accuracy of the transmission carrier and the exam trimming of the digital filter, thus making the performance totally independent of application disturbance such as component spread, temperature and supply and so on.

Working:

The carrier frequency is generated by the scanning of a ROM memory under the control of the microcontroller clock or the reference frequency provided by the on-chip oscillator, thus providing strict stability with respect to environmental conditions. High frequency clocking reject and aliasing components to such an extent that they are filtered by the coupling LC network and do not cause any significant disturbance. The data modulation is applied through pin DATAIN and smoothly applied by specific Digital circuitry to the carrier (shaping). Harmonic components are limited in this process, thus avoiding unacceptable disturbance of the transmission channel (according to CISPR16 and EN50065-1 recommendations). A -55 dB total harmonic distortion is reached when using the typical LC coupling network (or an equivalent filter). The D/A converter and the power stage are set in order to provide a maximum signal level of 122dBmV (RMS) at the output. The output of the power stage (TXOUT) always has to be connected to a decoupling capacitor, because of a dc level of 0.5VDD at this pin, present even when the device is not transmitting. This pin also has to be protected against overvoltage and negative transient signals. The DC level TXOUT can be used to bias an unipolar transient suppressor, as shown in the diagram. Direct connection to the mains is done through a LC network for low-cost applications. However, a HF signal transformer could be used when power line communication has to be performed.

Receiving Mode:

The input signal received by the modem is applied to a wide range input amplifier with Automatic Gain Control (-6to+30dB). This is basically for noise performance improvement and signal level adjustment that ensures a maximum sensitivity of the A/Dconverter. Then an 8-bit A/D conversion is performed, followed by digital band pass filtering, in order to meet the CISPR normalization and to accomplish additional limitation encountered in current applications. After digital de modulation, the baseband data signal is made available after pulse shaping. The signal pin (RXIN) is a high-impedance input, which has to be protected and DC decoupled for the same reasons as with pin TX OUT. The high sensitivity(82 dBmV) of this input requires an efficient 50Hz rejection filter(realized by the LC coupling network) also used as an anti-aliasing filter for the internal digital processing. The output of the power stage(TXOUT) always has to be connected to a decoupling capacitor, because of a DC-level of 0.5VDD at this pin, present even when the device is not transmitting. This pin also has to be protected against over voltage and negative transient signals. The DC level of TXOUT can be used to bias a uni polar transient suppressor, as shown in the application diagram. Direct connection to the mains is done

through a LC network for low-cost applications. However, a HF signal transformer could be used when power-line in solution has to be performed.

PLCC Modem:



Fig No 2. PLCC Modem

Power Line Carrier Communication or PLCC is technology of transmitting data over AC transmission lines. Fig No. 4.2 shows PLCC Modem.

It has high immunity to electrical noise persistence in the power line and built in error checking, So it never gives out corrupt data.

The modem is in form of a ready to use circuit module, which is capable of providing 9600 baud rate bi-directional data communication, So transceiver.

Due to its small size it can be integrated into and become part of the user's power line data communication system.

IV.RESULT



Fig 3. Complete Hardware Setup

V. ADVANTAGES AND APPLICATION

Advantages

- Saves Installation Charges
- Saves Maintenance charges
- Robust System
- No chances of noise
- Covers favorable distance

Application:

- Power Distribution Management
- Home Automation
- Automatic Meter Reading
- Process Control
- Status Monitoring and Control
- Low Speed Data Communication Network

VI.CONCLUSION

Though we believe that India is being a superpower on the basis of connecting roads, electricity, water definitely us all. But why we can't able to connect television set, high speed broadband many tele-facilities to each every part of our country. But now, yes it can! It all achieves by just a single line called as PLC. As per indicated in application, the power line provides wide areas of communication through all the channels, with this power line provides mobility, flexibility & stability because of its small size & portable size, internet accessibility & ease of installation. 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, today's point of view the first challenge is to reduce the cost. So, in future we definitely proved that power line communication is the most efficient, powerful & cheapest media of communication.

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