Power Line Communication Based Fault Monitoring And Control

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ABSTRACT

In today’s era there are lots of machineries in industries. For the operation of each machine there is separate operator & there are lot of complications & difficulties for controlling the machine by a individual. In emergency to OFF the supply of machine it is difficult due to less time to off the supply. This project is developed to make it easy, smooth & modern way. The main advantages of this system is saving energy. Same operation is required to stop any component of system. The operator is required to START & to STOP the system. An additional power source is required to PC operation. Extra supply will control the devices which are connected to the server computer. Battery arrangement is not provided in case of load shading. The motto of this system is to avoid human efforts. This system is using at Hospitals, prison, any industrial areas any industrial area where automatic operations are required.

Keywords
Power Line communication Modem, Microcontroller, ADC 0808, PC, Graphical User interface (GUI).

1. INTRODUCTION

There is Automation control used for various Control systems for operating equipment such as machinery, processes in factories, boilers and heat treating ovens, switching in telephone networks, steering and stabilization of ships or aircraft and other applications with minimal or reduced human intervention. The biggest benefit of automation is that it saves labour efforts. However it is also used to save energy and materials and to improve quality, accuracy and precision. It essentially involves leveraging the power of technology to reduce the dependency on human presence and decision making for any process. It leverages different electronic equipment (either standalone or interlinked with appropriate applications) to control different parameters of any process and to use the appliances in a smarter way to save energy. It also provide benefit people to be more energy conscious by enabling them to have a real time status of electric appliances. And making the system automated also helps reduce peak hour power consumption by enabling people to turn off appliances at will remotely. This facilitates a constant power supply by having varied pricing policies for different times of day and night. The Aim of this project is to simplify the process of human-machine interaction through the use of a generic interaction system and to make things around us smarter and interactive.

2. HISTORY OF POWER LINE COMMUNICATION MODEM

After electrical power supply became widespread, narrowband Power Line Communications began. The first carrier frequency systems began to operate over high-tension lines with frequencies of 15 to 500 kHz for telemetry purposes around the year 1922 and this continues Consumer products such as baby alarms have been available at least since 1940. In the 1930s, ripple carrier signaling was introduced on the medium (10–20 kV) and low voltage (240/415 V) distribution systems. It is a simple low cost system with a long history, however it has a very slow transmission rate, between 200 and 800 bits per second. In the 1970s, the Tokyo Electric Power Co ran experiments which reported successful bi-directional operation with several hundred units. Since the mid-1980s, there has been a surge of interest in using the potential of digital communications techniques and digital signal processing. The drive is to produce a reliable system which is cheap enough to be widely installed and able to complete cost effectively with wireless solutions. But the narrowband power line communications channel presents many technical challenges, a mathematical channel model and a survey of work is available.

3. LITERATURE REVIEW

3.1 Consideration While Choosing PLC Modem

3.1.1. What Is Inside A PLC Modem?

A Power Line Communication MODEM has a rectification circuit for converting an AC power source to a DC power...
source, a MODEM circuit to which a DC voltage is supplied from the rectification circuit, a USB connector connected to the MODEM circuit, and a signal overlapping circuit for overlapping a signal processed by the MODEM circuit with the AC power source, wherein the rectification circuit supplies the DC voltage to the USB connector.

3.1.2. How Does A PLC Operate?
Existing electrical wiring are used by Power line networking, whether in a building or in the utility grid, as network cables, meaning they also carry data signals. It can be a means of extending an existing network into new places without adding new wires. For example, a computer could be wired to a router as follows: an adapter is connected to a router of an existing wired local-area network, via its network port. A second adapter is connected to an Ethernet-ready device like a computer. When both adapters are plugged into their wall sockets they will have a network connection via the electrical wiring in between the two wall sockets being used. Some networking devices, such as routers or switches, also have power line connectivity built in. This adds no new wires since they need to be plugged into the wall to operate anyway.

Power lines are transformed into a data line through the superposition of a low energy information signal to the power wave. Data is transmitted at least 3 kHz to ensure that the power wave does not interfere with the data signal since electricity is 50 or 60 Hz. A technical challenge is that, the wiring acts as an antenna, because the power wiring is unshielded and untwisted so that the wiring emits radio energy, causing interference to the existing users of the same frequency band. The power lines can also act as receiving antennas, and receive interference from radio signals. In many jurisdictions such transmissions are illegal. U.S. is an exception, permitting limited-power wide-band signals to be injected into unshielded wiring, as long as the wiring is not designed to propagate radio waves in free space. The connection of has many advantages to a wireless connection; however the quality of the connection will still depend on the quality of the domestic electrical system. Improper wiring and circuit breakers in between the connected cables can negatively affect the performance, and can cause connection interruptions.

4. BLOCK DIAGRAM
Block diagram representation of the system to be design and implemented. Block diagram consists of microcontroller, power supply PLC modem, Load, CT, PT. Microcontroller is the heart of the system. The 8051 microcontroller is a low power, high performance CMOS 8-bit microcontroller with 8k bytes of in system programmable flash memory. The device is manufactured using Atmel’s high density nonvolatile memory technology. AT89S52 is a powerful microcontroller which provides highly flexible and cost effective solution to many embedded control applications. The AT89S52 provides the Following features: 8K bytes of flash, 256 bytes of RAM, 32I/O Lines, watchdog timer, 2datapointers,3 16bit Timer/counters. The opto-isolator is used to drive the triac which provide complete pulse in order to control electrical parameters.

![Fig.1 Block Diagram of power line communication model](image-url)
5. WORKING

A power supply of 5 volts is used for the working of the circuit, all components in the circuit require 5 volts. A transformer of 12v and 1 am is used with the bridge rectifier to regulate 5v using 7805 IC. This measures voltage and current of the connected load and displays it on computer screen using MATLAB through PLCC module. Here, we use a current sensor WCS2202 in serial of the load to measure the current flowing through the load and a step down transformer and voltage divider to measure the AC input voltage across the load. These sensors give respective analog output which needs to be converted to digital for sending to computer. Hence, we require a multi-channel ADC IC 0808. This is a 8 bits ADC IC. This IC gives the digital data to controller 8051. 89s52 is the main control unit of the circuit which is interfaced to PLCC modules through serial communication (i.e. RX, TX pins). When we start the MATLAB application on computer, the computer sends command to micro controller to read the sensor value. This works in master slave configuration. All the readings are displayed on the screen using MATLAB GUI. We have also set the threshold values for voltage and current. If voltage or current exceeds the threshold value, relay will be operated to cut off the supply to the load and this can be notified on computer screen also. We have connected a device driver IC ULN2803 to operate the relay and DC fan.

![Circuit Diagram](image-url)

The figure shows the receiver circuit, for receiver circuit a separate power supply is given for the operation. From transmission side PLC the data is transmitted to the PLC of receiver side. The data is sent to PC controls and monitor the fault by using the software.
6. FUTURE SCOPE
The future scope will be controlling and monitoring the fault of various types of devices by using GSM technology i.e. makes it wireless.

7. APPLICATIONS
[1] Automatic Meter Reading  
[3] Lightning Control  
[4] Status Monitoring and Control  
[5] Intelligent Buildings  
[6] Sign and Information Display

8. ADVANTAGES
[1] PLC can be used for transmitting radio programs over power lines in the AM radio band.  
[2] Low cost and simple to use.  
[4] By using this type of automation, only one man can able to control the transformer and will be able to monitor the over voltage, current under voltage faults.  
[5] It has high immunity to electrical noise persistence in the power line.  
[6] It is capable of providing 9600 baud rate low rate bidirectional data communication.  
[7] Due to its small size it can be integrated and become part of the user’s power line data communication system.  
[8] Built in error checking so it never gives corrupt data.

9. DISADVANTAGES
[1] The main disadvantage of this system is that it is a wired system.  

10. CONCLUSION
It can be concluded that this Power Line Communication Modem Circuit which demand a detailed understanding of digital communication principles, networking principles: electronics circuit design, and software knowledge After all the hardware requirements have been achieved, the software development in PC to facilitate communication between two modem devices.

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9. REFERENCES


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