



A Design of Multichannel Data Transmission Through Power Line Communication

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Abstract

Smart Metering in the power grid is the present popular technology in and around the world. Future Generation is requiring new method for data transfer. This paper introduces a novel method called Power Line Communication (PLC) transceivers. PLC has many number of smart grid applications. This work proposes mainly about the transmission of data's through Power Line. This work includes both electrical and electronic concept. Here, transmission process takes place through electrical line by using electronic equipment. This paper addresses the important role of transferring data's from one place to other. In this concept, dc loads are controlled by giving commands through power line. This work does not require additional medium for transmitting data's. This paper reduces the human efforts and systematic transmission takes place. In this work, data transmission through power line communication takes place by passing constant 5v. Hence fluctuations are avoided in PLC transceivers, this protects the electronic device and dc load from damage. Here the dc loads are operated by giving ON and OFF commands. These commands can be coded in binary form or it can also be variables. Voltage sensors are used for sensing the current at the receiver (dc loads). The current which is sensed by the sensors are stored by using batteries. These currents can be retrieved for future use. This paper provides advancement in data transmission process for future generation.

Keywords: Data Transmission, power-line communication, Multichannel data transmission.

1. Introduction

In the past decade, several efforts were made around the world with the motive of introducing "smart metering" concept into power grid. Then later the concept of smart metering was achieved by transmitting power from common power station to different buildings and houses through power lines. Generally data transfer is done to share information from one place to another. Earlier data were transferred manually, then after the development of technology data were transferred using a source or medium. Few years' later data transfer was done through wired medium. Later after rapid development of technology data transfer was done through wireless medium. Wired medium includes cables and wires etc. Wireless medium includes Bluetooth, wifi, zigbee etc. This paper involves both electrical and electronic concept. Here, Transmission of data is done through power line communication. In this proposed concept data transfer does not require any additional wired or wireless medium. Here transmission takes place through existing medium, ie., power line communication.

2. Operating Principle

In existing system data or Information are shared manually. Work done manually is time consuming and causes human error. So an effective system is required to reduce the human work.

In existing system electrical panel is the major source for data transmission. Also these days to transmit data we require an additional wired or wireless medium. So the cost is high for

transmission process. In existing system distance is the problematic factor. Data cannot be transmitted over very long distance, due to obstacles and disturbance. In existing system loss of information takes place during transmission due to external disturbance and obstacles. So while transferring an information, efficiency of getting the output is very low in existing system. Also because of human error and other obstacles load device cannot be controlled. Hence electricity or power resource is wasted. Energy resource cannot be saved for future generation. So new advancement should be made for saving energy resource and to transfer data efficiently. It should also be designed in such a way that it assures high safety while transferring data. High efficiency should be achieved at the receiver side.

Future generation requires advancement in technology for transmitting data. This advancement is implemented in this paper by transmitting data through power line communication. Earlier transmission was done through electric panels and many other sources. But in this proposed work transmission takes through existing medium

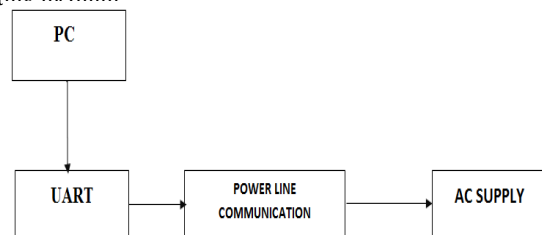


Fig. 1: Block Diagram

Figure 1 shows the block diagram of the proposed work. In proposed system, data transmission is done through power line. Power line communication is used for transmitting the data from one place to many. It does not require any extra cables or wires. It enables the data to transfer over existing power line. This new technology is used to reduce the human efforts. The PLC can be used to carry both data and power. Transmission of data takes

place at high rate using power line. In transmitter side, PLC will be plugged to the AC supply; the data will be transmitted along with the power. The PLC will receive the data through UART port. The power line can be connected to the PC through UART connection.

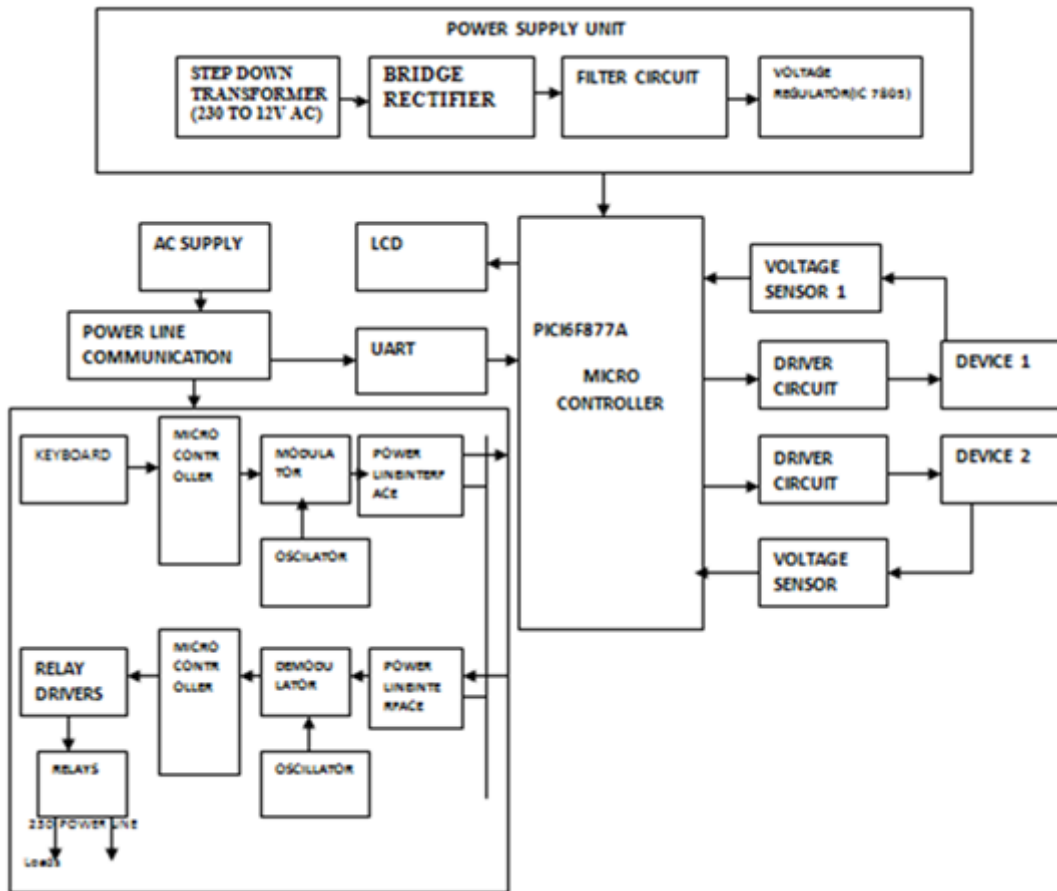


Fig. 2: Block Diagram of Receiver Section

Figure 1 shows the block diagram of the Receiver Section. In receiver side, voltage regulator is used and it will provide a stable dc voltage. This voltage can be send to the microcontroller. The microcontroller is used to receive the data. Wherever PLC is connected, the data will be received and it is used for controlling the device. To send the data to the receiver, the prefixed commands are used. The load is either ON or OFF based on the command received from the transmitter. The load consumed voltage is measured by using the voltage sensor which can be used to sense the voltage level and its value will be displayed on the LCD. The voltage sensor is used here to measure the load. In proposed system, we use driver circuit which performs ON and OFF operation.

In transmitter side, transferring of data is done using PLC. The ON and OFF commands are given through the PC by using the VB page which is one click page. The commands can be either coded in binary form or as variables. Generally, PC cannot be directly connected to the PLC hence UART port (serial port connection) is used to connect both PC and PLC the data can be transmitted along with the power. The PLC will receive the data through UART. PLC which carries both data and power which can be received at the receiver side through the same medium. In receiver side, wherever the PLC is connected, the data will be received and the received data will be displayed on the LCD. If you need to send the data to only one receiver means you need to transmit the data along with the unique code of the receiver. The code which is

matched with the receiver, the data will displayed. In the receiving side, we use step down transformer for converting high voltage power to low voltage power and producing 230v to 12v AC power supply. That Alternating current can be converted into direct current by using bridge rectifier. The voltage regulator is required to provide the constant 5v which can be given to the microcontroller and it receives the data through the power line. Whenever the data and power flows through the driver circuit that time it act as switch and it will be open for ON commands and it will be close for OFF commands. To control the dc loads by giving the ON and OFF commands through the power line. The voltage sensor is used to sense the voltage in the load device and the sensed voltage can be displayed on LCD. The sensed voltage will be stored in a battery for future use.

3. Results and Discussions

In this proposed work, fan and light are considered as load circuits through which ON and OFF operations are performed. The LCD is used to display the voltage value of the loads which is kept at the PLC board. Sensors are connected to the driver circuit to sense the voltage at the load. Figure 3 shows the photocopy of entire circuit of the proposed work.

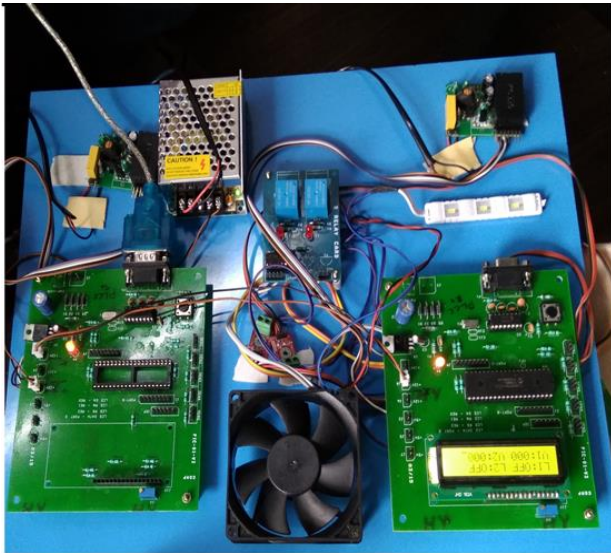


Fig. 3: PLC transceiver circuit

The ON and OFF operations are performed through PC by installing VB page. In the VB page, the required command is given using the tool bar. Once sent option is clicked in the tool bar, the command is sent to the transmitter side, through UART connection. UART is connected to the PLC board which gives internal supply connection to the receiver. The following command is considered in this work while considering fan as load 1 and light as load 2.

'a'- ON the load 1

'b'-OFF the load 1

'c'- ON the load 2

'd'-OFF the load 2

The required command is transmitted to the receiver side. Relay circuit is present in the receiver side which transmits the commands to the load circuit. In figure4, ON command transmission is shown.

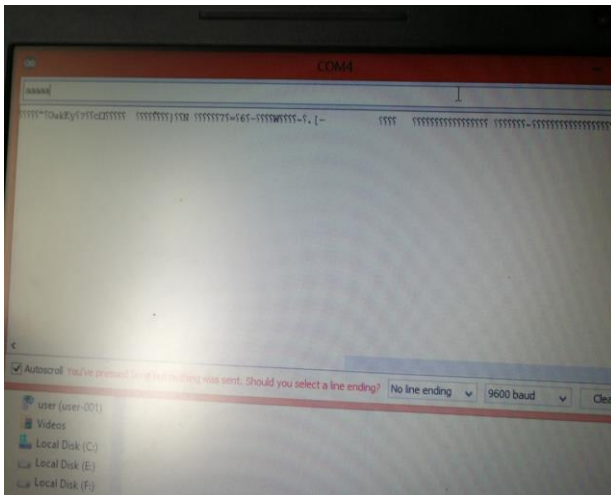


Fig. 4: Data 'a' given to ON the load

Data 'a' is given to ON the load 1 (fan).

The load receives the command from the relay circuits. Voltage sensors are placed at the receiver side to sense the voltage and the battery is used to store the voltage. After receiving the command 'a' the load 1 is started to operate and the fan rotates. Figure 5 shows the operation of load 1, by giving the command 'a'.

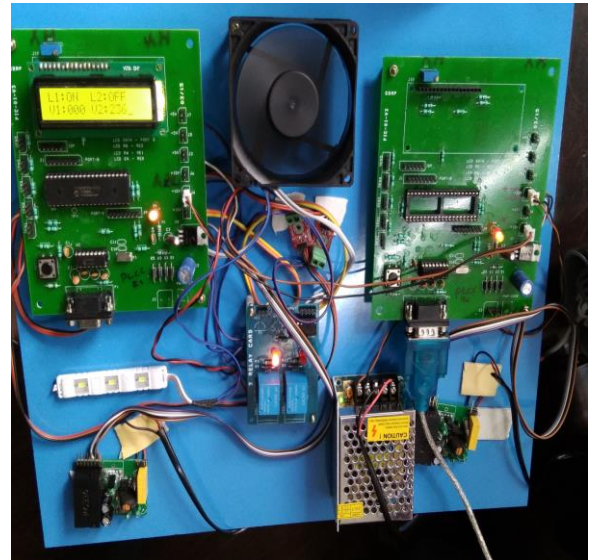


Fig. 5: Operation of Load 1

The load 1 is kept OFF by giving the command 'b'. Fig 6 represents the load 1 under off condition.

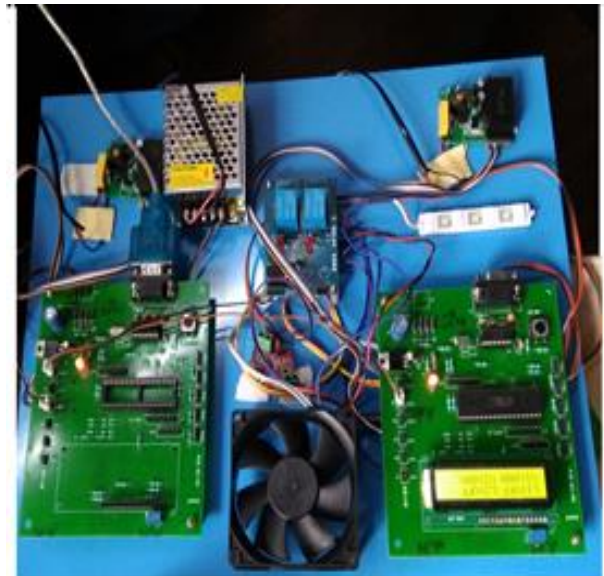


Fig. 6: Load 1 under OFF condition

Relay performs vital operation in this proposed work. It acts as switch and whenever there is no transmission through the power line, and then the relay circuit performs OFF condition on the load. When load 1 is in ON condition, load 2 will be under OFF condition and vice versa. Command 'c' is given to perform ON operation of load 2. Figure 7 shows the ON operation of load 2.



Fig. 7: Load 2 under ON condition

The load 2 is kept OFF by giving the command 'd'. This shows the load 2 is OFF. The load receives the command from the relay circuits. Fig 8 represents the load 2 under OFF condition.

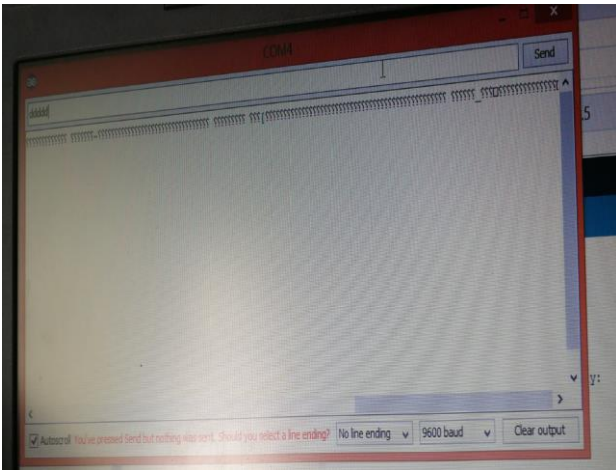


Fig. 8: Shows the off command given to load 2



Fig. 9: load 2 under OFF condition

The load 2 is kept OFF by giving the command 'd'. Fig 9 represents the load 2 under off condition.

Since transmitted voltage is a constant voltage of 5V, there is no short circuit. The system supports to save energy and it can be

retrieved for future use. This enhances data transmission through power line communication from one place to another.

4. Conclusion and Future Enhancement

This proposed work the load devices are operated efficiently through data transmission using power line communication. This proposed model is a feasible tool for various applications. It is very fast way of transmitting data through PLC. The coverage and capacity of the PLC network can be carried out efficiently under transmission. In advanced technology PLC can be used to send the data over the existing power cables. Furthermore, this PLC technology sends both power and data along power line cables.

The proposed work enhances the data transmission through power line communication. This is the advanced technology for transmitting data through power line cables. In this work human errors are reduced and automatic technology is implemented. As the available electricity infrastructure is used for transmitting the data, transmission is done without any additional medium. It neither requires additional wired nor wireless medium for transmitting data. Transmission is done through existing medium, transmission occurs at faster rate. The data transmitted are the commands to operate the load circuits. This work is proposed to save the energy for future generation. Power used for transmitting data is simultaneously stored in batteries for later use. This work is mainly useful in smart grid application.

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