An Efficient Implementation of Data Transmission Using AC Power Lines

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ABSTRACT

Power-line is a very attractive communication media for domestic applications. It allows a very easy installation of a comprehensive network without any additional wiring. Consequently, the installation costs will be reduced, Transfer of data is an important phenomenon which is used for communication between computer, people or various remote control and monitoring applications. Nowadays power line is used widely for sending control as well as communication signals. It is less expensive in order to establish a communication network. In this project, an efficient and implementation of data transmission is proposed to transmit data through ac power lines.

Keywords: Power Line Communication, Power Line Data Transmission.

1.INTRODUCTION

The electrical wiring in your home comes standard—but it can do a lot more for you than just keep the lights on. An alternative to running Ethernet cables through the walls, powerline adapters take advantage of the existing electrical wiring in your home to transfer network signals between rooms that otherwise would be out of range all you need is a power outlet. Powerline doesn't impact your electricity when the network is in use, despite being able to support a variety of frequencies without interference. Powerline connections also have less data loss and better speeds than regular Wi-Fi, regardless of how far your computer is from the router or how many obstructions there are between the two.

To set up a powerline connection, router, Ethernet cables, and at least two powerline adapters one for the router and one for each device you want to connect. Plug the first adapter into the power outlet nearest your router and connect it to your router using an Ethernet cable. Then, in another room, use another Ethernet cable to connect the other powerline adapter to your media player, computer, or other Wi-Fi device. Once plug the second adapter into a power outlet, the two adapters will use the electrical wiring running between the rooms to send each other network signals, creating an Internet connection where the router otherwise wouldn't be able to reach.Powerline is useful to anyone who needs to extend their network coverage. It's also a great way to achieve the fastest connection possible—to gaming consoles or streaming media players, for example—and connects old devices that don't feature built-in Wi-Fi connectivity. It's especially effective in larger spaces or old buildings with thick walls, concrete, metal or other obstructions—all of which interfere with Wi-Fi signals. For example, Europeans rely on powerline because their buildings can be more than two hundred years old and made of obstructive materials. Powerline is not, however, a good solution for a home that's been wired improperly or that's short on available power sockets.

2. POWER LINE CARRIER COMMUNICATION

The power line modem uses the power line cable as communication medium. It is convenient as it eliminates the need to lay additional cables. However the traditionally used channels have come to a saturation level. There is need to explore new kind of technology which is simpler to implement and is not as expensive as other related technologies. This can be implemented in small areas such asresidences, offices, etc. Failed message transmission leads to the necessity of retransmission, with possible multiple retransmissions. This causes the prolongation of average time required for collecting the information from the great population of meters, reducing the capacity of reading expressed in meters per hour being read. Our analysis is partly based on the assumption that the PLC medium has much lower quality than the radio, causing most of the transmission errors occur on the PLC itself. The result of the analysis is the processing prolongation factor g, which depends on the statistic parameter of single-try retransmission probability only [1]. It is the advantage of power line carrier (PLC) that digitalization and networking of existing facilities could be organized at low cost. Because there is no need for any further construction of communication lines, given that home appliances, information devices and other various kinds of control devices therein related are easily digitalized. Moreover, automatic meter reading (AMR) is very attractive to utility companies because not only does it reduce the cost of reading meters, but controls and monitors energy demand, and resolves consumer problems effectively [2]. Power line communication (PLC) is a rapidly evolving

technology, aiming to use electrical power lines for the transmission of data. The used signal is high frequency and in the range of 1 to 30 MHz. For PLC applications, this paper presents the modeling of the high frequency distribution network that includes overhead or underground cables and the MV/LV transformer by ATP/EMTP software [3].

- Data transfer through domestic power lines is one such technology which would revolutionize the smart power monitoring and metering distribution system and it is used to find out the power theft.
- The existing system uses PLCC modem which is a dedicated device used to modulate and demodulate the data.
- At transmitter side the PLCC will transmit the data from the power lines through RS232 interface.

At receiver side the PLCC will takes the data from the power lines

3. PROPOSED SYSTEM

- In proposed system, this circuit contains temperature sensors, humidity sensor, LCD display and Atmega 328 microcontroller both side.

- The temperature and humidity are sensed by a particular sensors and then the microcontroller read the data and transmits to the power module connected to ac socket of ac transmission line.

- At the receiver side the power module takes the data from power line and processed by microcontroller after that received data send to the LCD then LCD displays the data.
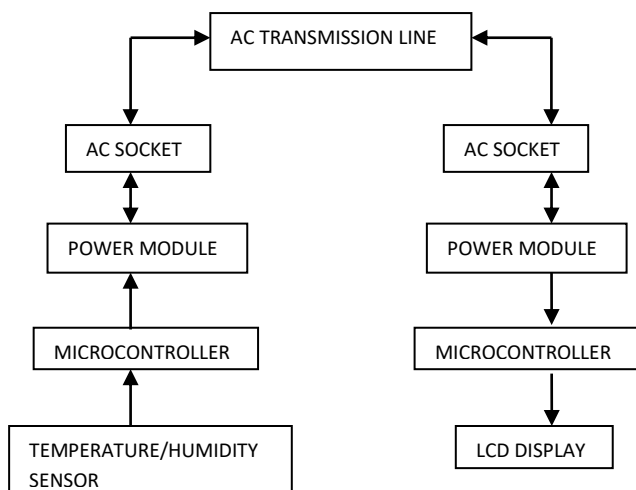

Fig 1: Block diagram of proposed system

In this project the data is being transferred over AC line from one module to another, which is encoded and decoded by controller chips. In this the source information is generated by a sensor and this will be sent to destination through power line module (KQ330) communication. The receiving system will check the data and displays on the LCD. The power line module communication used here are power module Transmitter/Receiver, The transmitter stage must be carefully designed to take digital signals from the MCU, filter them to eliminate out of band emissions and drive the low impedance of the AC power line. In receiver section of the power line module receive the data through the power line communication module and send to the receiver section of the microcontroller unit and display on the LCD.

4. DATA TRANSMISSION

SOURCE ENCODER: The signal produced by source is converted into digital signal consists of 1′s and 0′s. Source Encoding or Data Compression The process of efficiently converting the output of analog or digitalsource into a sequence of binary digits is known as source encoding.

CHANNEL ENCODER: The strategy of the channel encoder is to add redundancy to the transmitted signal in this case so that errors caused by noise during transmission can be corrected at the receiver. The process of encoding for protection against channel errors is called error-control coding. Error-control codes are used in a variety of applications, including satellite communication, deep-space communication, mobile radio communication, and computer networking.

MODULATION: Modulation is a process of changing the characteristics of the wave to be transmitted by superimposing the message signal on the high frequency signal. In this process video, voice and other data signals modify high frequency signals – also known as carrier wave.

SOURCE DECODER: In computers, encoding is the process of putting a sequence of characters (letters, numbers, punctuation, and certain symbols) into a specialized format for efficient transmission or storage. Decoding is the opposite process -- the conversion of an encoded format back into the original sequence of characters.

CHANNEL DECODER: Decoding is the process of translating received messages into codewords of a given code. There have been many common methods of mapping messages to codewords. These are often used to

recover messages sent over a noisy channel, such as a binary symmetric channel.

DEMODULATION: Demodulation is the process of separating information from a modulated carrier wave. To perform the demodulation, an internal counter is used to determine the frequency of the incoming signal. The output section demodulates the signal, restores it to the original analog input equivalent, and filters the ripple component, which resulted from the demodulation process

5. SIMULATION

Simulation of circuits is done using proteus simulation. In this project, show how to measure temperature and display it on a 16x2 LCD using Arduino, and we can use 2 button to choose what we want to see on LCD: Degrees Celsius or Fahrenheit . Here also add 2 leds into this circuit in order to warn us whenever the temperature value is lower or upper than the temperature limit we set. Leds will blink when it happens. The upper and lower limit can be adjusted with 2 resistor vars. Here use temperature sensor in this project.
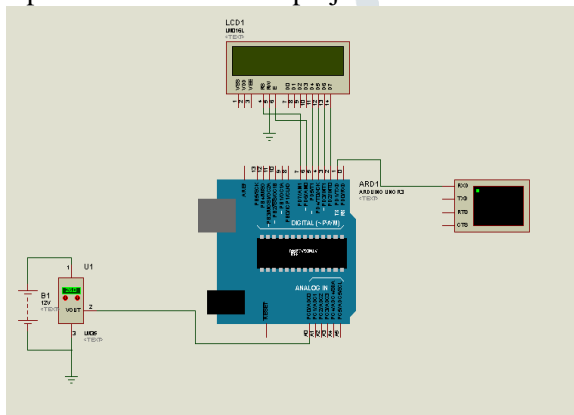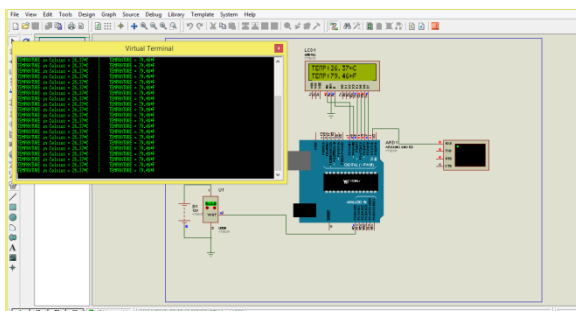

Fig 2: Simulation model

Fig 3: Simulation output

6. HARDWARE IMPLEMENTATION

This circuit contains sensor (DHT11), LCD display and microcontroller both side. We send the data using program prepared in Embedded C through serial port. This serial port is connected to power line communication module (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 which is connected to ATMEGA 328 microcontroller. Whenever sensor get data, on the LCD screen it shown to view. After the data microcontroller reads the data and transmits to the modem. This modem injects the data in power line. At the receiver side same modem is used to decode the data and it is fed to microcontroller. Finally the message is displayed on LCD.
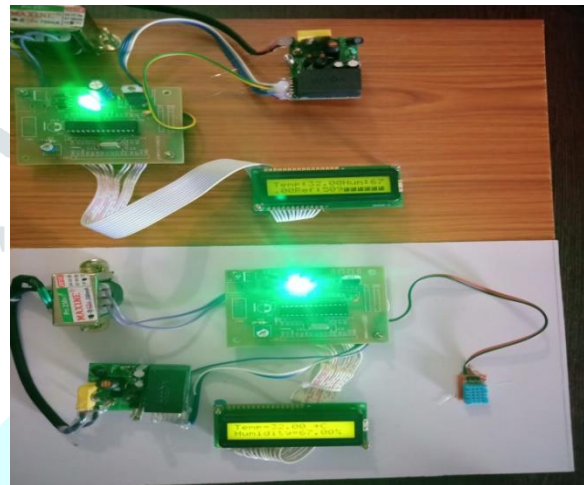

Fig 4: Hardware setup

7.CODING

```
#include "DHT.h"

#include <LiquidCrystal.h>

#define DHTPIN 8

#define DHTTYPE DHT11

DHT dht(DHTPIN, DHTTYPE);

LiquidCrystal lcd(2, 3, 4, 5, 6, 7);

int x = 0;

void setup() {

  Serial.begin(9600);

  lcd.begin(16, 2);

  dht.begin();

}

void loop() {

  float h = dht.readHumidity();

  float t = dht.readTemperature();
```

```
if (isnan(t) || isnan(h)) {

  Serial.println("Failed to read from DHT");

  lcd.setCursor(0, 0);

  lcd.print("DHT11 FAILLED");

}

else {

  lcd.setCursor(0, 0);

  lcd.print("Temp=");

  lcd.print(t);

  lcd.print(" *C");

  lcd.setCursor(0, 1);

  lcd.print("Humidity=");

  lcd.print(h);

  lcd.print("% ");

  Serial.print("hellow ");

  Serial.print(x);

  Serial.print("\n");

  delay(3000);

  x++;

  }

}
```

8.CONCLUSION

Power line solutions may be seen as complementary or alternative solutions to traditional fixed line networks, wireless networks networks. Consequently, the installation costs will be reduced, Transfer of data is an important phenomenon which is used for communication between computer, people or various remote control and monitoring applications. Nowadays power line is used widely for sending control as well as communication signals. It is less expensive in order to establish a communication network. In this project, an efficient and implementation of data transmission is proposed to transmit data through ac power lines.

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