

# AUDIO TRANSMISSION THROUGH POWER LINE SYSTEM

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## ABSTRACT

*In the field of communication and data transmission, new technologies are arising in a rapid manner. Power line communication which is also known as power line carrier is one such technology which allows the transmission of data and audio signals through the existing power lines. Power line Digital Subscriber Line, mains communication, Power Line Telecom, Power Line Networking are some other common names of power line communication technology. Power Line Communication uses the existing main wires in the building for the transmission of signals, where the installation of new wires is not needed.*

*The power lines are developed for the transmission of power at 50-60 Hz and 230 Volts, and thus the power line networks has a very widespread arrangement in every buildings. A FSK – KQ330 power line module which can act as a carrier modulation and demodulation module. This paper is about the transmission of audio signal using FSK – KQ330 power line module, by converting the audio signal to text by using a speech to text converter, then modulating it and transmitted through a power line and the converting back the text to speech by using a text to voice converter. Analog and digital signals can be transmitted through the power lines. Digital mode of data and audio signals transmission and reception is focused here.*

**Keyword:** - Power Line Digital Subscriber, Power Line Telecom, Power Line Networking, Power Line Communication, KQ330- Power Line Module

## 1. INTRODUCTION

Power line communication is a communication technique which allows the data and audio signals to transmit through the existing power lines in the power line system. Power line communication transmits data through power line that is also used for AC electric power transmission or electric power distribution at the same time. The of power line communication technologies are used for different applications, such as home automation and internet access which is often called broadband over power lines (BPL). The meaningful information signal is transmitted through the power line system in the power line communication technique using the power line as a channel or medium for the communication. It is a flexible and cost effective approach. [1]

Since the communication is possible through the existing power lines in the building no new wires are necessary for this technique. When the device in each room are electrically plugged then the devices in the home can perform communication between each devices using this technology. The transmitter in the system contains a FSK Modulator, i.e. FSK- KQ330 in which frequency shift keying is done and the signal is transmitted through the power line which can act as a channel or medium for the transmission and then the signal is demodulated to get the original signal back using the same FSK- KQ330 power line module. While transmitting the original signal, the signal should be modulated using a higher frequency carrier signal and after the transmission this signal is received and after receiving it should be demodulated with the same higher carrier frequency signal to get the original output, i.e., in a PLC system, the superimposition of carrier signal to the original signal take place in the PLC system. In this

system the audio input is given to a microphone and transmitted through the power line then the output is taken out from the speaker. For the transmission of audio signal first it should be converted to data and then it should be modulated with the carrier and at receiver signal should be demodulated using a demodulation module operating at same frequency.

## 2. LITERATURE SURVEY

[1] S.Varunkumar proposed POWER LINE COMMUNICATION – A SMART APPROACH FOR EFFICIENT DATA TRANSMISSION. In this emerging world advanced technologies is an essential need in communication and data transmission field. The new technologies want to be more efficient, pocket friendly and also time consuming. S.Vrunkumar explained in this paper is about such a technology The Power Line Communication (PLC). PLC is an emerging technology where we can replace all the external wires for communication with the existing power lines. Here we can transmit and receive audio signals through the power lines. Since the power lines are already existing this technology can be easily implant in the office buildings, schools, colleges etc. Hence power lines are found everywhere we can use the power lines for speed transmission of voice servers and data's. This technology is also a new approach for Home automation.

[2] Asif Hassan proposed ENHANCED IN-HOUSE VOICE COMMUNICATION OVER POWER LINE NETWORK. Here Asif Hassan explained about the voice communication through low voltage network. We can use the existing power line for in house voice communication since the power lines are all over the house. All the power channels are designed to transmit a power of 50-60 Hz and 230 V since the use of power line for transmission of voice is increasing day by day. Here the transmission and reception of data through power line is by the principal of superimposition of voice over power in power channels.

The Power Line Communication means the transfer of data and voice servers from transmitter to receiver through the power lines which is already existing where the existing AC (alternating current) power wires are act as the transmission channels. When we transmit voice through the power lines the PLC system will transmit voice signals along with the power signals through the principal superimposition.

[3] Habib Rasi and Maryam Shirzadian Gilan proposed NEW METHOD FOR DATA COMMUNICATION OVER POWER-LINE CAREER. The power transmission line is a dual functional transmission line. According to the power transfer of electric possibilities the power transmission line is an efficient and cheap method for voice transmission. It makes use of existing power lines for the digital communication technology. Broad band power line is one of the technology which use power line as a communication channel. The major drawback of the power line communication is electromagnetic radiation due to the arrangements of wiring and frequency variations. They conduct power distribution in an effective manner but due to some restrictions it's not adapted for communication. The power line transmission provides efficient communication possibilities with the help of frequency band and fast transmission is provided. To attain high rate and reliable data transmission on the basis of orthogonal frequency division multiplexing modulation is used. According to this paper power line using method and multiplexing of signal is explained.

[4] Victor Apaza-Mamani and Efrain Zenteno-Bolanos proposed HIGH-SPEED AUDIO COMMUNICATIONS IN DOMESTIC POWER LINE CHANNELS. The day by day usage of global communication the PLC where introduced. Which is the technology with fast data communication. The major drawback of PLC communication is that it will be affected by the noise easily and get disturbed with the wireless signals. On the basis of usage PLC has divided with variant types in narrow band. To overcome the channel malfunctions the OFDM play a key role in the Domestic power line communication by regulating the cost of solutions.

Here is a design of a transceiver which is less expensive and pocket friendly which communicates through power line. Hence the existing power line itself act as the communication medium the expense will be comparatively lower than other communications or technologies.

[5] Jianfeng Chen proposed A FAST RETRANSMISSION MECHANISM IN POWER LINE COMMUNICATION NETWORK. For high quality audio and video transmission Broadband power line communication (BPLC) network is a fast growing technology in this emerging world. Because of the frequency and time varying characteristics of PLC there is a higher chance of losing audio signal packets during the transmission, hence the idea of Retransmission is essential in power line communications. Here a new method of retransmission

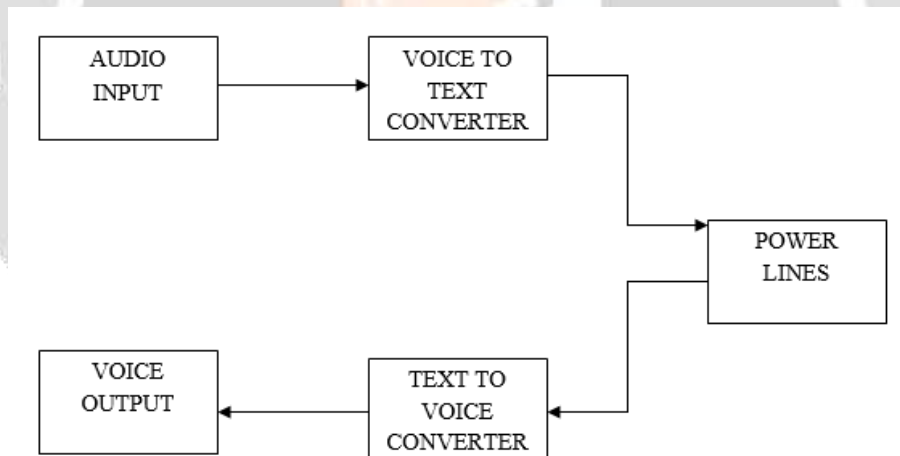
which connects the transmitter node and destination node which indicates the packet loss from the destination node. This new method can be implemented in PLC where regular or constant signal packet loss occurs.

The traditional method for retransmission solves the losing of packets in the destination mode but in this new method of retransmission the losing of packets is solved in the transmission node itself since there will be no loss of signal packets in the transmission time. PLC is a proven technology for cost effective transmission of audio signals and data's but sometimes the data packets the send from the receiver to transmitter may not reach the destination properly here comes the advantage of retransmission it will retransmits the loss packets once again hence the information can be reach the destination properly.

### 3. PROPOSED SYSTEM

In this system audio signals are transmitted through the existing power lines. Audio signals are given as input through a computer or using a mobile phone and the output is taken through a speaker. A KQ330 frequency shift keying (FSK) modulator and demodulator is used as the power line module. KQ330 plays an important role here. First the audio signal is converted to text using a voice to text converter and it is modulated. Then it is transmitted through the existing power lines. In the receiving side signal is demodulated using an FSK demodulator KQ330.

The proposed system first convert the audio signal to data and then after transmitting it through the power line it is converted back to the audio signal. This is specified in the simplified block diagram shown below. Two conversions are mainly done here. First one is voice to text converter. It is done in the transmitting side. The input audio signal is converted to data. Then the second one is text to voice converter. It is done at the receiver end. Then the final audio output is obtained.



**Fig-1:** Simplified Block Diagram

### 3.1 Detailed Block Diagram

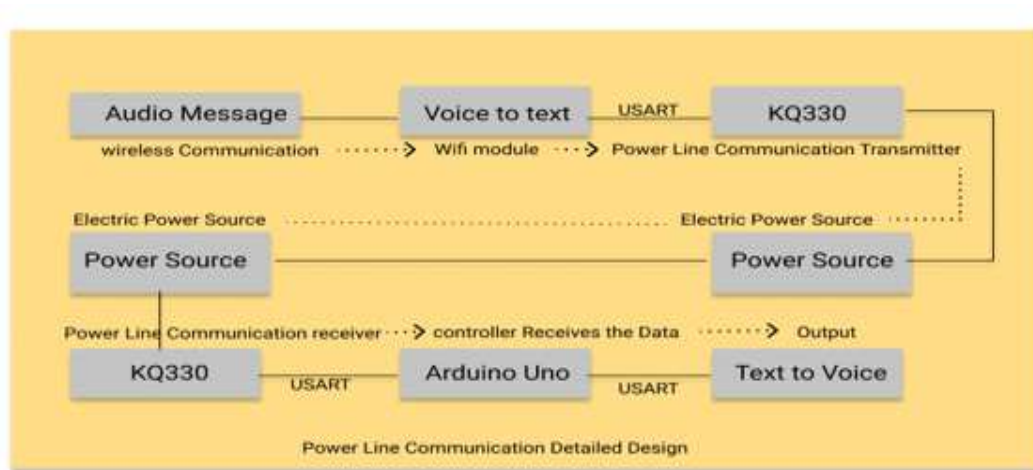


Fig -2: Detailed Block Diagram

Detailed block diagram shows that there are transmission and reception ends where we can give input and take output respectively. As power lines are working in 50- 60 Hz and 230 v the given input should be converted to these frequency and voltage levels. The data here is transmitted serially. The input audio is given to the power lines using two methods. First one is using a computer it is given to the Wi-Fi module and here the connection is wired. The second method is using a mobile app we can transmit the recorded voice input and here the connection is wireless. The input audio signal is transmitted to the Wi-Fi module ESP-12-R3 and for this serial communication MAX 232 is used. The baud rate at which the transmission occur is 9600 bps. Then the Wi-Fi module receives the data and transmit it to KQ330 power line modem. KQ330 is a frequency shift keying (FSK) modulator and demodulator. KQ330 transmits the data to the power line and receives the data from the power line. Two KQ330 FSK Power line modems are used. That is, one as modulator in transmission side and the other as demodulator in the reception side. Both the modulator and demodulator is connected to the power lines using extension cables. Thus the data is transmitted through the power lines and the demodulator KQ330 receives the data and it is then connected to a Arduino UNO. The transmission between the Arduino UNO and KQ330 is also serial communication. Then it is connected to the Wi-Fi module ESP-12-R3 or the data can be transmitted to mobile phones using Bluetooth.

### 3.2 TRANSMITTER

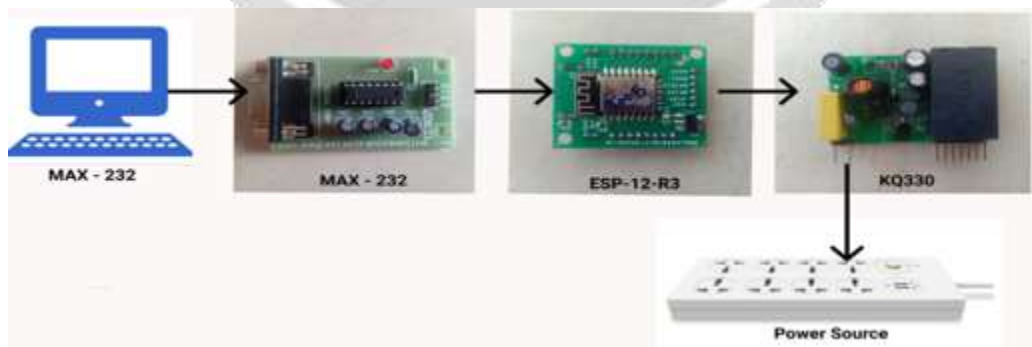


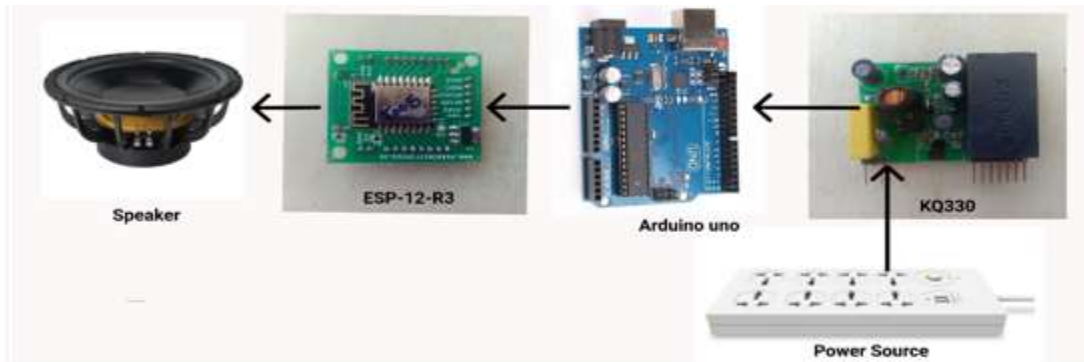
Fig-3: Block diagram of Transmitter side

In the transmitter side the signal modulated and then it is injected to the power line. More signal power across the line is implied by the stronger transmitted signal. If the signal is stronger, then it will be less corrupted by the noise



while transmitting. Since the more signal energy injected into the line and the more energy the node consumes, the transmitted signal strength also affects the power consumption of the PLC node.

### 3.3 RECEIVER



**Fig-4:** Block Diagram of Receiver side

Signals have to travel over the power line, signals can be significantly attenuated by the time they are picked up by the receiver depending upon the power line's characteristics, loads, and segment lengths. Thereby increasing the effective communication distance, a receiver that has a high Rx sensitivity can pick up even lower strength signals from the line. However, high sensitivity is not always good. A high-sensitivity receiver will not only detect smaller signals but also it will detect smaller noise in the channel.

### 4. RESULT

The Drawbacks about the PLC communication are mainly according to the power line channel impedance differences, Sound interference and signal attenuation. Different household applications and different office instruments are the most common reason for the interference in the network distribution. The PLC communication consist of transmission and reception parts with low I/O impedance which is matches with the channel within the operating circumstance. The major advantage of this technology is that we can transmit and receive the information through the existing power line with minimum possibility of hacking.



**Fig-5:** Power Line Communication

## 5. CONCLUSION

By this project reducing the cost of transmitting the information from one point to another point is the main goal. By this project we can use the existing power lines itself as the medium for transmission and reception of audio and data signals. Audio transmission through power line is implemented to ensure the security of transmitted audio and data signals. In the wireless communication the hacking possibilities is very high it can be reduced by using the power line communication as a channel for audio transmission. The main feature of this project is that the number of wires used for the transmission of audio signals can be reduced since the power lines are already existing everywhere.

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