

DIGITAL DATA TRANSMISSION / RECEPTION VIA POWERLINES FOR MINING APPLICATIONS

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ABSTRACT

Technology has wide contribution in all the fields of society, but there are many challenges which are occurring newly day by day. One such issue in the society is about communication between employees working in underground mining and control room which is very important, were most of the times communication signals don't reach on mobile phones also using wireless technology can be expensive to set nodes at regular distance in the underground, so the solution to this should be cost effective and efficient enough, hence the proposed system uses the concept of PLC (Power Line Communication) to communicate between underground and control room using the existing power line, since the system uses the existing power line infrastructure the cost of the system is less where there is no need of separate cables for communication. The system uses the PLC module which is used to transmit and receive the data which is sent on existing power line. The proposed system monitors the temperature, humidity, pressure and gas parameters inside the underground mining tunnels and it is transmitted to the control room via PLC module which is attached to existing power Line. The system also has an emergency alert system which is used to alert the control room or inside the tunnel. The control room which is outside the underground tunnel is implemented with IoT technology so that authorized person can even monitor the status of tunnels from anywhere using the Monitoring App provided, since all the monitoring parameters are sent to online central server.

Key words—Plc module, cloud, relay, gas sensor, temperature sensor, pressure sensor, and humidity sensor.

1. INTRODUCTION

The power line communications use the existing power line infrastructure for communication purposes. This technology is preferred over other communication technologies like satellite, wireless and optical fiber communications due to wide availabilities of power lines as power lines are one of the most widely available communication mediums for PLC technology and also it is already existing infrastructure. Finally, we describe a communication strategy that eventually could be used for information transfer over the power-line communication channel.

2. LITERATURE SURVEY

John Murphy and Parkinson [1] proposed in Underground mine communications that for power line communication, minimum frequencies are about 30 kHz in the LF range the higher the frequency the better the coupling efficiency, in the UHF band, the radiated wave propagates in the “waveguide” formed by the mine opening. Hence, selection of optimum frequencies is dependent on the relative efficiency of propagation and the noise level, which together give the optimum signal-to-noise ratio.

L. K. Bandyopadhyay and A. Narayan[2] proposed in Power line communication systems in underground mines, sometimes due to fissured strata, the roof or side wall of a gallery collapse, miners gets trapped inside sealed area. Many miners get trapped beneath the big chunk of fallen roof. A communication link between the trapped miner [1, 6-7] and rescue team is essential to find out the actual location of trapped miner for rescue operation. Studies revealed that attenuation of low frequency is comparatively lower through coal block. The low frequency tone signal modulated over RF signal 457 kHz can be transmitted through large thickness of coal block.

Tanmoy Maity[3] proposed in Rescue and protection system for underground mines based on zig bee that a wireless sensor network (WSN) are usually low data rate, low latency and self-organizing in an arbitrarily spaced collection of nodes. A wireless sensor network consists of small devices, called sensor nodes that are equipped with sensors to monitor the physical and environmental conditions.

L.K. Bandyopadhy[4] proposed Power line communication in underground mines rfid based sensor networking that a proper and reliable PLC system in underground mines will save the machine breakdown time, also help in immediate transfer of message from the vicinity of underground working area to surface for speedy rescue operation.

Rakesh Roushan [5] proposed Power line communication in coal mines that, accidents due to roof fall and collapse of side gallery are some of the daily occurrences in coal mines. Hence the PLC offers an aid to establish communications with miners, trapped under coal debris.

3. METHODOLOGY

The proposed system main concentrates on establishing communication over Existing Power

Line using PLC module, the system mainly has 2 sections as follows

1] Transmitting Section:

This section consists of microcontroller attached with sensing unit which is used to monitor the surrounding environment parameters like temperature, humidity, pressure and gas. The system also consists of Alert system where any employee inside the tunnel can press the button to alert the control room for help during panic situation. The transmission of data is done through PLC module which is attached to microcontroller at one end and other end is connected to 200v AC power line. The data is transmitted to receiving section.

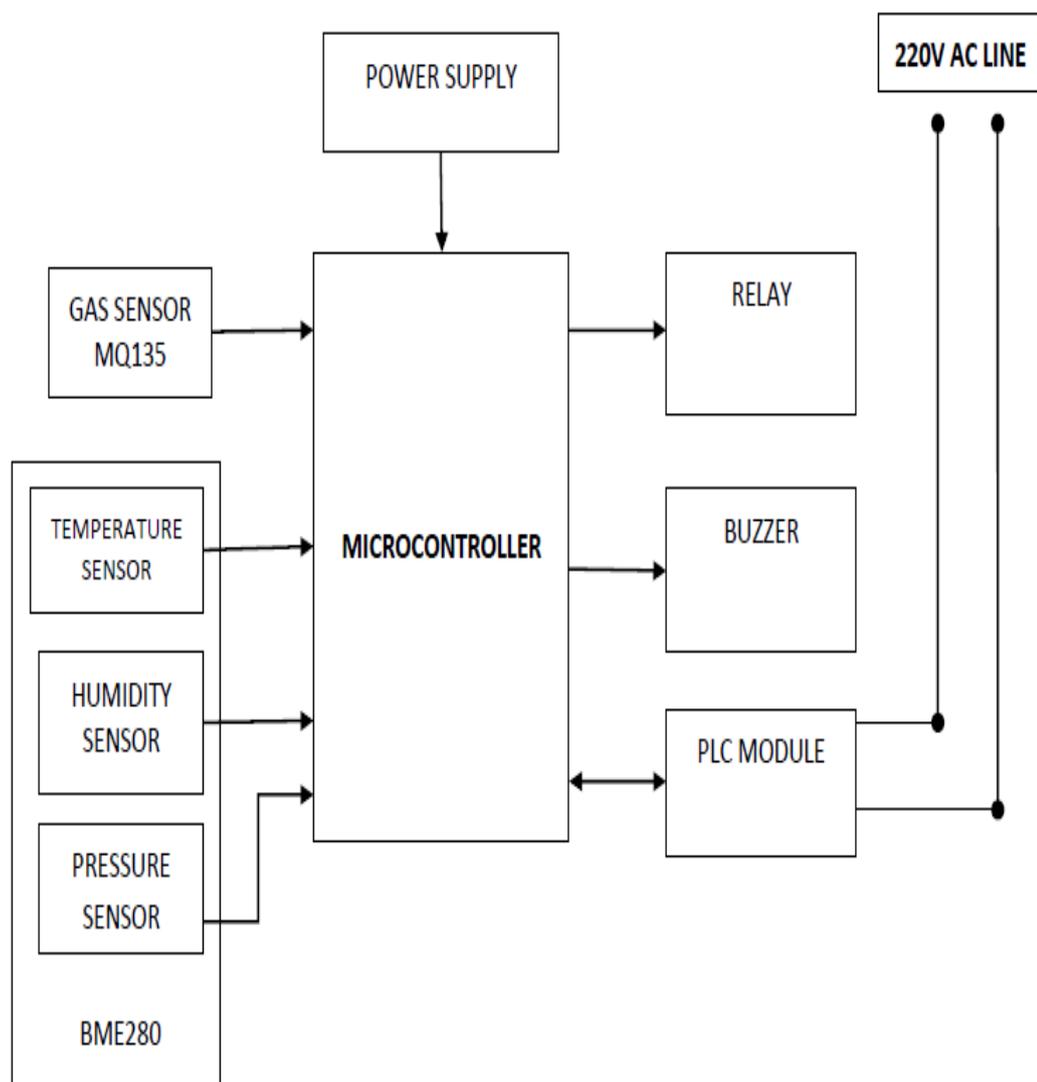


Fig 1: Block diagram of transmitting section.

2. Receiving section

This section is placed in control room which is outside the underground mining tunnel where maintenance team monitors the parameters which is sent from the underground tunnel, the receiving section has microcontroller unit with LCD interfaced and an PLC module connected to microcontroller unit at one end and other end to the existing power line from where all the transmitted data from transmitting section is received, so that all the monitoring parameters are displayed continuously on LCD. An alert system is even installed at control room so that alert can be given to underground working employees in panic situation. Simultaneously the monitoring data is transmitted to online central server via IoT technology implementation using Wi-Fi module and that data can be accessed from anywhere using a Management App provided to the concerned authority.

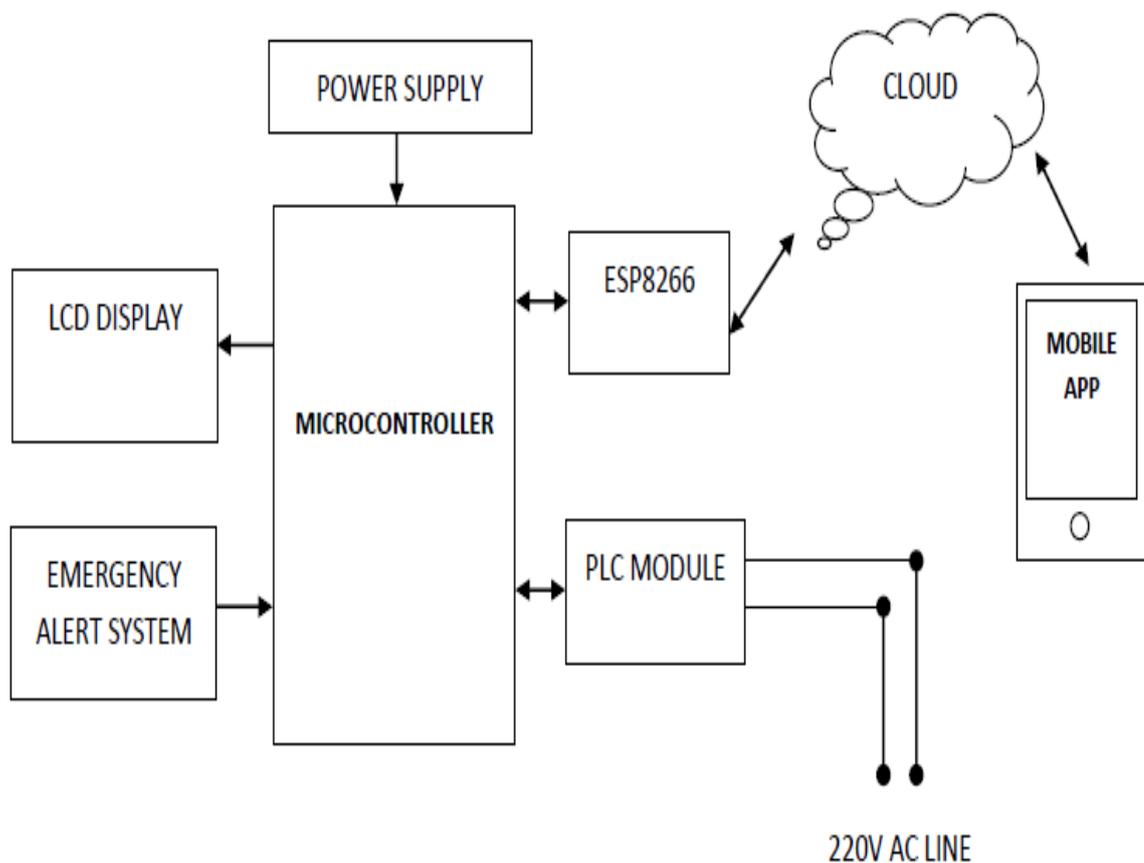


Fig 2: Block diagram of receiving section.

4. ADVANTAGES

1. It is low cost.
2. PLC is easy to setup and even easier to use.
3. PLC has secure data encryption.
4. PLC has no more wires, just plug in so easy to install and use.

5. APPLICATIONS

1. Mining areas.
2. Shipping service.
3. Home automation.
4. Campus, schools, hospitals, hotels, etc .
5. Without new wires, power line communication can be used to bring high speed connectivity.
6. Fire and security alarm system.
7. Heating & ventilation, air conditioning control.

6. CONCLUSION

PLC solutions maybe seen as complementary or alternative solutions to traditional fixed line networks, wireless networks and VDSL networks. According to existing network architecture, buildings or technical constraints, either solutions can be chosen, but one can also consider one solution to complement another! PLC band widths are said to increase the homolog AV standard is being considered for broadcasting digital television. Many research projects are on giving into these solutions and their application, it is all to come, one should pay close attention to news about this technology.

ACKNOWLEDGEMENT

We would like to show our deepest gratitude to **Dr. C.V. Ravishankar**, Head of Electronics and Communication Engineering Department, SaIT was very supportive. He provided us with facilities of the college to help make the project a success **Prof K. Ezhilarasan**, Assistant Professor, Electronics and

Communication Engineering, has been very helpful in the design and construction of the concept, and always offered guidance when we faced dead ends.

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