ANALYSIS OF POWER WIRE COMMUNICATION SYSTEM

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Abstract: ***The communication over power wire we can use for transferring data on low and medium speed. This communication allows to reduce wires used for sensor networks, signal wires and data transmission. It can use for vehicles having more number of sensing elements and number of BCM of featured vehicle. So sensors are connected with transmitter controller board via cable, Power wire transmitter will transmit sensor data over same power wire which provides power to sensor device, transmitter and receiver board. This communication will be the good solution for reducing number of wires for multiple sensor device interfacing. The major application area for this system would be electrical vehicle which have multiple sensor networks and complex wiring.***

Keywords: ***BCM, Electrical vehicle, Sensors, Wiring, Power Wire communication.***

1. INTRODUCATION:

As a dependable alternative networking medium, this study offers communication on power wire system that allows in-vehicle communication for the transmission of control messages and sensor data from sensor location to receiver control module. The Power wire Communication can be sue for multiple sensor networking, sending short data massages and vehicle system uses an existing DC/AC power wires as the communication media, which doesn't require an additional signal wires for sending data and signals in-vehicle signal transmission. We can achieve the reduction of number of wiring harness from a system where large number of sensors and slave network works. For example, solar panels are located at far distance from control station in solar electricity generation system. Power Wire Communication will help to send data like solar panel position altitude, voltage and current measurement near to the solar panel terminals which is quite difficult with manually for every solar panel. Second example is we can utilize this system for features of vehicle (Stop light, reverse light, number plate light, demister, rear wiper, rear indicators) with the safety features like short circuit protection, fault protection and feedback to vehicle control unit.

This power Wire communication will eliminate the number of wires, complexity of wiring harness design, weight of wire and production of wiring harness. Hence cost will come down.

2: Author review

Analysis Review result of author 1:

Sheng-Xiu Lin, Yuan-Hua Zhang, Chao-Tang Yu, Wei-Wen Hu, Liang-Bi Chen, and Wan-Jung Chang – "A DC Power-Line Communication based In-Vehicle Safety Aided System for Rear Vehicles Road Safety" [3]

This paper proposes an in-vehicle safety aided system, which adopts DC power-line communication (DC PLC) as a main transmission channel.

The system is composed with

- Voice-to-text (VTT) module
- Two embedded computer modules
- Two DC PLC transceiver modules
- Text and video message display module
- Distance measurement module.

Moreover, the proposed system is successfully installed and tested in a real vehicle. The experimental results showed that the proposed system can have a data of distance to the adjacent rear vehicle, and display front view video with alerting messages for drivers of rear vehicles.

Analysis Review result of author 2:

S. Barmada, M. Raugi, M. Tucci, T. Zheng - "Power Line Communication in a Full Electric Vehicle: Measurements, Modelling and Analysis".[2]

The technological implementation is nowadays done by using different data bus (Local Interconnect Network, Controller Area Network, Media Oriented Systems Transport, FlexRay), depending on the required communication speed and reliability.

- A modern vehicle of average dimension is characterized by a communication grid of several km, with a constantly increasing number of connection points (more than 200 nowadays).
- The weight of the wiring harness is second only compared to the engine – gearbox weight. It is not

difficult to understand that the complexity of this structure will soon become an issue difficult to manage, also from the diagnostic and maintenance point of view.

- For this reason the use of power lines to transmit data could reduce this problem, since it would remove part of the cables (or all of them in the best case) for command and control with enormous advantages in terms of weight, space and cost.

3: SELF SYSTEM ANALYSIS (Author: Vaibhav Rajguru) result review

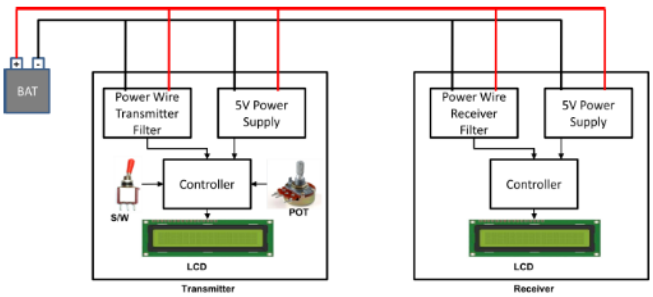

Fig.1 Power Line Communication Block Diagram

Block diagram analysis description

1. The UART transmitter and receiver for communication with two microcontrollers system.
2. Interfacing resistive sensor (potentiometer) and two switches as input to the transmitter controller.
3. Interfacing LCD for showing the transmitting data.
4. Interfacing filters at receiver with receiver microcontroller pin and interfacing LCD for showing received data from transmitter to show the complete communication over power wire.

4. FLOW CHART

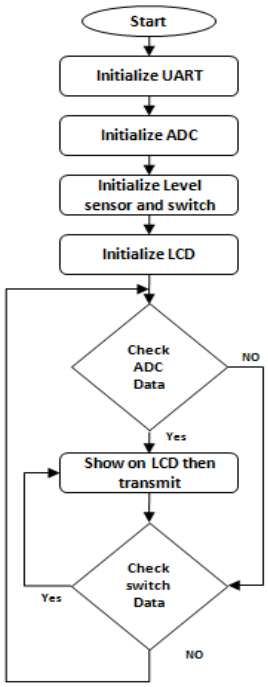

Fig.2 Power Wire Transmitter Flowchart Analysis

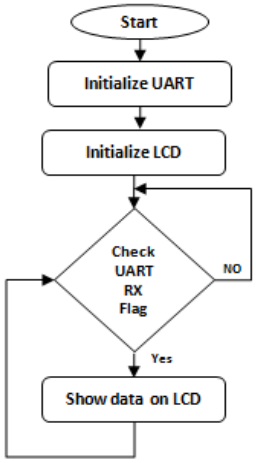

Fig.3 Power Wire Receiver Flowchart Analysis

ANALYSIS OF SYSTEM FLOWCHART WORKING

Transmitter Flowchart:

1. Microcontroller will initialize communication port, GPIO ports and ADC port.
2. Sensors like level sensor, switch type sensors ate initialized. Date read from sensors is shown on transmitter LCD display, simultaneously sent on power wire media.
3. Checking for next data and reapete 1st and 2nd number function in polling technique.

Receiver flowchart:

1. Initialize communication port.
2. Wait for data receive interrupt.
3. Display the data on LCD display. Repeat 1st and 2nd in polling technique.

5. RESULT ANALYSIS FOR POWER WIRE COMMUNICATION:

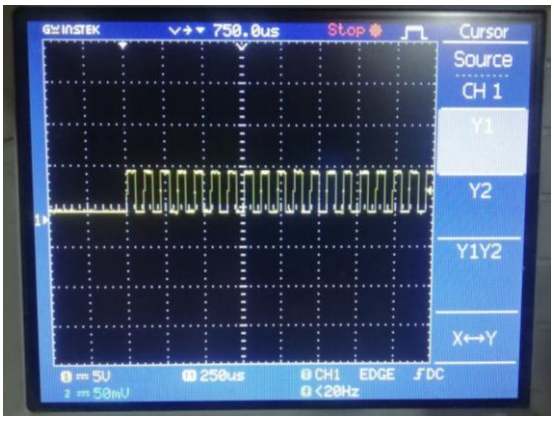

Fig.4 Power Wire Transmitter: Pulses at controller pin

Data pulses from communication port pin of transmitter controller. Amplitude is 5V that is microcontroller output pulses

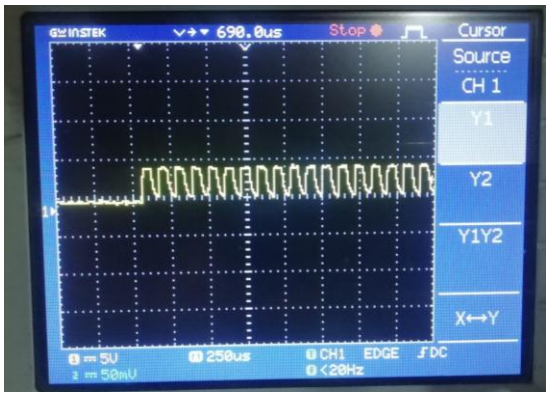

Fig.5 Power Wire Transmitter: Pulses on 12VDC Wire.

The communication signal coupled over 12VDC supply. 5V pulses are superimposed over 12VDC voltage.

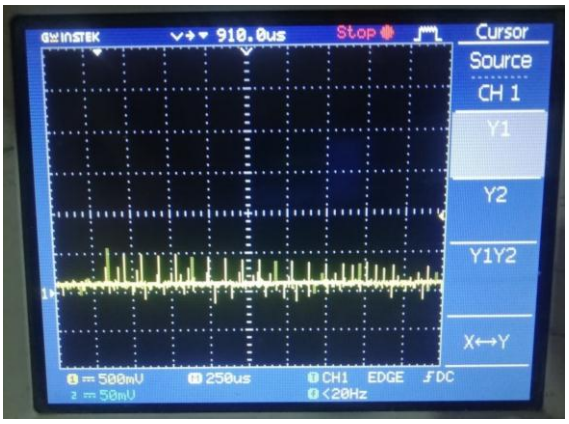

Fig.6 Power Wire Receiver: data received from sender

The received pulses form are so noisy and having distortions. So this received distorted signal pulses are filtered to get removed from noise.

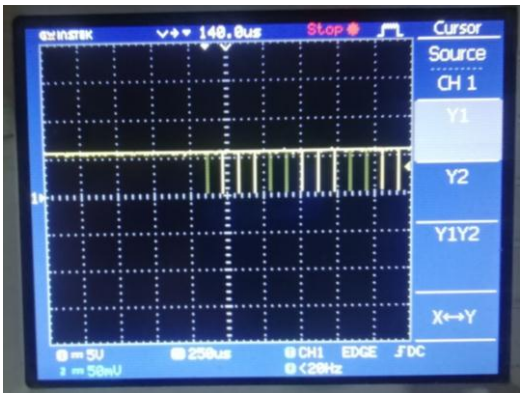

Fig.7 Power Line Receiver: pulses at RX pin of receiver MCU

After filtering and buffer stage we get the pulses which can readable for receiver microcontroller communication port and decode the transmitted data to display on LCD.

6. CONCLUSION

I have analyzed a 12V DC-based Power Wire Communication system for many applications who are working on DC power. in solar system and in-car communication, in order to make a alternative networking method for solar and vehicle in this study. The main goal of this work for an application is to do message transmission via an Power Wire Communication system It can provide the performance, data rate, dependability, flexibility, and cost-effectiveness required for mentioned applications.

POWER WIRE COMMUNICATION PROJECT SETUP ANALYSIS:

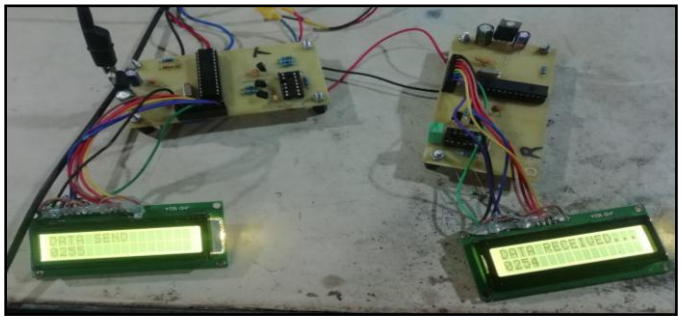

Fig.8 Project setup short wire

In project setup there is two PCBA boards, power line transmitter and power line receiver board. Both boards are interfaced with batter cables only. This battery power cable is responsible for communication between them. Transmitted ADC data count is shown over transmitter as well receiver display. The tolerance of received data count is ±2 counts.

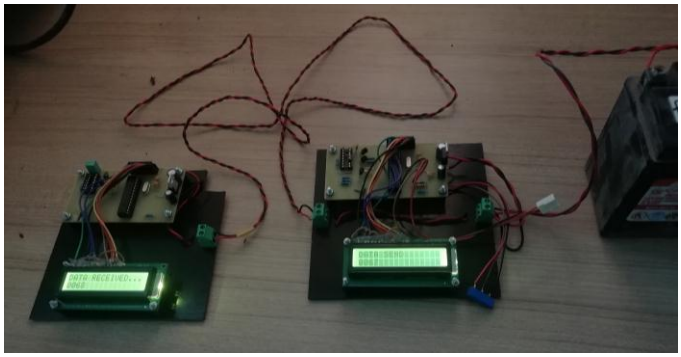

Fig.9 Project setup Long wire

13. FUTURE SCOPE OF POWER WIRE COMMUNICATION

The advantage of the Power wire communication is to send and receive data signal over DC power supply wire. Communication over power supply wire will allow to minimize the wire require to send sensor data in network. Reduction in number of wire will lead to minimize complexity, cost and weight of wiring harness in said applications and useful for automotive industries. The advantage of power wire communication is can support sensor networks with minimum wire count for long distance (several meters) communication.

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