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Research Article

# IMPULSE DRIVE IN SELF PROPELLED SYSTEMS USING WIRELESS SENSOR NETWORK FOR AUTOMOTIVES

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## ABSTRACT

This article fully deals about designing an vehicle that is fully been Automatic. Automatic in the sense we are building this vehicle with the help of Wireless Sensor Networks. Those days the vehicles were been controlled by mechanical or hydraulic methods. The vehicles steering, brakeing and accelerating are been controlled by this methods only. This is an oldest method of controlling of vehicles. By following this method there is a possibility of one or more wires get broken or disconnected which will result in the serious accident. The capacity of the wired network will be more congested and develop unacceptable latency. When the vehicle is been build with wired technology these wires have to be checked up manually so it causes waste of time. If the wires is not been checked it will result in collision of our vehicle with the other vehicle which will result in the loss of life and property. So to overcome all these problems we are designing a vehicle with the help of Wireless Sensor Networks. Wireless Sensor Networks are most widely used in todays technology. The characteristics of these sensors are less energy possesing, very low memory and highly lowered processing power.

**Keywords:** Wireless Sensor Networks, Radio Frequency, Nodes, Data Packets, Sensor Network Field, Pic microcontroller, Steering Angle Sensor, Brake Pedal Sensor, Accelerator Pedal Sensor, Mi-Wi.

## INTRODUCTION

Drive-by-Wireless System is an innovative and advanced technology that uses wireless network to control steering, braking, accelerating, and other functions in an automobile or other type of vehicle[1]. An vehicle designed by wireless will be more efficient and good in controlling. As we discussed earlier the vehicles that is been wired will always be a problem because if the wires are been damaged the controlling of the vehicle will be in a great vain[2]. This will result in the collision of our vehicle with the opposite vehicle which will result in the serious loss of life and property. So to overcome this problem we are designing the vehicle with the help of Wireless Sensor Networks[3].

A wireless sensor network is a collection of nodes that are been well organized into a group of co-opearting network. Here each node consists of microcontrollers, may contain memory, have a RF transceiver with Omni-directional antenna, and have a power source. They analysis or route the data received from the units attached to them. Sensor nodes send the occurrence of an event to a sink node. Sink node then transmits the data over internet to the user[4]. The entire area covered by the collection of sensor nodes is called a sensor network field. Power consumption happens in a node when it finds route, sends data, acknowledges the requests or processes data. So using energy maximized protocols is dangerous for Wireless Sensor Networks (WSNs) because of the limitations on the sensor nodes' energy. The routing protocol should be able to optimize the power utilization during transmission of data to the sink node. Sensor nodes can communicate with sink directly but it is always better to make the network adaptable so that when the network size is scaled up it will be easier to augment or decommission nodes at will without worrying too much about the communication between the nodes. This will be very much useful in case of networks in areas in building up the wireless self driven vehicles[5].

### CHARACTERISTICS OF A WSN

IN the past decade, the sensor-specific and service-oriented architectures became one of the important issues for the purpose of detecting, analysing, and managing the information. Due to the vast growth of technology in Micro Electro Mechanical Systems usually called as MEMS, the base

Integrated Circuit (IC) and signal Radio Frequency (RF), the network that is Wireless Sensor Network (WSN) has been widely used out in a various variety fields. The WSN is practically deployed to do sense phenomena, the gateway devices (the devices that is been used to connect) to process sensed data, and the back-end processor to take actions according to applications of the ubiquitous network. Many studies has induced the routing algorithm and the localization capability of the WSN system for providing the optimal deployment strategy to collect sensor data. Most of algorithms used gives the correct function for this manner by commercial software or middleware and would be eventually implemented and it is been approved by the practical field of measurement. These WSN utilities mostly served relay transportation of identical type data to achieve specific tasks but it is still in lack of a gateway model that can filter diverse sensor data prior to the back-end processor[6,7].

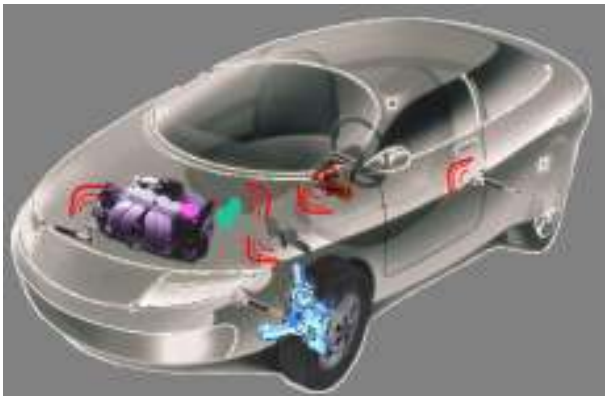

**Figure 1: Wireless Communicated Vehicle**

## HARDWARE SETUP

Now let us discuss about the hardware setup of our vehicle that is been build by the Wireless Sensor Networks. The project is constructed over LR-WPAN which stands for Low Rate – Wireless Personal Area Network based on IEEE 802.15.4 operating at 2.4 GHz. The protocol used here is MiWi P2P which is a propriety protocol from microchip developed for PIC Micro microcontrollers.

Since the system is wireless any adjacent drive-by-wireless implemented vehicles may cause interference there by reducing the stability of the entire system. This drawback is overcome by giving a vehicle a unique Vehicle Identification Number (VIN) which is sent with all the transactions involving wireless communication packets.

The implementation of Drive-by-Wireless system includes implementing Steer-by-Wireless, Brake-by-Wireless and Throttle-by-Wireless systems. The system is suitable for all vehicles, for example, an automobile, a bus, a truck, or a train. The building blocks of our vehicle is given below.

- PIC 18F45J11.
- Mi-Wi.
- Steering, acceleration, brake unit
- LCD.
- Wheel.
- RF Transmitter.
- RF Receiver.

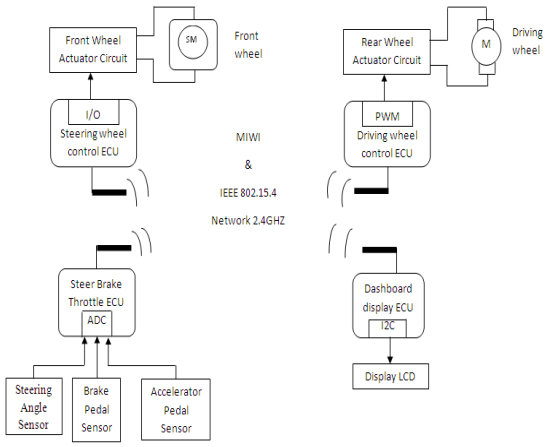


**Figure 2: Vehicle Block Diagram**

In the hardware setup PIC18F45J11 microcontroller is the main block. It includes Flash Memory. The main reason for using PIC is because it is cost effective and uses a much reduced instruction set, consisting of around 35 instructions only. This IC can be erased and reprogrammed up-to 10000 times.

**Figure 3: PIC18F45J11**

The system is constructed using Mi-Wi peer to peer wireless networking protocol based on IEEE 802.15.4 running at 2.4 GHz. It provides 16 channels and operates on all PIC micro-controllers. It always functions as a state machine and supports a sleeping device at the end of the communication. It also always enables frequency agility.

Here a 16x2 LCD display is used. It is very cheap and shows the actual latitude and longitude position of the vehicle. L293D motor driver is used. It has on board heat sink for better performance and can drive up-to 36V and total DC current of 600mA.


**Figure 4: LCD Display**

I $^2$C bus is used for LCD display. It is a low bandwidth short distance protocol. It provides a single way talk between ICs by using two wires for serial clock and serial data and both the lines being bi-directional.

**TEST SETUP AND WORKING**

Now let us see about the test set-up and working of our designed wireless vehicle. The connections are given as per the block diagram. The PIC18F45J11 is been mounted in the vehicle and it is connected to the sensor modules namely Steering Angle Sensor, Brake Pedal Sensor, Accelerator Pedal Sensor. Now let us see in detail how the vehicle unit works.

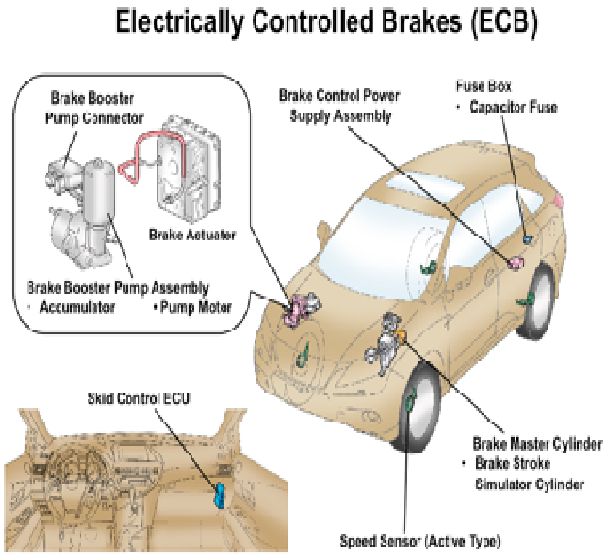


**Figure 5: Electrically Controlled Brakes**

**Step 1**: The PIC microcontroller is been connected to the RF Transmitter and to the LCD display. It is also connected to the sensor module.

**Step 2**: The Steering Angle Sensor senses the exact angle of the steering that has to be maintained while driving.

**Step 3**: The Brake Pedal Sensor senses the actual speed of the vehicle when driving and when the brake has to be applied during driving.

**Step 4**: The Accelerator Pedal Sensor senses the actual speed that has to be given to accelerator when driving.

**Step 5**: All these three sensors values will be displayed in the LCD Display. When there is a necessary that brake has to be applied the RF Transmitter sends the information to the RF Receiver.

**Step 6**: The RF Receiver will receive the signal and slows down the vehicle. The entire transmission and receiving process is carried out here by the wireless sensor. Here MI-WI is used as a wireless sensor in this vehicle unit.

**Step 7**: Every time this how the vehicle is been slowed down by our newly designed wireless sensor networks.

## CONCLUSION

In this we have designed a vehicle using wireless sensor network. Compared to wired communication it is proved that the vehicle designed by wireless is more efficient and got more advantages. So by implementing this system we can save the life of humans, animals and also property. This system in future can be implemented in buses, vans, lorries etc.

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