Remote Control Sensor Car for Vehicle to Vehicle Communication Testing
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INTRODUCTION

Motor vehicle accidents take thousands of lives a year in Canada alone. Several studies have shown up to 60% of these crashes could be avoided if the driver was warned just a half second sooner[1]. Large number of such crashes are due to driver factors[1]. Drivers suffer from perception limitations, resulting in large delays propagating emergency warnings.

Short term Goal: Create a prototype for a sensor car. Equipped with ultrasonic sensor and Bluetooth that can be controlled remotely by the user.

Long Term Goal: Implement a mesh network with multiple sensor cars to test Vehicle to Vehicle (V2V) communication in a controlled environment.

Wireless Communication

ZigBee communication protocol was used. It is Based on the IEEE 802 standard. Used for low power, short range transmission with relatively low data rates. Designed for long battery life.

- ZigBee Coordinator - Selects channel parameters, allows nodes to join, can route data, has to be awake
- ZigBee Router - Must join network before routing data, can allow other nodes to join, always awake
- ZigBee End device - Transmits or receive data from parent only, can sleep

Mesh network: Each node must be able to transmit and receive data from every other node.

RESULTS

Interface between Sensor Node and RC Car

- Reproduce demodulated RF signal to control the car
- Simple one wire interface. Feed the reproduced signal from Waspmote board’s digital output directly to the IC on the car’s PCB
- Easy implementation and easy to repeat over many cars
- No need to add or remove hardware on PCB

Network Creation

- Set up Waspmote device in a Mesh topology with the corresponding node types
- Program network joining parameters on Xbee modules; Channel, PANID, stack profile etc.
- Smart routing handled by Waspmote API
- ZigBee Routers are used so cars can route warnings or messages they receive to the next node

User Control

- On screen GUI control to work in real time, both sending and receiving data from the sensor node. This would require heavier processing needing an external application
- Create multiple sensor cars and test communication of the car’s data between them, test if cars can avoid each other based on position and ultrasonic data

FUTURE APPLICATION

Ford is currently testing V2V communication using NFC and WiFi as part of its intelligent cars program. This System would give drivers advanced warning on upcoming accidents, warn drivers if there is an oncoming car at a difficult or obstructed intersection or let them know of sudden changes in speed from cars in front of them.

V2V communication trials are going on in 6 major cities in the US, headed by their Department of Transportation. Such systems when implemented can reduce up to 80% of unimpaired accidents and can even relieve traffic congestion as well as pollution by offering real-time traffic and alternate routes.

CONCLUSION

- Need to constantly drive and produce a PWM signal to control car, requiring heavy use of the network if real time

USER CONTROL

- On screen GUI control to work in real time, both sending and receiving data from the sensor node.

REFERENCES

[7] [2]
[8] [4]