Relocating Vehicles to Avoid Traffic Collision Through Wireless Sensor Networks

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AGENDA

• Introduction
• Motivation
• Hardware
  – XBee series 2 wireless module
  – Arduino layout module
• Position Calculation using Triangle algorithm
• Collision estimation and Correction
• Advantages and Conclusion
• References
• The present technologies available are not adequate to prevent fast moving vehicles from collision.

• Wireless sensor networks along with essential electronics can be used to avoid fast moving vehicles from collision.
Motivation

• One in every ten thousand people die in the US every year due to road accidents.

• Most of the accidents occur due to speeding or drunken driving.

• Present technologies have capability to hinder user actions that can cause collision and not to relocate vehicles to avoid collision.
XBee series 2 module:

- XBee Series 2 does not offer any 802.15.4-only firmware; it is always running the ZigBee mesh firmware.
- Typical range - 40 meters.
- Best range - 120 meters.
- Supply voltage - 2.8 to 3.4 Volts.
- Supported network topologies:
  - Point-to-point
  - Point-to-multipoint
  - Mesh
Hardware

Arduino mega module:

Specifications:

- Microcontroller: ATmega1280
- Operating voltage: 5V
- Flash memory: 128 Kb
- SRAM: 8 Kb
- Clock speed: 16 MHz
- Digital I/O pins: 54
- Analog input pins: 16
The Foxboro systems could be used to control and monitor the mechanical parts in the vehicle.

Triconex system could be used for emergency shutdown for the system.
Position Calculation

- Triangle algorithm is used to calculate the position of the vehicle on the road.
- The distance between the car and layout module can be calculated based on signal strength measured by XBee.
- The position of vehicle can be known by measuring distances between two successive layouts which are separated by fixed distance.

Distance calculation
Collision estimation and correction

- Based on position and speed of every vehicle the mother controller would estimate the chance for collision.

Flow chart for collision avoidance
Collision estimation and correction

- In low speed scenarios the accidents can be prevented by braking or reducing speed.

Flow Chart for speed control
Collision estimation and Correction

- In high speed scenarios it might be necessary to measure the angle of the steering and to control it.

Flow Chart for Relocating vehicles
Advantages and Conclusion

• Human road-safety
  The proposed system can be developed to improve safety of pedestrians also. Signals from mobile phones can be used to track people in a similar way.

• The system is robust and other advanced features like clearing traffic can be for emergency services can be incorporated in the system.

• The system size makes practical implementation easier.

• The system can be used for real time monitoring of the traffic density.
References