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

Introduction

- 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.

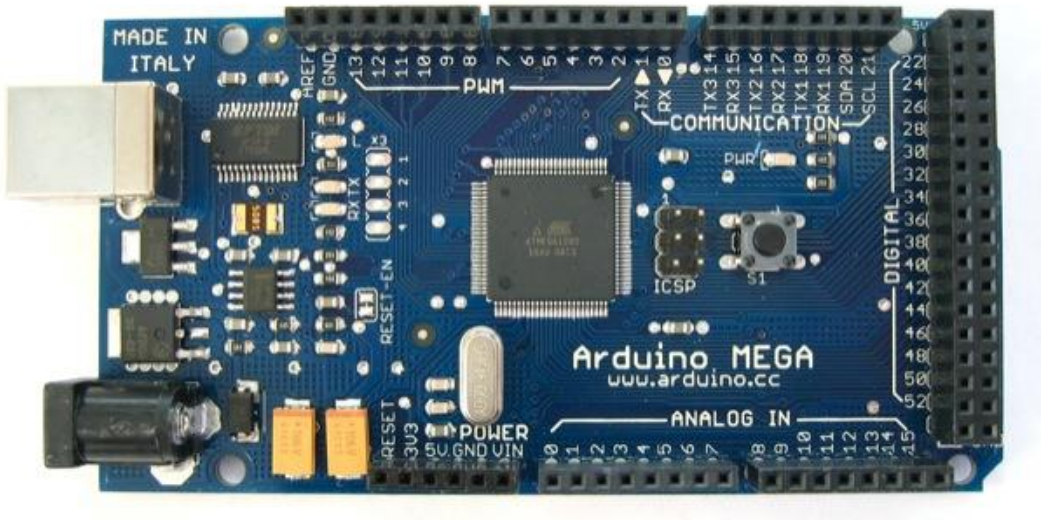
Hardware

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

In car modules:

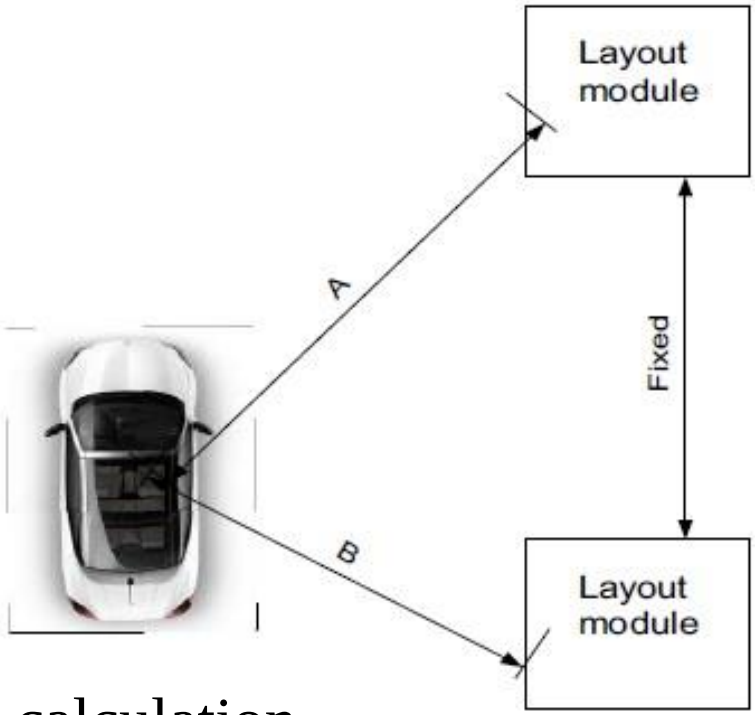
Foxboro module

Triconex module

- 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

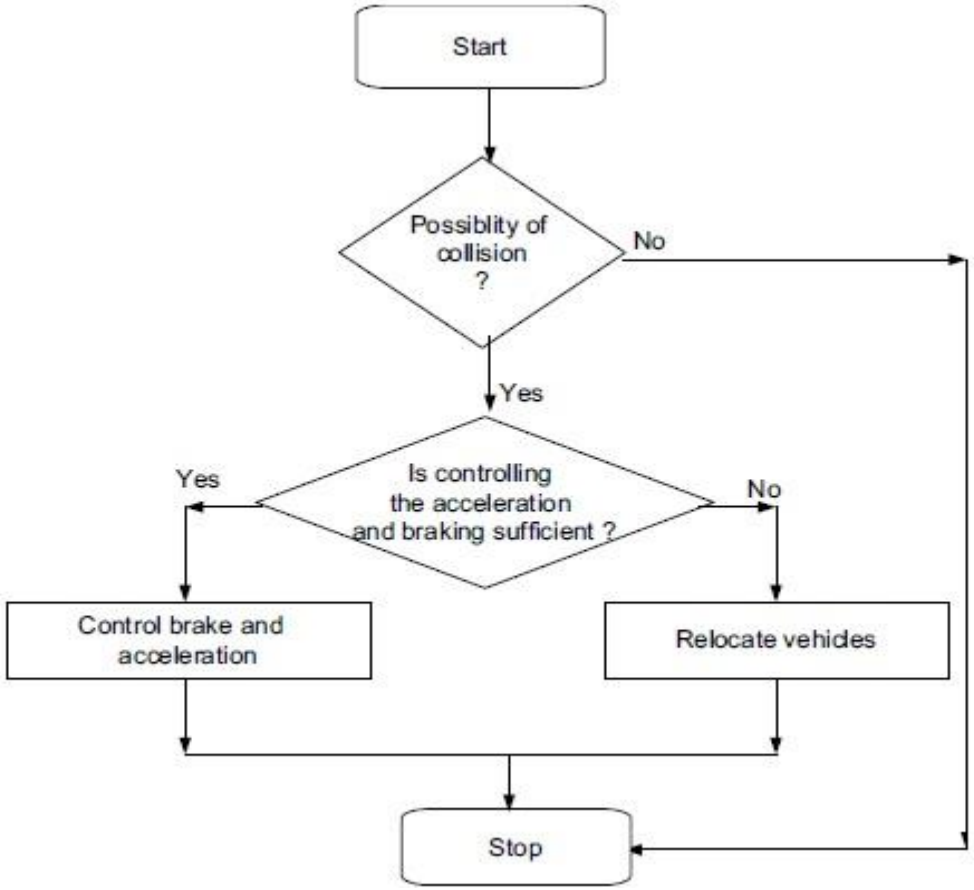
- Triangle algorithm is used to calculate the position of the vehicle on the road.
- The distance between the car and layout module can be calculated based on signal strength measured by XBee.
- The position of vehicle can be known by measuring distances between two successive layouts which are separated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



Distance calculation

Collision estimation and correction

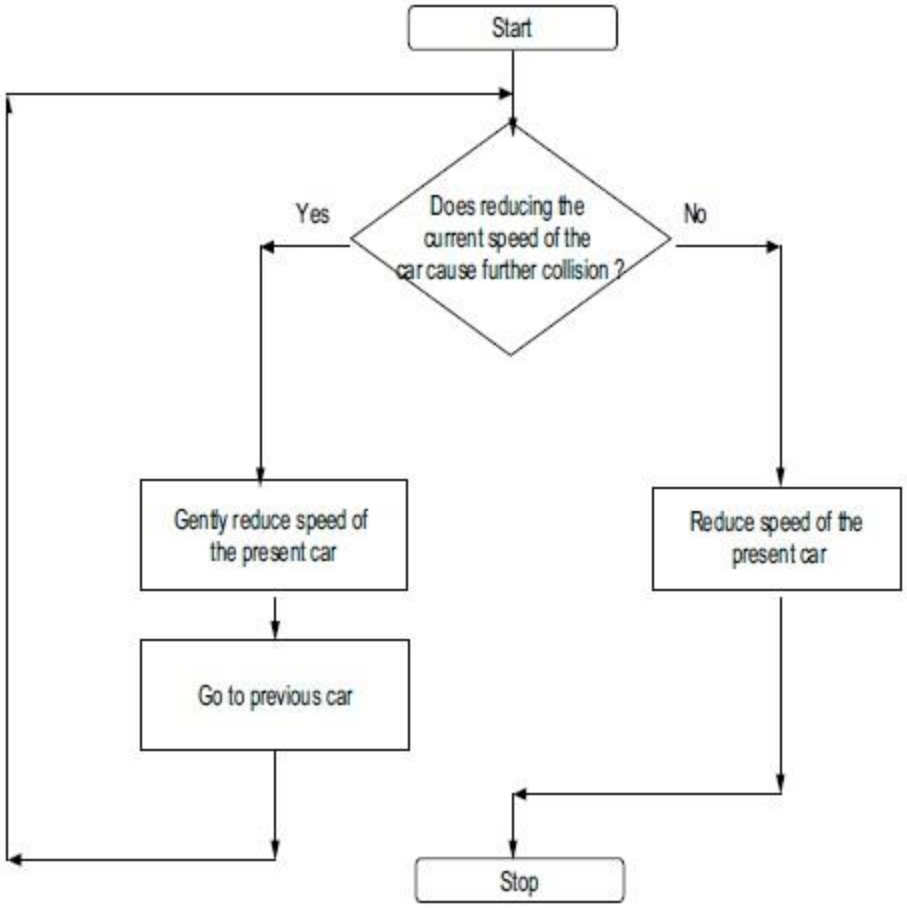
- Based on position and speed of every vehicle the mother controller would estimate the chance for collision.



Flow chart for collision avoidance

Collision estimation and correction

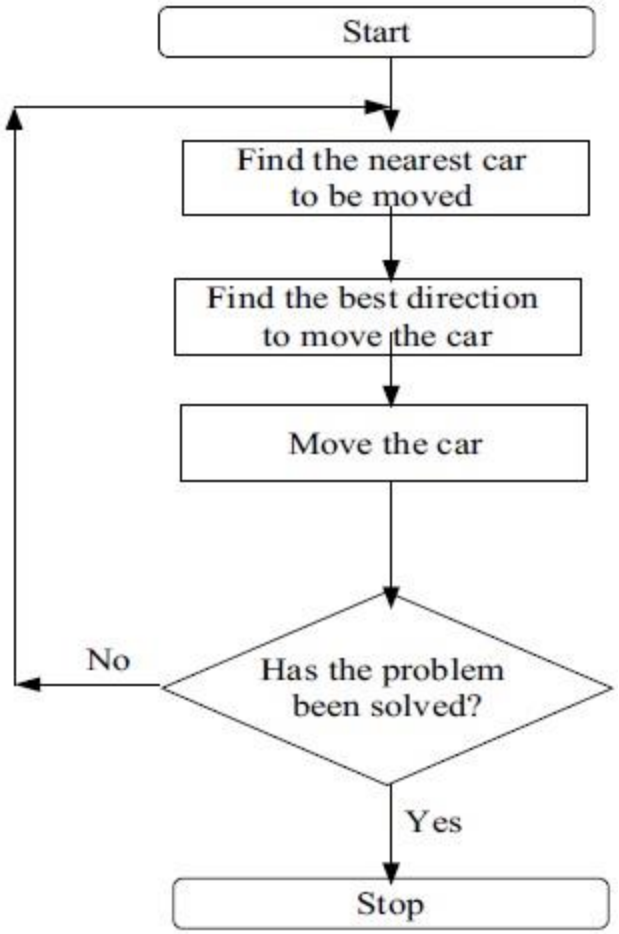
- In low speed scenarios the accidents can be prevented by braking or reducing speed.



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

1. http://arduino.cc/en/Main/arduinoBoardMega
2. http://iom.invensys.com/EN/pdfLibrary/Datasheet_Tricone x_PriorityLogicModule_11-10.pdf
3. http://iom.invensys.com/EN/Pages/Foxboro_DCSIASeries _ControllersandIO.aspx
4. ftp://ftp1.digi.com/support/documentation/90000866_A.pdf