

Chapter 25

Wireless Sensor Network to Support Intelligent Transport Systems

H Ranganathan

Sakthi Mariamman Engineering College, India

ABSTRACT

The future generation of vehicles on the road is going to be driven by wire. To aid in this 'electronic' revolution in the vehicle, the role of wireless sensors and their interaction amongst themselves and with the environment is gaining importance. It is an area where the majority of research resources is allocated and being spent. For successful interaction of information from environment / vehicle, there is a need for wireless networking of the information from different sources. To keep pace with the development of wireless networks for intelligent transport systems, newer network architectures, protocols, and algorithms are being developed. This chapter sheds light on all these issues.

1. INTRODUCTION

The use of wireless sensor networks (WSN) in different fields is already discussed. One major area where WSN can be very useful is in transport. WSN can be effectively used to enhance the safety and mobility. We have been witnessing tremendous growth in Intelligent Transport Sys-

tems over the past three decades (Wang, 2010). Transport systems have become sophisticated with the introduction of electronics systems in vehicles. Growingly we find electronics finds increased use in vehicles. As per a study, the market for automobile electronics is growing @ 5.9% per year (http://www.oliverwyman.com/ow/pdf_files/1_en_PR_Automotive_Elektronics.pdf, n.d.). At this rate, it is expected that by the year 2015, electronics will contribute up to

DOI: 10.4018/978-1-4666-0101-7.ch025

30% of the value of the automobile. The major areas where the role of electronics is growing are safety, entertainment, information and comfort. We see that the growth potential is matched well with formidable technical challenges. In the current technology, we find increased transportation research and development are in the fields of Computer sciences, Control, Communication, Information Technology and many more emerging information science related fields (Wang, 2010). Modern Transportation Engineering encompasses all these fields along with traditional fields such as Civil, Mechanical and automobile engineering. All these developments are aimed towards making the journey pleasurable.

It can be found that majority of electronics components used in automobile are sensors and components used for intercommunication of information. There are attempts all over the world to standardize Intelligent Transportation Systems. The areas where sensors can aid the driver are Collision avoidance, Obstacle detection, Range detection, Reversing sensors, intelligent headlights and automatic braking (Sawant, Tan, Yang, & Wang, 2004). Since there is a proliferation of attempts to increase the development efforts or to improve the existing design, we find there is a requirement for standardization of efforts so that the resources spent by various researchers are focused and not scattered. Network topologies, hardware and software designs are proposed for developing network protocols suitable for intelligent transport systems (Tao, Liu, & Ma, 2010).

To develop the wireless vehicle detection system, the California Department of Transportation (Caltrans) Division of Research and Innovation teamed up with the Partners for Advanced Transit and Highways (PATH) program, a research unit of the Institute of Transportation Studies at the University of California, Berkeley. Today the product is available on the market through Sensys Networks, a business founded by the researchers who developed the wireless vehicle detection system (<http://www.techtransfer.berkeley.edu/>

[newsletter/08-3/vehicle-detection-with-wireless-sensors.php](http://www.techtransfer.berkeley.edu/newsletter/08-3/vehicle-detection-with-wireless-sensors.php), n.d.). The California Center for Innovative Transportation (CCIT) tested and reported on the wireless vehicle detector system on behalf of Caltrans DRI in October 2006.

The role of sensor networks in intelligent transportation systems can be between vehicles and between vehicle and stationary location such as vehicle to infrastructure or infrastructure to vehicle. The vehicle to vehicle (v2v) sensors are used for sharing information between vehicles. The concept of this direct communication is to send vehicle safety messages one-to-one or one-to-many vehicles via wireless connection (Iqbal, 2006). There are also systems for effective communication between the vehicles and the infrastructure. These include interactive information transfer between the vehicle and the traffic light controllers through cooperative technology. The technique is demonstrated by Audi which introduced Travolution vehicle to infrastructure communication system. The basic idea is to cut down on pollution and fuel consumption by reducing idling at stop signals and in some cases without the need to stop at all. The system also helps the drivers to avoid running the red signals by informing the driver about the status of the upcoming signal (will it be red or green) if the driver continues at current speed. The system helps the driver to keep track of traffic jams ahead and also payment at parking lots and gas stations (http://www.audi.in/sea/brand/in/company/news/company.detail.2010~06~audi_travolution_.html, n.d.).

The U.S. Department of Transportation, through the 1998 Intelligent Vehicle Initiative, identified eight areas where intelligent systems could “improve” or “impact” safety. The list includes four kinds of collision avoidances: rear end, lane change and merge, road departure, and intersection; two kinds of enhancements: vision and vehicle stability; and two kinds of monitoring: driver condition and driver distraction.

18 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/wireless-sensor-network-support-intelligent/62753

Related Content

Distributed Computation in Wireless Sensor Networks: Efficient Network Architectures and Applications in WSNs

Tejaswini Devanaboyina, Balakrishna Pillalamarriand Rama Murthy Garimella (2015). *International Journal of Wireless Networks and Broadband Technologies* (pp. 14-32).

www.irma-international.org/article/distributed-computation-in-wireless-sensor-networks/154479

Cross-Layer Joint Optimization of Multimedia Transmissions over IP Based Wireless Networks

Catherine Lamy-Bergotand Gianmarco Panza (2010). *Fourth-Generation Wireless Networks: Applications and Innovations* (pp. 469-493).

www.irma-international.org/chapter/cross-layer-joint-optimization-multimedia/40714

Application of Game Models for Cognitive Radio Networks

Yenumula B. Reddy (2013). *Cognitive Radio Technology Applications for Wireless and Mobile Ad Hoc Networks* (pp. 271-288).

www.irma-international.org/chapter/application-game-models-cognitive-radio/78241

Optimizing 5G in V2X Communications: Technologies, Requirements, Challenges, and Standards

Shimaa Abdelnaby AbdelHakeem, Anar Abdel Hadyand HyungWon Kim (2021). *Research Anthology on Developing and Optimizing 5G Networks and the Impact on Society* (pp. 972-1011).

www.irma-international.org/chapter/optimizing-5g-in-v2x-communications/270226

Receiver Diversity for Distributed Detection in Wireless Sensor Networks

Mohammad A. Al-Jarrahand Mohammad M. Al-Ibrahim (2012). *International Journal of Wireless Networks and Broadband Technologies* (pp. 1-15).

www.irma-international.org/article/receiver-diversity-distributed-detection-wireless/75524