Understanding Connected Vehicles

Prof. Alexander M. Wyglinski
Worcester Polytechnic Institute, Department of Electrical & Computer Engineering

Abstract:

This presentation will consist of the following modules:

(1) **Wireless connectivity in vehicular environments**: Compared to other transmission environments, vehicular wireless networks operating in temporally and spatially dynamic topologies are very challenging to implement. Given the requirements of these networks to possess low latency and high error robustness, it is necessary to understand how these wireless transmissions interact with the surrounding mobile environment. Fundamental concepts regarding vehicular wireless channels, propagation characteristics, and spectrum utilization will be presented to provide a general understanding of this environment.

(2) **Techniques for supporting wireless links between vehicles and with road-side devices**: The application of wireless connectivity to vehicular platforms is nothing new. Roadside assistance services, localization and navigation services, entertainment systems, and other forms of wireless communications have been applied to vehicular systems for decades. Nevertheless, new high bandwidth and low latency applications are now being applied to vehicular platforms, and new solutions are required to meet these new performance requirements. Standards such as IEEE 802.11p and 5G are several options available to support vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications. This module will provide some insights on these solutions and how they can be implemented to support new applications, such as platooning, autonomous vehicles, and enhancing driver safety.

(3) **Connectivity transforming traffic into the Vehicular Internet of Things**: Given the rise of the Internet of Things, many are targeting the automotive industry as one application where vehicles on the road can connect to the vehicular cloud to obtain information in order to enhance their situational awareness. This Vehicular Internet of Things (VIoT) has the potential to transform how are vehicles operate, especially with respect to self-driving, powertrain control, and energy efficiency. In this module, several insights on how vehicles across a traffic scenario will be connected in order to enhance both local and global performance.

About the distinguished lecturer:

Dr. Alexander M. Wyglinski is internationally recognized as an expert in the field of wireless communications, cognitive radio, connected vehicles, software-defined radio, dynamic spectrum access, electromagnetic security, vehicular technology, wireless system optimization and adaptation, autonomous vehicles, and cyber-physical systems. Dr. Wyglinski is an Associate Professor of Electrical and Computer Engineering and an Associate Professor of Robotics Engineering at Worcester Polytechnic Institute, Worcester, MA, USA, as well as the Director of the Wireless Innovation Laboratory (WI Lab).

Dr. Wyglinski is very active in the technical community, serving on the organizing committees of numerous technical conferences and several journal editorial boards. These activities include serving as the General Co-Chair for both the 2013 IEEE Vehicular Networking Conference and the 82nd IEEE Vehicular Technology Conference in Fall 2015. Dr. Wyglinski's editorial board commitments include the IEEE Communications Magazine, IEEE Transactions on Wireless Communications, and IEEE Transactions on Communications. In January 2016, Dr. Wyglinski became President-Elect of the IEEE Vehicular Technology Society, an applications-oriented society of approximately 4200 members that focuses on the theoretical, experimental and operational aspects of electrical and electronics engineering in mobile radio, motor vehicles and land transportation.

Throughout his academic career, Dr. Wyglinski has published approximately 40 journal papers, over 80 conference papers, nine book chapters, and two textbooks. He is currently being or has been sponsored by organizations such as the Defense Advanced Research Projects Agency, the Naval Research Laboratory, the MITRE Corporation, the Office of Naval Research, the Air Force Research Laboratory Space Vehicles Directorate, The MathWorks, Toyota InfoTechnology Center U.S.A., and the National Science Foundation. Dr. Wyglinski is a Senior Member of the IEEE, as well as a member of Sigma Xi, Eta Kappa Nu, and the ASEE.