Innovative ADAS for Smart and Connected Cities

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The emergence of the Internet of Things Technology is driving the development of several large cities around the world. In line with these incentives is the increasing need to study electronics fidelity under different and harsh conditions. These cities are now innovation hubs and are developing quickly into what so called the connected smart cities. The number of smart cities around the world is expected to grow exponentially over the next few years and by 2050. The visionary plans for these connected smart cities will be based on establishing strong and well-connected city infrastructure. The use of LED Technology and smart street lighting systems will have clear positive impact on reducing energy use and consumption as well as maintenance costs while hosting new sensing applications. Cities are quickly realizing the important value of street lighting infrastructure as a critical asset that can put the foundation to support multiple smart city applications. With the digital networks and embeded sensors, street lights can collect and transmit information that will help cities monitor and respond to any circumstances from traffic and air quality to crowds and noise.

The presented work will demonstrate the use of simulation in characterizing the different types of sensors hosted by the LED street lights and their various functionalities in motion detection, surveillance cameras, WiFi Connectivity as well as short- and long-distance communication networks. Both median and side street light poles are modeled with various antennas mounted covering different frequency bands hosting variety of smart applications. Not only the city street's infrastructure will have an impact on the future of smart cities but the idea of using transportation infrastructure to help monitoring, analyzing and optimizing the backbone of the smart city and deliver tangible benefits in understanding the surrounding environment. Hence Vehicle to Vehicle communications technology will enable sharing data via wireless networks including speed, location, direction of travel, braking and loss of stability. V2V communication can be studied between two moving vehicles through a busy intersection as shown. The goal is to estimate the maximum range across which the vehicles can reliably communicate using the Dedicated Short-Range Communications (DSRC) protocol operating at 5.9GHz.

Exploring the bigger picture of intelligent road transportation will also include the vehicle to infrastructure communication. With that, all vehicles and street infrastructure systems will start interacting with each other and passing along messages regarding road conditions and traffic flow. The advent of autonomous vehicles will drive the need for multiple sensors, spanning microwave and millimeter wave radar, as well as visible and infra-red spectra. ADAS and Autonomous vehicle systems are likely to require at least 6 radar systems to monitor traffic and to perform safety functions to ensure the safety of the passengers.

At the end, this work summarizes the use of different simulation techniques from ANSYS in implementing the value of ADAS technology for road accident avoidance. Rrealistic radar signatures of objects observed by the radar will also be demonstrated in this work.