



Towards Extreme Band Communications

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ABSTRACT

As the world continues to move toward a more efficient transportation system driven by connected and autonomous vehicles (CAV), there is a growing demand for new technologies that guarantee efficient and safe operation. Trust in CAVs hinges on the reliability of autonomy, including the crucial task of positioning and navigation, which should be accurately provided at high precision everywhere for all environments and operating conditions. The next-generation mobile networks (5G and 6G) operating in the millimeter wave (mmWave) band is anticipated to transform modern societies by providing an ultra-reliable, high-speed communications infrastructure. mmWave operates with high bandwidth, allowing for high-resolution time-based measurements hence accurate range estimation. It also features massive MIMO antennas, providing higher angular resolution and precise angle-based measurements. The use of mmWave wireless networks for high-precision positioning in CAVs may have the potential to significantly improve the safety and efficiency of transportation systems.

In this presentation, the recent advancements in mmWave wireless networks for high-precision positioning will be explored, with a specific focus on navigating CAVs in densely populated urban areas. The discussion will cover the development and implementation of a seamless positioning solution that integrates the mmWave wireless network with the motion sensors onboard the CAV. Furthermore, the presentation will examine how non-line-of-sight signals can be used for wireless positioning and how to overcome the challenge of multipath in urban environments. The capabilities of achieving an uninterrupted decimeter level of positioning accuracy will be demonstrated, making the developed methods suitable for level three of autonomy. The presentation will showcase the performance of the integrated mmWave wireless positioning solution using road test trajectories from downtown Toronto, Ontario, Canada.

BIO



Mohamed-Slim Alouini was born in Tunis, Tunisia. He received a Ph.D. degree in Electrical Engineering from the California Institute of Technology (Caltech) in 1998. He served as a faculty member at the University of Minnesota and then at the Texas A&M University in Qatar before joining 2009 the King Abdullah University of Science and Technology (KAUST), where he is now a Distinguished Professor of Electrical and Computer Engineering. Prof. Alouini is a Fellow of the IEEE and OPTICA (Formerly the Optical Society of America (OSA)). He is currently particularly interested in addressing the technical challenges associated with the uneven distribution, access to, and use of information and communication technologies in rural, low-income, disaster, and/or hard-to-reach areas.