Navigation Technologies – State of the Art and Future Trends

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Navigation is a field that has been fascinating humankind for thousands of years and these pillars have been evolving with new technological advancements. There are three 'pillars' that define the performance or usefulness of a navigation technologies –cost, accuracy, and continuity. The past two decades have witnessed major progress in navigation technologies. The current market in positioning and navigation is clearly dominated by GNSS. Besides being globally available, it meets two important pillars: accuracy and cost by providing the whole range of navigation accuracies at very low cost. It is also highly portable, has low power consumption, and is well suited for integration with other sensors, communication links, and databases.

At this point in the development of navigation technology, the need for alternative positioning systems only arises because GNSS does meet the continuity pillar as it does not work in all environments. Furthermore, there has been a constant market push to develop navigation systems that are accurate, continuous and easy to afford. Needless to say, that cost, and space constraints are currently driving manufacturers of cars, portable devices (e.g. smartphones), and autonomous systems (e.g. self-driving, drones and agriculture machine systems) systems to investigate and develop next generation of low cost and small size navigation systems to meet the fast-growing autonomous vehicles and location services market demands. This presentation will provide a state of the art and future trends of sensors used for navigation of autonomous vehicles: possibilities, limitations and various design approaches. Emphasis will be on sensors and technologies that can navigate autonomous vehicles everywhere and at any time independent of weather and light conditions. Some of the current developed and possible future system's accuracy performance will be demonstrated through different implementations/applications using Propound Positioning Inc technologies.

Biography of Prof. Naser El-Sheimy

Prof. Naser El-Sheimy, PEng, CRC
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Prof. Naser El-Sheimy is Professor and former Head of the Department of Geomatics Engineering, the University of Calgary. He holds a Tier-I Canada Research Chair (CRC) in Geomatics Multi-sensor Systems. His research expertise includes Geomatics multi-sensor systems, GPS/INS integration, and mobile mapping systems. He is the founder and president of Profound Positioning Inc.

Prof. El-Sheimy published two books, 6 book chapters and over 500 papers in academic journals, conference, and workshop proceedings, in which he has received over 30 national and international paper awards. He supervised and graduated over 60 Masters and PhD students. He is the recipient of many national and international awards including the ASTech "Leadership in Alberta Technology" Award the Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA) Educational Excellence Award. He also received the Schulich School of Engineering Research Excellence Award, the Schulich School of Engineering Teaching Excellence Award, The UofC Student Union Teaching Excellence Award, and 4 times the departmental teaching award, 2 times departmental research excellence award, and the department of Geomatics Engineering Graduate Educator Award.

Prof. El-Sheimy was the president of Commission I on "Sensors and Platforms" of the International Society for Photogrammetry and Remote Sensing (ISPRS) from 2008 - 2012. He organized and participated in organizing many national and international conferences and chaired many conferences such as the USA Institute of Navigation Global Navigation Satellite Systems (GNSS). Dr. El-Sheimy is currently Chief Editor of MDPI geomatics, a member of the editorial board of Journal of Satellite Navigation, Survey Review, MDPI Sensors, Journal of Applied Geodesy, and Coordinates.