"Multi-Antenna Systems for GNSS"

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ABSTRACT

The quality of the ranging data provided by a global navigation satellite systems (GNSS) receiver largely depends on the synchronization error, that is, on the accuracy of the propagation time-delay estimation of the line-of-sight (LOS) satellite signal. In case the LOS signal is corrupted by several superimposed delayed replicas (multipath) and additional radio interference, the estimation of the propagation time-delay and thus positioning can be severely degraded using state-of-the-art receivers.

Multi-antenna systems can provide enhanced robustness to multipath and radio interference, but applications strongly demand that antenna arrays need to be physically small, thus reducing the footprint of the single elements and inter-element spacing is required. In general, this results in stronger mutual coupling between the antenna elements. On the other hand, exploiting not only time and spatial domain but also different domains like polarization or frequency bands has excellent potential in separating LOS signals from non-LOS signals and radio interference and thus enabling enhanced time-delay estimation and positioning.

In this talk, the potential of multi-antenna systems for GNSS is introduced, and the application of multidimensional signal processing (tensor-based signal processing) as a promising approach for multipath and radio interference mitigation for GNSS is discussed. To consider mutual coupling of antenna elements, linear and nonlinear array interpolation methods are presented.

BIOGRAPHICAL SKETCH

Felix Antreich received the Diploma degree in electrical engineering from the Technical University of Munich (TUM), Germany, in 2003. In 2011 he also received the Doktor-Ingenieur (Ph.D.) degree from the TUM. Since 2003 he has been an Associate Researcher with the Department of Navigation, Institute of Communications and Navigation of the German Aerospace Center (DLR), Wessling, Germany. Since September 2016 he is on leave at DLR, and he is a visiting professor in the Department of Teleinformatics Engineering (DETI) at the Federal University of Ceará (UFC) in Fortaleza, Brazil. His research interests include sensor array signal processing for GNSS and wireless communications, estimation theory, wireless sensor networks, space weather and atmospheric research based on GNSS, as well as signal design for synchronization, positioning, and GNSS.

Felix Antreich has received the VDE Award 2011 for an outstanding dissertation from the German Association of Electrical Engineers (Verband für Elektrotechnik, Elektronik, Informationstechnik VDE), in November 2011, as well as the best presentation award at the ION GNSS 2012 and 2015 conference in September 2012 and 2015, respectively. He is an IEEE Senior Member and an Affiliate Member of the Sensor Array and Multichannel Technical Committee of the IEEE Signal Processing Society.