

Abstract

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Analysis of different GNSS array processing methods utilizing new experimental approach using a Spirent simulator and single frontend receiver

Performing array processing on the Global Navigation Satellite Systems (GNSS) signals in a controlled environment requires costly hardware that most researchers cannot afford. This paper introduces a new experimental approach that substantially reduces that cost. It makes possible the emulation of raw digitized in-phase (I) and quadrature phase (Q) samples of GNSS signals, received by an array of Global Positioning System (GPS) antennas. The proposed technique enables simulating linear, planar and three dimensional (3D) array geometries for any satellite positioning system. In this study, only one Spirent GSS6700 GNSS simulator is used along with a single Novatel Firehose frontend. They are both designed for single antenna systems and are used in this research to simulate a seven element uniform linear array (ULA) and a seven element uniform circular array (UCA). Multiple signal classification (MUSIC), Minimum Variance Distortionless Response (MVDR) and classical beamforming are applied for direction of arrival (DoA) estimation, utilizing both ULA and UCA array structures, in order to verify the proposed experimental approach.