An Android-Controlled Direction of Arrival System using Polarization-Reconfigurable Antennas

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GPS is very powerful and provides variety of positioning services for both civilian and military purposes. Unfortunately GPS cannot reliably be used inside, because the GPS signal is seriously attenuated by many structures. Increasing demands for indoor positioning require the development of a new type of indoor GPS. Our system was developed to realize such functionality. The indoor GPS is based on the direction of arrival (DOA) estimation. The Multiple Signal Classification (MUSIC) is utilized to perform DOA. Providing estimation for DOA has been studied in signal processing for several decades

In order to facilitate rapid testing and refinement of the indoor GPS system, a near-real-time testing configuration was developed using an Android smartphone to control the measurement parameters and states of the polarization-reconfigurable antennas in the array. In this system, a LabVIEW Virtual Instrument (VI) running on a laptop computer is used to control an NI USB-6259 Data Acquisition (DAQ) interface and an Agilent FeildFox Network Analyzer. The FieldFox is used to measure the phase differences between antennas in the array. Since the analyzer is only a 2-port device, a set of solid-state switches are used to select which array antenna is connected to Port 2 of the PNA, and the switch configuration is controlled by the DAQ. The LabVIEW VI uses the VXI-11 TCP/IP instrument control interface to control the PNA over an Ethernet network and the DAQ is connected to the control computer via USB. System design and preliminary results using a remote cloud-based server for computation of DOA estimation will be discussed.