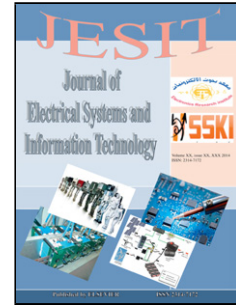


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<AT>Design of complete Software GPS Signal Simulator with low complexity and precise Multipath Channel Model

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<ABS-HEAD>Abstract

<ABS-P>The need for GPS data simulators have become important due to the tremendous growth in the design of versatile GPS receivers. Commercial hardware and software based GPS simulators are expensive and time consuming. In this work, a low cost simple novel GPS L1 signal simulator is designed for testing and evaluating the performance of software GPS receiver in a laboratory environment. A typical real time paradigm, similar to actual satellite derived GPS signal is created on a computer generated scenario. In this paper, a GPS software simulator is proposed that may offer a lot of analysis and testing flexibility to the researchers and developers as it is totally software based primarily running on a laptop/ personal computer without the requirement of any hardware. The proposed GPS simulator allows provision for re-configurability and test repeatability and is developed in VC++ platform to minimize the simulation time. It also incorporates Rayleigh multipath channel fading model under non-line of sight (NLOS) conditions. In this work, to efficiently design the simulator, several Rayleigh fading models viz. Inverse Discrete Fourier Transform (IDFT), Filtering White Gaussian Noise (FWFN) and modified Sum of Sinusoidal (SOS) simulators are tested and compared in terms of accuracy of its first and second order statistical metrics, execution time and the later one is found to be as the best appropriate Rayleigh multipath model suitable for incorporating with GPS simulator. The fading model written in 'MATLAB' engine has been linked with software GPS simulator module enable to test GPS receiver's functionality in different fading environments.

<KWD>Keywords:GPS signal simulator; Rayleigh fading; Non line of sight (NLOS); Sum of sinusoids (SOS)

<H1>1. Introduction

The GPS system has become the fundamental technology for position determination. It has enabled many applications in various areas. Due to its widespread use, much research is being done to develop low cost, small size and efficient GPS receivers. GPS simulators which provide the real time environment of the GPS satellite system become the need of the hour. The two approaches for obtaining GPS signals are either collecting the set of real GPS signal measurements from a commercial front-end or by using software GPS signal simulators to generate the digitized IF GPS signal. (Bin Tang et al.[1], 2006; Meng Jian et al.[2], 2002; Hu et al. [3], 2009). The GPS signal parameters are non stationary, time varying, weather and satellite health have an effect on the signal characteristics. Underneath these conditions to perform multiple tests in indiscriminately outlined conditions, it's essential to simulate and record the signals rather than collecting the live signal from the satellites each time. In the laboratory environment, software GPS simulators are gaining popularity for providing the excellent research tool for investigating and improving the receiver performance in a wide range of conditions. The software based GPS simulators have a provision to

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