

Development of Software GNSS Signal Generator

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INTRODUCTION

As the Galileo system is being developed and the GPS modernization is progressing, there is a need for unified GNSS signal simulators which can generate multi frequency signals of GPS and Galileo system. VEGA is developing the Galileo System Simulation Facility(GSSF). GSSF is a software simulator tool that reproduces the functional and performance behavior of the Galileo system in order to support the Galileo definition, integration, verification, validation and operational phases[1]. The Position, Location And Navigation(PLAN) research group of the university of Calgary has developed a complete IF signal generator that can model the new GPS and Galileo signals propagation channels[2].

Since South Korea determined to join the Galileo program, it is necessary to have the receiver receiving signals from GPS and Galileo. In response to this need, The ETRI is developing GNSS digitized IF signal simulator which is a part of development of GNSS Test & Evaluation Facility based on software for providing test and evaluation environment for various software level application and navigation algorithm in GNSS. The purpose of this paper is to provide researchers and developers with more evaluation and testing flexibility and an effective GNSS signal simulation environment. The GNSS digitized IF signal simulator can be used for studying the processing techniques of new signals, such as Galileo signals, without any hardware development.

The first part of this paper will summarize the GNSS digitized IF signal simulator. The second part will present the conceptual design of the each module. Finally, the third part will explain result of the simulator, and validate against real data.

GNSS DIGITIZED IF SIGNAL SIMULATOR

GNSS digitized IF signal simulator provides test and evaluation environment for various software level application and navigation algorithm in Global Navigation Satellite System(GNSS). GNSS digitized IF signal simulator can be used for studying the processing techniques of new signals, such as Galileo signals, without any hardware development. GNSS digitized IF signal simulator provides two main capabilities, GPS and Galileo raw data generation and digitized IF signal generation. GNSS digitized IF signal simulator consists of

four main modules which are GNSS Satellite Orbit Simulation Module, Navigation Message Generation Module, Error Generation Module, and GNSS IF Signal Generation Module. The Orbit Simulation Module can simulate orbit of GPS 24 satellites and Galileo 30 satellites. The Navigation Message Generation Module can make GPS and Galileo satellite navigation message. The IF Signal Generation Module can generate GPS L1 C/A, L2C, and Galileo E1(B&C), E5A. The Error Generation Module can generate the satellite clock error, ionospheric error, and tropospheric error. This paper presents the requirement analysis for GNSS digitized IF signal simulator. After a brief introduction of the functional scope of the simulator, the conceptual design of the each module for GNSS digitized IF signal simulator will be presented. The paper will present the test and evaluation method to illustrate a potential application of the simulator.

SIMULATION RESULT

The GNSS digitized IF signal simulator has been validated against real data. As a result, GNSS digitized IF signal simulator is very well suited for the development phase of software due to its versatility. This GNSS digitized IF signal simulator can also be used to feed a multi-frequency multi-system software receiver for the prototyping of a combined GPS/Galileo receiver.

REFERENCES

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