A Modular Re-programmable Digital Receiver Architecture

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BIOGRAPHY

Alison Brown is the President of NAVSYS Corp. She has a PhD in Mechanics, Aerospace, and Nuclear Engineering from UCLA, an MS in Aeronautics and Astronautics from MIT, and an MA in Engineering from Cambridge Univ. She was a Draper Fellow at Charles Stark Draper Lab. She worked six years for Litton developing GPS and inertial navigation systems. In 1986 she founded NAVSYS Corp.

ABSTRACT

The many diverse applications of GPS have led to the development of a wide variety of specialized GPS receiver products. However, any custom receiver design results in significantly higher priced equipment than the conventional OEM receiver due to design changes, equipment changes, and the loss of economies of scale. In this paper, a modular re-programmable digital and software based GPS receiver architecture is described that can be easily and cost-effectively adapted for a variety of advanced GPS applications for military, commercial and space.

NAVSYS' re-programmable Advanced GPS Receiver (AGR) is a special purpose GPS receiver system designed to provide enhanced signal processing for special-purpose GPS applications and advanced test capability. The AGR signal processing provides highly accurate TSPI data even in stressed environments (e.g. high dynamics or low signal-to-noise) and allows low-level access to the GPS tracking loop parameters which can be used to optimize performance. Eight channels are provided with data output rates from 1 Hz to 1kHz. The system utilizes NAVSYS' GPS digital front-end (DFE) sensor technology.

NAVSYS' GPS DFE sensor technology is adaptable to custom requirements. The DFE can be a single element or it can be implemented as a phased array. Coherency between elements is maintained with common clock circuitry. The DFE can provide 1-bit to 8-bit data at sample rates from 2 MHz to 60 MHz. Multi-frequency DFE inputs are able to track GPS (L1 or L2), Pseudolite (Lx), L5, etc.

The AGR is a flexible system accommodating a variety of front ends, data transmission methods, and allows real-time processing or data storage and playback for post-test processing. The AGR can be configured to fit specific requirements with "Key-Word" changes or software modifications.

The AGR is supported by NAVSYS' Matlab GPS signal simulation toolbox to assist in system optimization. The signal simulation toolbox can be used as an analysis aid to assist in test and evaluation of GPS receivers. Data output from the AGR can be used as inputs to the toolbox to optimize receiver parameters that can then be adjusted in the AGR for optimum performance.