A Time Transfer Tracking Loop with Innovation-based Adaptive Kalman Filter in Dynamic Platforms

Yan Cheng, Xueyun Wang, Haifeng Wang, Wenzhe Yang, Liang Guo, Shengkang Zhang,

Jun Ge

Science and Technology on Metrology and Calibration Laboratory,
Beijing Institute of Radio Metrology and Measurement,
Beijing/China

Email: chengyan178@163.com

The microwave two-way time transfer systems usually work in dynamic conditions, such as vehicles, netted radar platforms, and so on[1]. In static platforms, the microwave two-way time transfer system can achieve high precision time synchronization accuracy[2]. However, in dynamic platforms, the time transfer system has poor robustness and synchronization accuracy. Accordingly, it is necessary to improve the time synchronization accuracy in dynamic systems.

The time transfer modem is the core device of the microwave two-way time transfer system[3]. The tracking loop is the key part of the modem. In dynamic platforms, the tracking loop is easy to lose lock and cannot work well[4]. To enhance the tracking performance in dynamic conditions, an innovation-based adaptive Kalman filter tracking loop is proposed, which can adjust the noise covariances to adapt to the dynamic signals. The proposed tracking algorithm has been employed in the receiver of the modem.

According to the test results, compared with the traditional Phase Lock Loop (PLL) tracking method and the standard KF tracking loop, the proposed tracking loop has better tracking performance in dynamic conditions. This algorithm is of great significance for improving the time synchronization accuracy of complex dynamic collaborative networking systems.

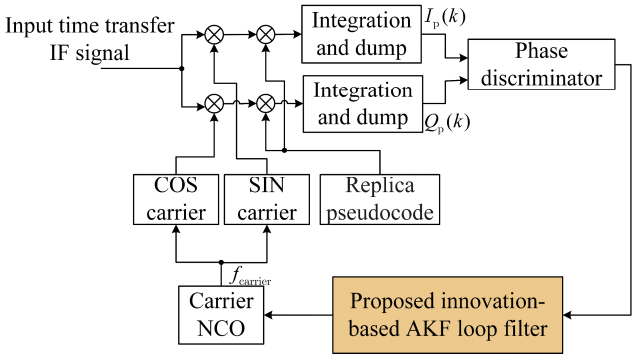

Fig. 1: Block diagram of the proposed innovation-based tracking loop for the time transfer modem

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