IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Space Communications and Navigation Global Technical Session (8-GTS.3)

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# A GNSS/INS INTEGRATED NAVIGATION METHOD BASED ON DEEP LEARNING

**Abstract**

Global navigation satellite system (GNSS)and inertial navigation system (INS) can provide high-precision navigation services. The complementary advantages of GNSS and INS can ensure the continuity of navigation services. GNSS/INS integrated navigation technology based on Extended Kalman Filter (EKF) has been widely used in location navigation.

In complex environment, the GNSS signal is easily interferedand the errors of the inertial elements in the navigation system gradually diverge over time, resulting in a significant reduction in navigation accuracy and robustness. Therefore, another solution is needed. Deep learning has advantages for non-linear sequence problems, and INS / GNSS integrated navigation combined with deep learning can correct errors accumulated over time by the inertial measurement unit in the case of long-term failure of satellite signals.

In this paper, a novel INS / GNSS integrated navigation method based on deep learning is proposed. The method consists of LSTM neural network and Extended Kalman Filter. In the training mode, correct GNSS/INS data were used to train the model. In the predictive mode, when GNSS signals are not disturbed, GNSS/INS integrated navigation system can achieve high-precision navigation. When the GNSS signal lost, INS information is used as the input sequence of the prediction model to generate pseudo-GNSS information, which is then corrected by combining with EKF navigation position. The simulation results of the corresponding environment show that the proposed method has strong data processing capability in the absence of GNSS signals. In particular, the method guarantees high accuracy, reliability and robustness of the positioning service of the target during the GNSS signal lost.