

Sensor Fusion INS/GNSS based on Fuzzy Logic Weighted Kalman Filter

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Abstract - A Fuzzy Logic Adaptive Control (FLAC) is used to adjust the exponential weighting parameter of a weighted Error-State Kalman Filter (ESKF) in an INS/GNSS system. The FLAC is used to prevent the Kalman Filter (KF) from diverging or to reach to a high bound when the IMU produces colored noise. Furthermore, a matrix notation for the weighting parameter alpha is introduced and compared against the single alpha value. First, the results show the influence of a colored noise in the system, which makes the ESKF reaching a large error bound solution. The application of FLAC considering both constant and matrix alpha reduces the error boundary for the position and velocity states. However, the constant alpha leads to an inaccurate altitude, bias correction, and error covariance matrix. The matrix alpha parameter shows a final solution that improves the navigation accuracy for all states, preserving the stability of the error covariance matrix.

Keywords: INS/GNSS Fuzzy Adaptive weighted Kalman Filter