Reinitialization of the error covariance matrix by this method in a space shuttle navigation system, where the measurements consist of range and range-rate to Earth-fixed beacons, was also studied.[3] The position and velocity errors were averaged for 10 Monte Carlo trajectory simulations. Figures 3 and 4 show that the actual errors are improved by an order-of-magnitude in many cases with the benefit of low-error growth rates during regions where measurements are not made. (Reinitializations of the error covariance matrix are indicated by the arrows.)

In summary, the pseudo-measurement technique has been demonstrated to be useful when reinitialization of the error covariance matrix is required to prevent filter divergence. By assuming a diagonal matrix, useful information pertaining to cross-covariance errors is lost. From an engineering standpoint it is desirable to carry as much information as possible through the reinitialization phase. Even though the gains associated with the covariance matrix deteriorate, information pertaining to certain parameters of the problem seem to be inherent in the current best estimate of the state and can be utilized to develop an appropriately correlated matrix with which to restart the navigation problem.

References

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[3] Muller, E. S. and Phillíou, P., Shuttle Orbit Navigation Analysis, Group 23A STS Memo No. 48–71, MIT Charles Stark Draper Lab., Sept. 1971.

Errata

Errata: "An Analysis of Plume-Induced Boundary-Layer Separation"

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AN error has been found in Eq. (5) which should read

$$A = M_{ex}^{0.5}\left[-0.04\left(\log\frac{P_{ex}}{P_0}\right)^3 + 0.397\left(\log\frac{P_{ex}}{P_0}\right)^2 - 0.579\left(\log\frac{P_{ex}}{P_0}\right)\right] \quad (5)$$

The author regrets that this error was made, but the correct equation was used in obtaining the results presented in the article. Also a typographical error appears in the definition of Cr in the Nomenclature section, where the "$-$" before the parenthesis in the denominator should be a "$+$."

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