

Outer Feedback Correction Loops in Particle Filtering-based Prognostic Algorithms: Statistical Performance Comparison

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Abstract: This paper presents, analyzes, and evaluates two different approaches for outer feedback correction loops (OFCL) in particle-filtering-based prognostic algorithms. These approaches incorporate information, from the short-term prediction error, back into the implementation of the estimation routine, to improve its performance in terms of both the resulting state and time-of-failure (ToF) pdf estimates. Three indicators are also proposed and used to measure the performance of the prognostic routines that result from the implementation of these OFCL in terms of precision, accuracy, and steadiness of the solution. Both approaches are tested using actual data from a seeded fault test in a critical component of rotorcraft transmission system.

Keywords: Particle filtering, failure prognosis, nonlinear state estimation, feedback loops.