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Aircraft Engine Health Prognostics Based on Logistic Regression with Penalization Regularization and State-Space-Based Degradation Framework

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Abstract: Engine health prognostics is critical to ensure reliability and safety of aircraft operations due to the provision of various health decision information. In this studying, a prognostics system is developed based on logistic regression (LR) and state-space-model (SSM) for engine health assessment and prediction. In this system, a health indicator based on logistic probability (LP) inferred from a variable set of sensor signals selected by LR with penalization regularization (LRPR) is used to characterize engine health states. LP is capable of offering a failure probability for the monitored engine, which has **intuitive** explanation related to its health state. A data-model-fusion method is developed for the engine health prognostics task accomplished by integration of LR and particle filtering (PF). Bayesian state estimations, on the basis of the engine health changes modeled by a baseline LR, are implemented to sequentially update the current health state and then to predict the future health propagation of engines. The prognostics system is applied to a gas turbine on the Commercial Modular Aero-Propulsion System Simulation (C-MAPSS) test-bed developed by NASA. The experimental results indicate the potential applications of the proposed system as an effective tool for engine health prognostics.

Keywords: engine health prognostics, remaining useful life, logistic regression, penalization regularization, state-space-model, particle filtering.

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