

A FAULT DETECTION SCHEME FOR MODELED AND UNMODELED FAULTS  
IN A SIMPLE HYDRAULIC ACTUATOR SYSTEM USING AN EXTENDED  
KALMAN FILTER

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ABSTRACT

In this work an extended Kalman filter (EKF) is used to detect a variety of faults in a simple hydraulic actuator system. Much interest exists in detecting faults in their early stages in the hopes that machine downtime and repair costs can be kept to a minimum. This EKF model employs two different techniques for identifying the presence of system faults. In one case, parameters of interest are included in the state-space model as augmented states. Faults are then introduced into these new states, and the EKF successfully detects the faults by tracking the new post-fault parameter values. The second method is an indirect approach for identifying unmodeled faults. These faults become apparent through analysis of the difference between a state measurement and estimate, known as error residual data. It is shown that, for this simple hydraulic system, this extended Kalman filter detects system faults confidently and promptly.