GRADUATE STUDENT RESEARCH SEMINAR SERIES (2020)

STATISTICAL ANALYSIS OF A LEAST SQUARES PARAMETER ESTIMATOR FOR A LITHIUM-ION BATTERY MODEL

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In this research, a complex nonlinear least squares (CNLS) problem is solved to develop an estimator of parameters in a fractional order model of a lithium ion battery (LIB). The model's parameters are estimated based on the cell's measured impedance which is a random variable; hence, the identified parameters are random variables as well. Two main properties of an estimator are biasedness and covariance. Biasedness of an estimator refers to the closeness of estimates to true values of parameters, and covariance of an estimator indicates the dispersion of estimates. Covariance of any unbiased estimator is lower-bounded by Cramer-Rao bound, and any estimator that meets the lower bound is called efficient. The two aforementioned properties are investigated for the CNLS estimator of LIB's model parameters in this work, and necessary and sufficient conditions to have an unbiased and efficient estimator are presented.

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