

Department of Electrical and Computer Engineering

University of Rochester, Rochester, NY

Ph.D. Public Defense

Monday, August 21, 2017

11:00 AM

Computer Studies Building, Room 426

Hidden Markov Models for Supercapacitor State-of-Charge Tracking and Audio Watermarking

Andrew Nadeau

Supervised by
Professor Gaurav Sharma

Abstract

This thesis examines applications of the hidden Markov model (HMM) in two very different settings.

The HMM is first applied to estimate the available stored energy in a supercapacitor. The main benefits of supercapacitor energy storage over electrochemical batteries are high instantaneous power and ability to survive 100 to 1000 times as many charge/discharge cycles as a battery. We focus on an additional benefit, a more direct relation between a supercapacitor's terminal voltage and stored energy, to improve energy awareness. However, a simple capacitive approximation cannot adequately represent the stored energy in a supercapacitor. It is shown that the three-branch equivalent