Yalan (Christina) Bi

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SUMMARY

Experience with lithium-ion battery electrochemical and equivalent circuit modeling, optimal charging strategy design, and online SOC/SOH estimation. Complete multiple projects in the past 5 years with hands on experience of large experimental data set processing and battery-in-the-loop testing.

EDUCATION

Auburn University, Auburn, AL

- Doctor of Philosophy in Mechanical Engineering — May 2015 – (Expected) May 2020
  - GPA: 3.93 / 4.00
  - Thesis: Online state and parameter estimation of lithium-ion batteries based on a reduced-order electrochemical life model
- Master of Science in Mechanical Engineering — Aug 2014 – Aug 2018
  - GPA: 3.93 / 4.00

Jilin University, Changchun, Jilin, China

- Bachelor of Science in Automobile Engineering — Sep 2010 – Jul 2014
  - GPA: 3.38 / 4.00

EXPERIENCE

Research Assistant, Auburn University

Collaborated with companies (GM, LG Chem, Hyundai, etc.) on multiple projects. Responsible for meeting arrangement and progress report development

- *Online SOH Estimation Using Nonlinear Filters and ML Methods* — Aug 2018 – Present
  - Estimated SOH and parameters using particle filter via a physics-based aging model
  - Analyzed sensitivity of terminal voltage and SOC analytically with respect to aging parameters
  - Applied machine learning methods with aging models for parameter and SOH estimation
  - Collaborated with materials-majored students on conducting postmortem analysis of battery cells
- *Characterization of Heat Generation in Large-Format Pouch Cells* — Oct 2018 – Oct 2019
  - Designed a calorimeter with Kalman filter for heat generation rate measurement
  - Developed a cell surface temperature control algorithm working simultaneously with the calorimeter
  - Worked closely with team members and provided guidance to control/estimation-related problems
- *Development of an Ultra-fast Charging Algorithm for a High Power Battery* — May 2017 – Feb 2019
  - Developed a ROM considered the SEI layer formation and lithium plating/stripping
  - Validated model using data of a large-format NMC622 cell and achieved 22 mV maximum error
  - Evaluated sensitivity of electrochemical parameters and procedure for parameter estimation
  - Designed an adaptive SPKF with equality constraints for SOC estimation with 2% maximum error
  - Applied pulse charging to promote lithium stripping to reduce both charging time and aging rate
  - Led a team of 3 graduate students; planned and organized monthly meetings with sponsors and completed project 3 months in advance
- *Development of a ROM and Online Monitoring Algorithm for an LFP Cell* — May 2015 – Dec 2017
  - Developed and validated a ROM for an LFP cell with modeling of side reactions
  - Designed an EKF for SOC estimation with 3% maximum error and tested it in a BIL system
  - Conducted tests on self-constructed test-stations controlled by LabVIEW; conducted EIS tests to evaluate changes in aging parameters of ECM
  - Collected and processed a large amount of data collected at different operation conditions

Teaching Assistant, Auburn University

- Guided and trained new graduate assistants
- Created and graded assignments, projects, and exams
- Instructed students with mechatronics laboratory exercises and software training

SKILLS

- Matlab/Simulink (+5 years), Python (+4 years), LabVIEW (+4 years), Git, LaTeX, Mathematica
- Applied machine learning and deep leaning with Scikit-learning and Keras
- Ability to communicate effectively both as a leader and a team member

PUBLICATIONS (SELECTED)

[1] Y. Bi, and S-Y. Choe, "An adaptive sigma-point Kalman filter with state equality constraints for online state-of-charge estimation of a Li(NiMnCo)O_2/Carbon battery using a reduced-order electrochemical model," *Applied Energy* (in press)

[2] Y. Bi, X. Zhao, and S-Y. Choe, "A hybrid state of charge estimation method of a $LiFePO_4$/graphite cell using a reduced order model with an extended Kalman filter," in *2019 American Control Conference (ACC)*, Philadelphia, PA, Sep 2019

[3] Y. Bi, and S-Y. Choe, "Automatic estimation of parameters of a reduced order electrochemical model for lithium-ion batteries at the beginning-of-life," in *2018 IEEE Vehicle Power and Propulsion Conference (VPPC)*, Chicago, IL, Aug 2018

[4] X. Zhao, Y. Bi, and S-Y. Choe, "An integrated reduced order model considering degradation effects for $LiFePO_4$/graphite cells," in *Electrochimica Acta*, 280, pp.41-54, Aug 2018

AWARDS & SCHOLARSHIPS

- Graduate Research Assistantship, Auburn University — May 2015 – Present
- Graduate Teaching Assistantship, Auburn University — May 2018 – Present
- Second Prize Scholarship (10%), Jilin University — Aug 2013 – May 2014
- Third Prize Scholarship (15%), Jilin University — Aug 2010 – May 2013

LANGUAGES

- Chinese: Native
- English: Proficient