Battery Cycling Algorithm for Laptop Power Systems

Major Qualifying Project
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Problem Statement

- Rechargeable appliances: Batteries constantly plugged in

  — Overcharge causes battery damage

  — Battery life deterioration

- Consequences:

  — Costly on the customer side

  — Damaging to the environment

LOW BATTERY!

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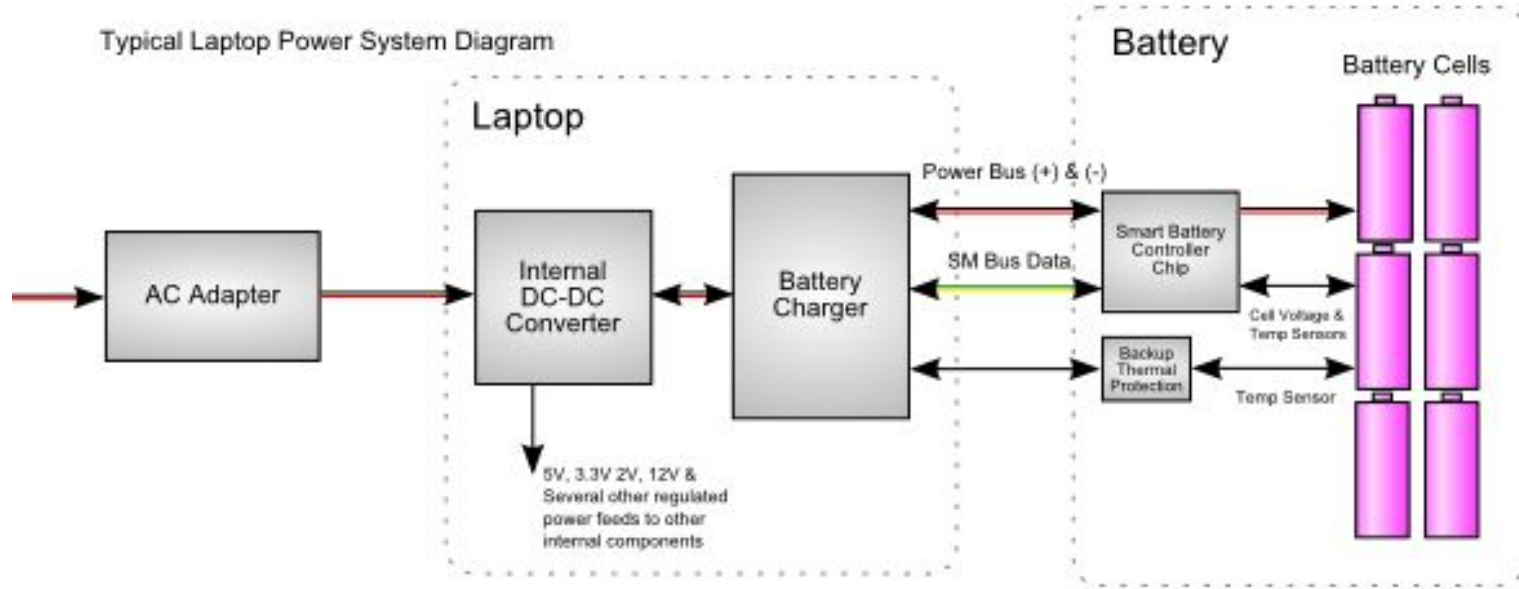
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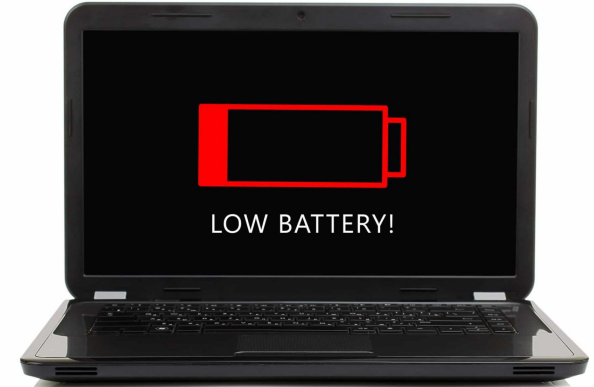
Project Goal

- Propose an algorithm that manipulates charge cycles to improve overall battery life.

- Focus specifically on the laptop power system applications.

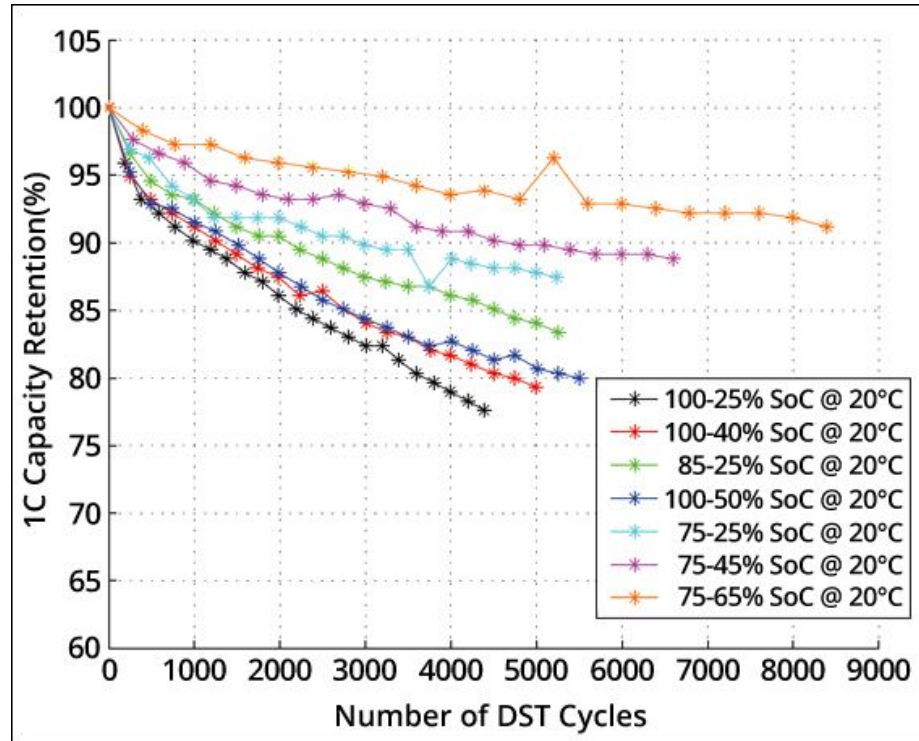Worcester Polytechnic Institute

Project Objectives

- Battery Cycling Algorithm
- Battery Switching Circuit
- Battery Monitoring Control Circuit
- Algorithm Proof-of-Concept Prototype
- Prototype testing and verification

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Typical Laptop Power System

4info (n.d.)

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Proposed Algorithm

Xu, Oudalov, Ulbig, Andersson, Kirschen (2016).

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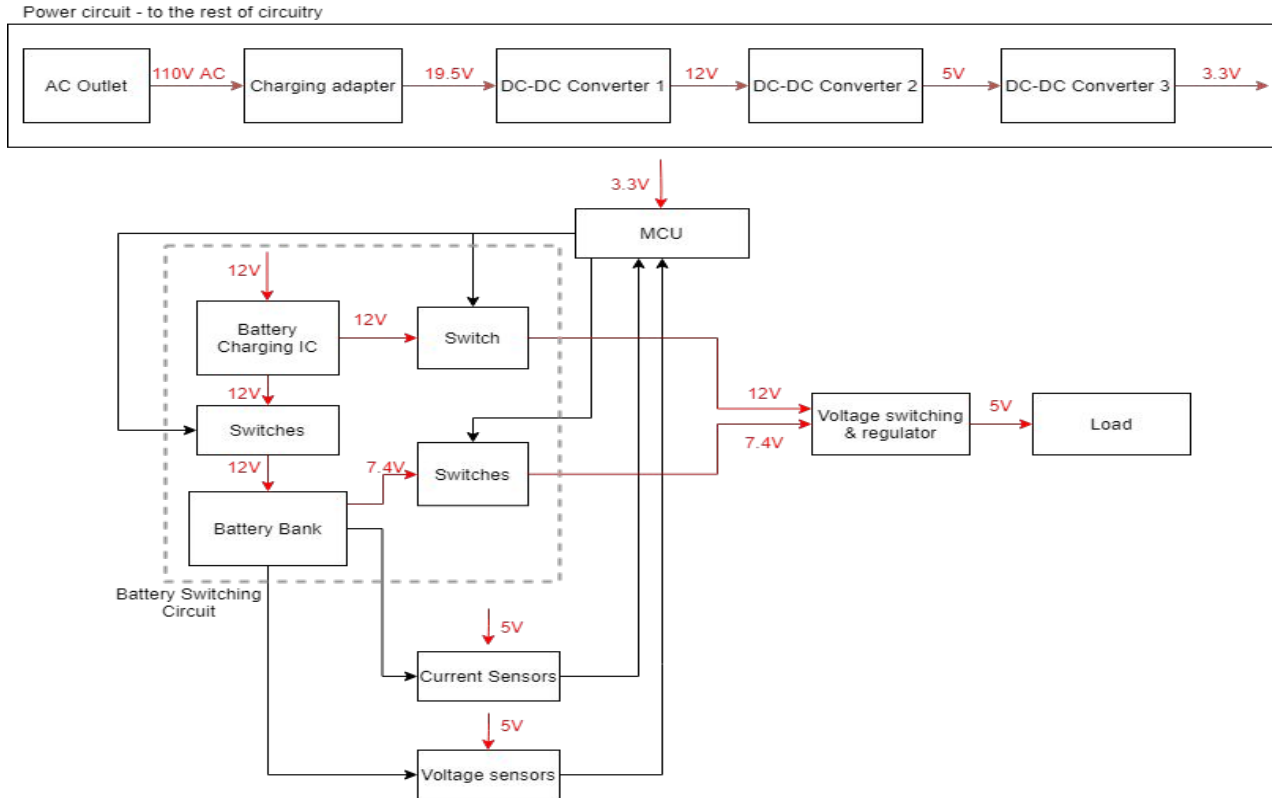
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Proposed Algorithm

- Charge batteries to 100% SOC
- Discharge a branch to 90% SOC
  — Keep the other branch being charged
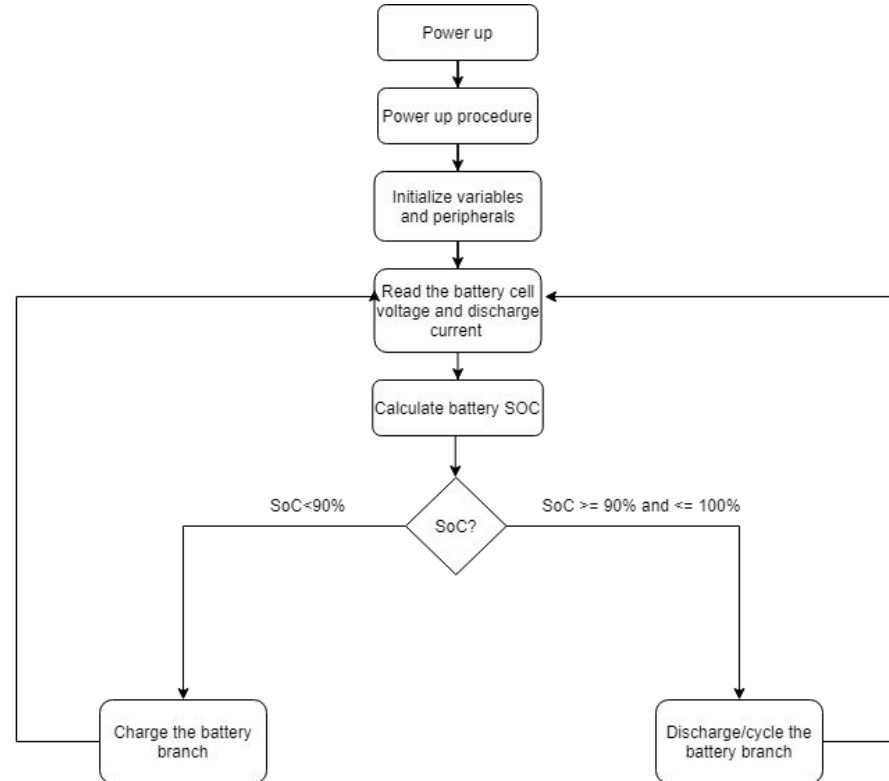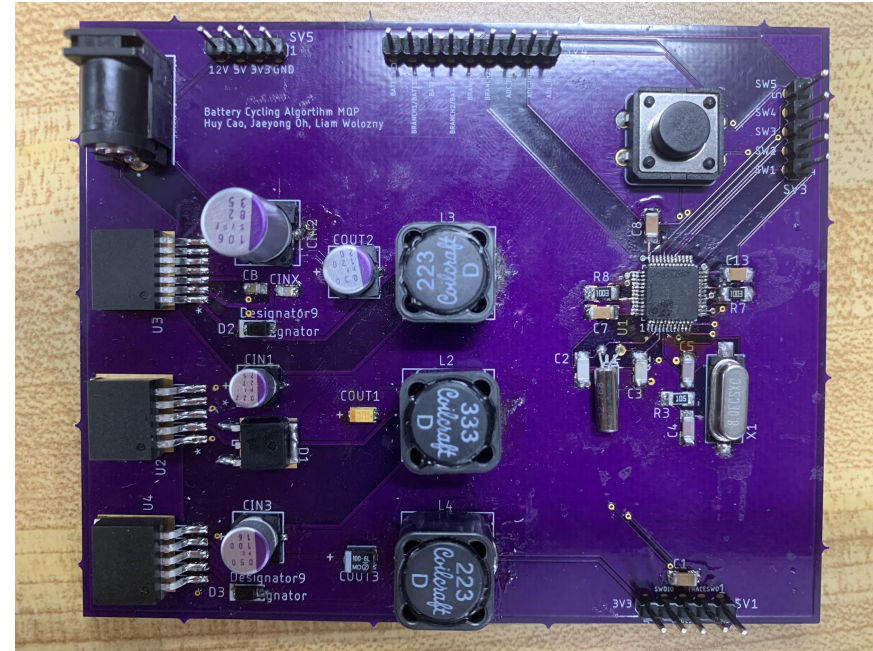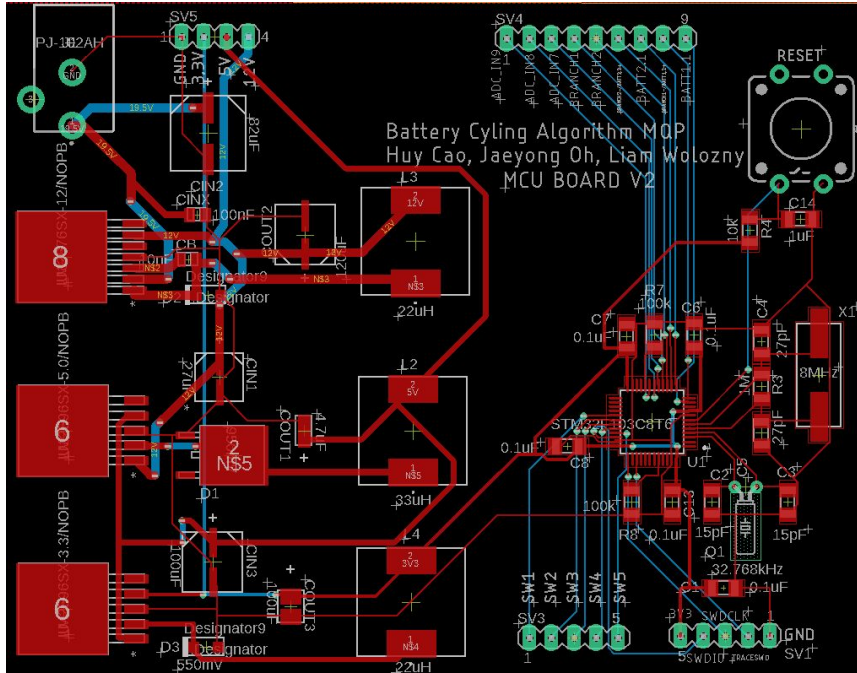- At 90% SOC, charge up to 100% SOC again

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Battery Switching Circuit

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Top-level Block Diagram

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MCU Program Flowchart

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PCB Design - MCU Circuit

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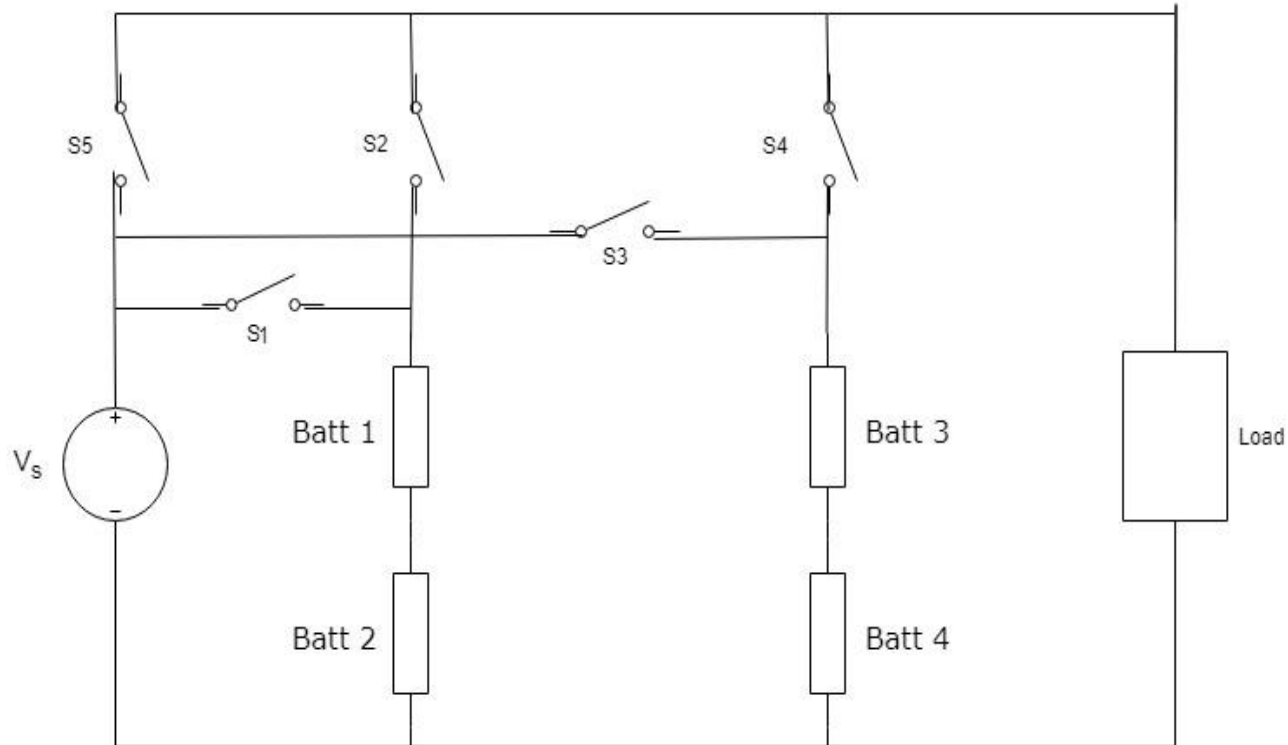
PCB Design - Switching Circuit

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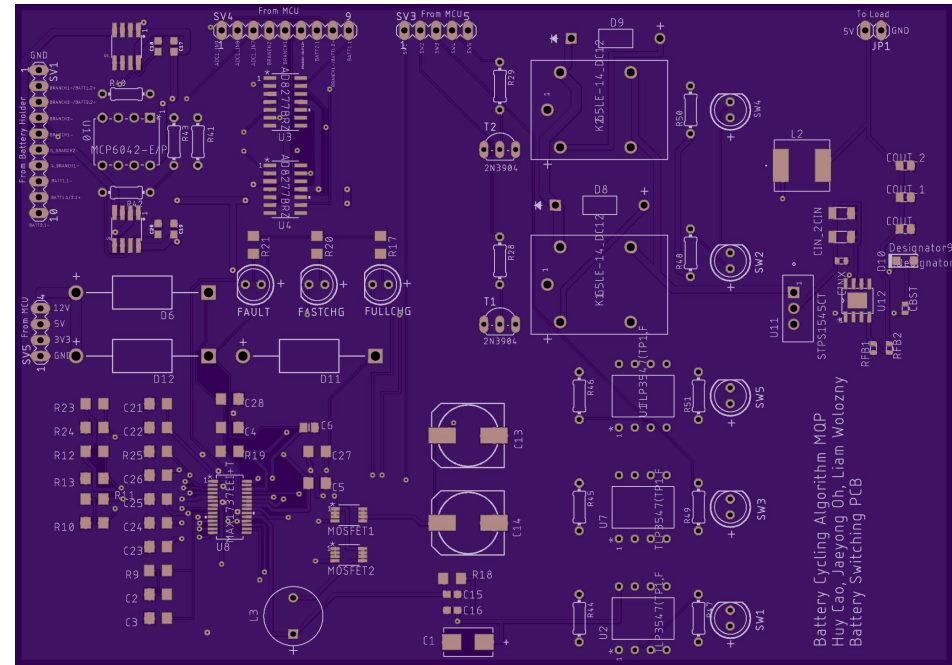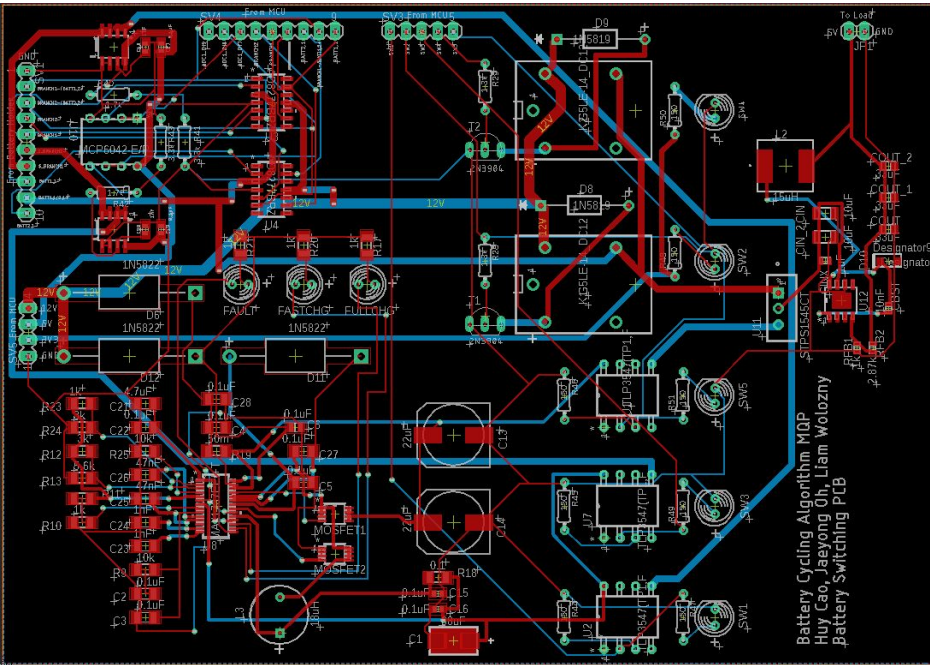
PCB Design - Battery Holder Circuit

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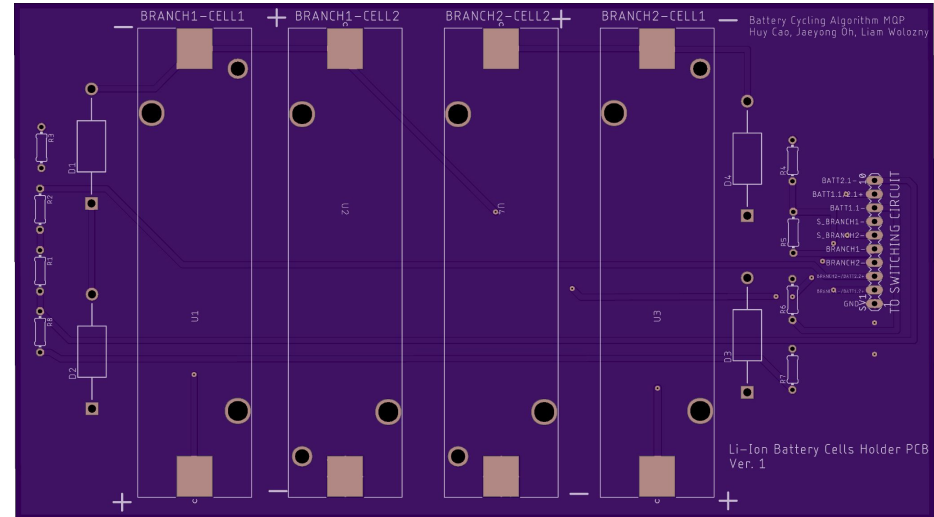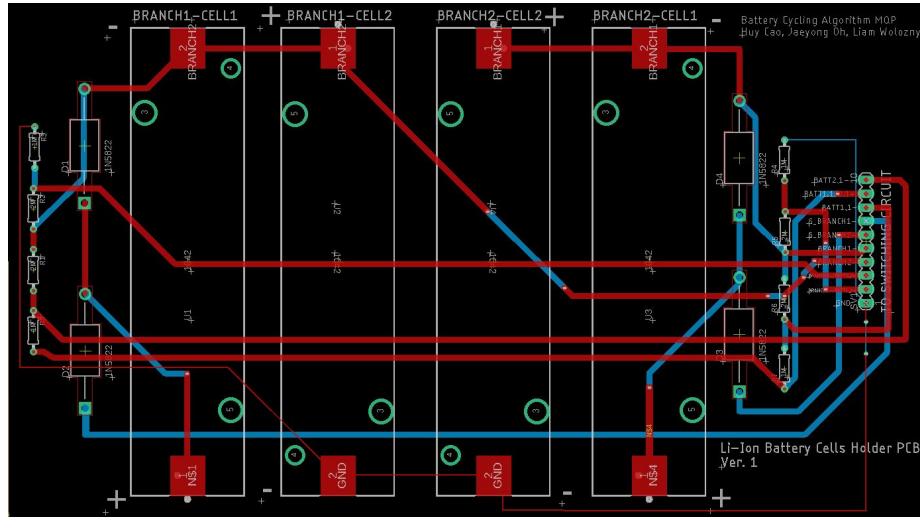
Future Recommendations

- Cell Balancing Circuit
- Battery Life Testing
- Integration into laptop
  - Using a CPU instead of MCU
  - Integrated switch in battery pack
  - Drive laptop loads (CPU, GPU, Hard drives,...)
- Implementation to other rechargeable applications

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Thank you for listening!

Questions?

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