COLLEGE OF ENGINEERING
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Research and Creative Experience for Undergraduates Program (RCEU) Summer 2020

Pulsed Power Control System

Logan Curtis, Dr. Jason Cassibry, Department of Mechanical and Aerospace Engineering

Overview

A pulsed power control system is a combination of software and hardware solutions that work together to allow for safe operation of a pulsed power device.

Hardware

- The following hardware was used in the system:
  - Raspberry Pi 4B
  - Arduino Uno
  - 2 Ethernet over Fiber Converters

- The Raspberry Pi is the brains of the control system. It runs the custom control software.

- The Arduino is controlled by the Pi over USB and is used for outputting signals for relays and receiving voltage data.

- The fiber converters allow an external computer to remote into the Pi over Ethernet. Fiber optics are used to isolate the user from the pulsed power device.

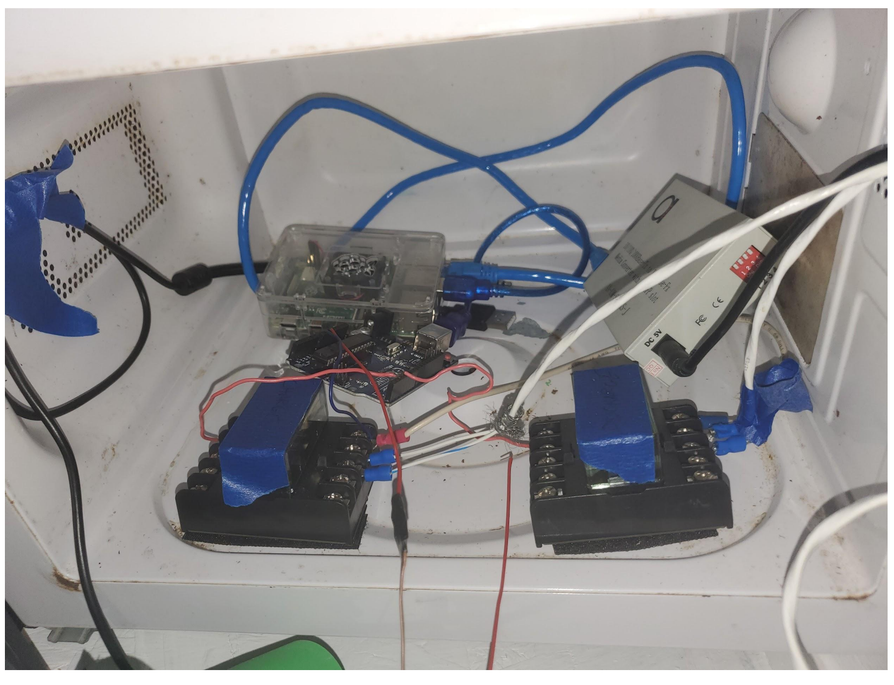

Figure 1. Hardware for control system. Kept inside a microwave to shield from Electromagnetic Interference (EMI).

Software

- A custom control program was written and ran on the Raspberry Pi

- The control software is written in Python. Python was chosen for its ease of programming, wide support, and the Author's familiarity with the language

- The software handles the GUI and the serial communication with the Arduino.

- Several safety feature are build into the program:
  - Automatic reconnection with Arduino if serial connection is disrupted
  - Prevents the user from activating the charge and discharge circuits at the same time

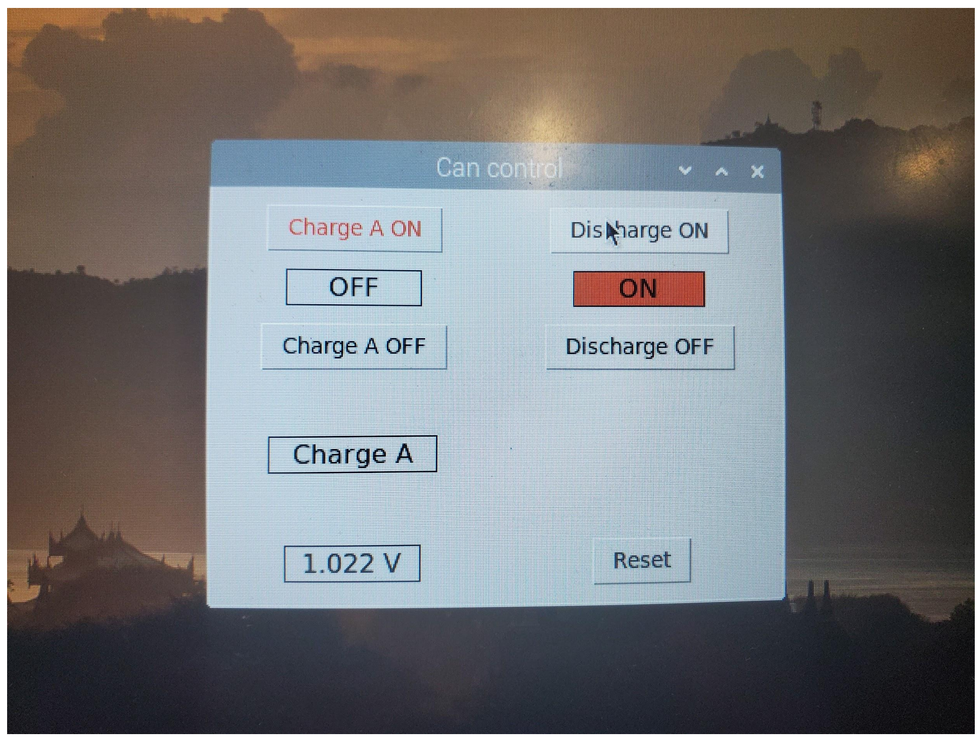

Figure 2. Screenshot of the control software

HONORS COLLEGE
THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Acknowledgements

The authors would like to thank the UAH Office of the Provost, UAH Office of the Vice President for Research and Economic Development, the Dean of the College of Science, the Dean of the College of Engineering, Alabama Louis Stokes Alliances for Minority Participation, and the Alabama Space Grant Consortium. A special thanks to Allen Davis and Sumontro Sinha for their assistance.