Class Kit Vending Machine

Michel Turpeau, Austin Sigg, Ryan Reed, Dillon Williams,
and Nidhay Patel

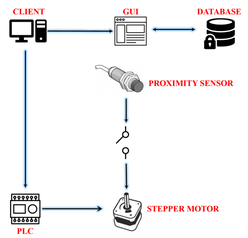
Abstract

Typically, in the first month of a semester, students attempt to check out on average 50 devices in a day from the Office. This capstone project was focused on designing and implementing a vending machine that could distribute devices out to students while recording when students checked out a device. The ideal product would be a vending machine with the functionality to vend the needed specific devices to students.

Design Requirements

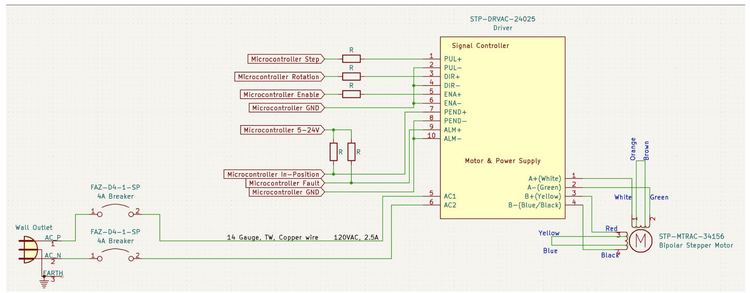
The student enters information into the GUI using the given keyboard and cannot close or leave the application for any reason. The student enters their ID, name, email, which course is needed, and the term. Before the board can be rented, the information is checked for formatting errors and the student must agree to the listed terms. The GUI is connected to a SQL (structured query language) database storing all the data. After the data is verified, the machine reads the current position to assign the correct device to the student. The PLC receives the order to turn on the motor given the GUI state and the admin is allowed to delete information and load devices from the GUI given certain commands and passwords as well.

System Communication



Housing

Motor Schematic

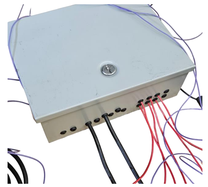


Safety

- Separate from other systems
- Controls Relays
- Interrupts peripherals' power

Power

- Houses 120V AC Driver which provides 24V DC output
- Provides protection to the team and students
- Built in GFCI protection



Software

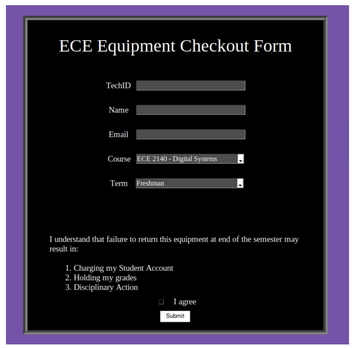
- Intuitive & Simple UI
- Information Error-Checking
- Protects from SQL Injection
- Send/Receive PLC Data

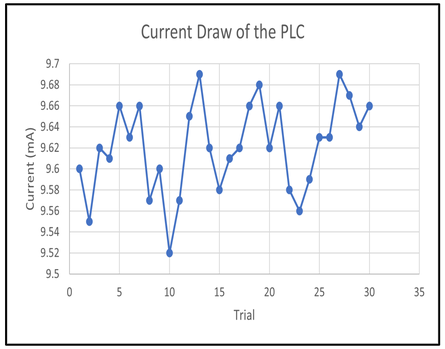
More Information

For more information on the project, you can check out our GitHub at:
https://github.com/DillonSW/Capstone_Team_5.git

Experimentation

The team was able to get most of the major systems operational. The biggest concern was the safety of student data and the integrity of the Database. To protect the database, the team needed to have a combination of buttons to shut down the program and needed to prevent SQL injection into the program. The information stored was kept offline so the computer could not be accessed through another device and the code contained input validation so no other type of information could be entered. An image of the GUI is below. As for the other systems, the Safety sensors were able to interrupt the power sent to peripherals if the door was open, the Power system was able to power the Motor through an enclosure, and the GUI was intuitive and simple in design. The PLC average current consumption is also below and does not exceed the rated value.





Future Work

- Implement a barcode scanner and ID card reader to avoid students entering the incorrect T# in the database
- Fully implement the power system to be independent from the current configuration
- Add the locks into the machine and add functionality for the locks to the PLC
- Acquire Memory Card for Donated PLC

Acknowledgements

We are grateful to the faculty, staff, and Dr. Jesse Roberts here at Tennessee Tech for allowing our team to work on this project. We would also like to thank our Mechanical Team for their work on the housing of the machine.