IOWA STATE UNIVERSITY
Electrical and Computer Engineering

SD-MAY-19-13

Small Equipment Checkout System

Client Organization: Electronics and Technology Group
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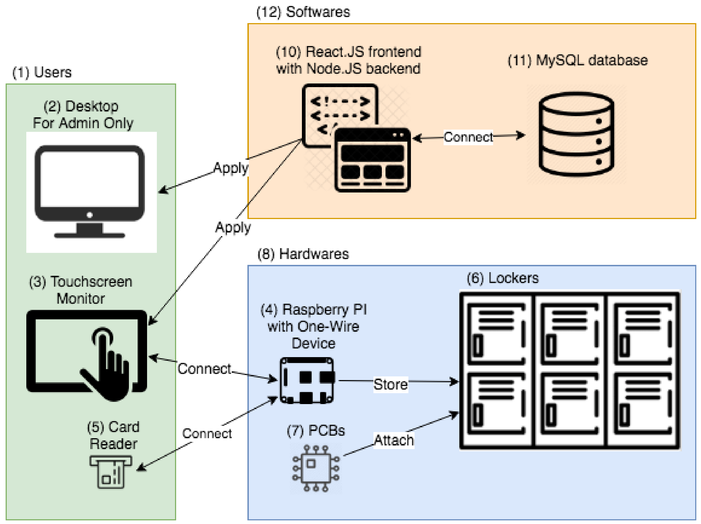
IOWA STATE UNIVERSITY
Electrical and Computer Engineering ETG

Abstract

Electrical and Computer Engineering are subjects rely heavily on experimental experience. The current way that students borrow circuit components depends on Electronic and Technology Group (ETG)'s office hours. The goal of this project is designing a feasible and reliable equipment checkout system that can work 24/7 and simplifying faculty's maintain process.

Concept Diagram

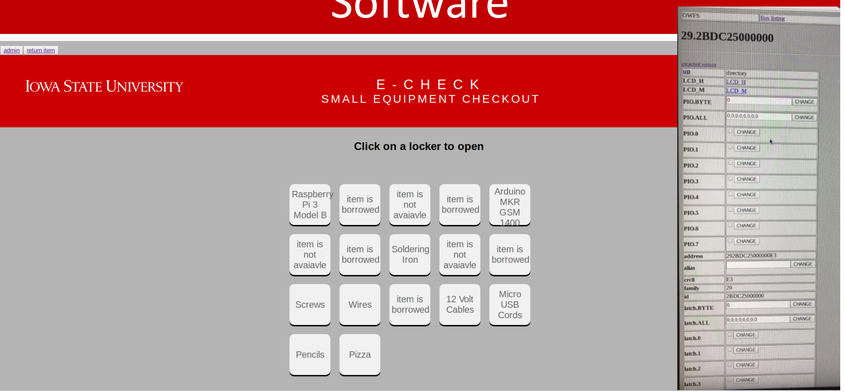


Requirements

Functional requirements:
- Check the availabilities on the front-page.
- Turn on the LED in the selected locker for checking.
- Sweep ID card to open the latch after check.
- Report to ETG if find equipment missing during check.
- After clicked return item, the corresponding latch should open.

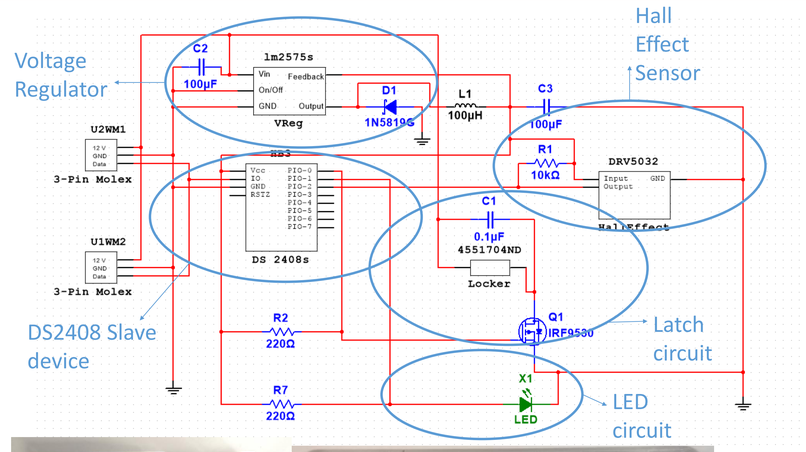
Non-functional requirements:
- The number of lockers can be extended easily by modify the database and add PCBs.

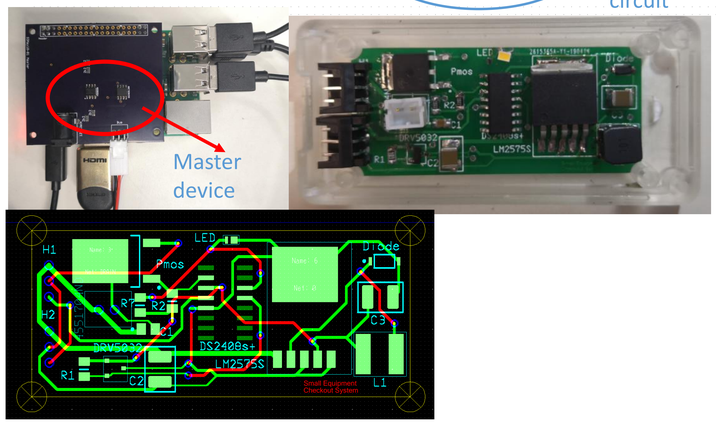
Software



Backend: We used node.js for the server and MySQL for the database, and a local host OWFS server for communicating the hardware. The server reads data from database and handle the HTTP request from the frontend. It also sends requests to OWFS server to control the latch and LED.
Frontend: We used react.js to build user interface. It has different components and selectors to handle user's action and send requests to sever for data changes
OWFS: It is a system for easy communicating with hardware. It runs a local host server, users can switch the PIO status on this server between 0 and 1 to change the hardware state.

Hardware

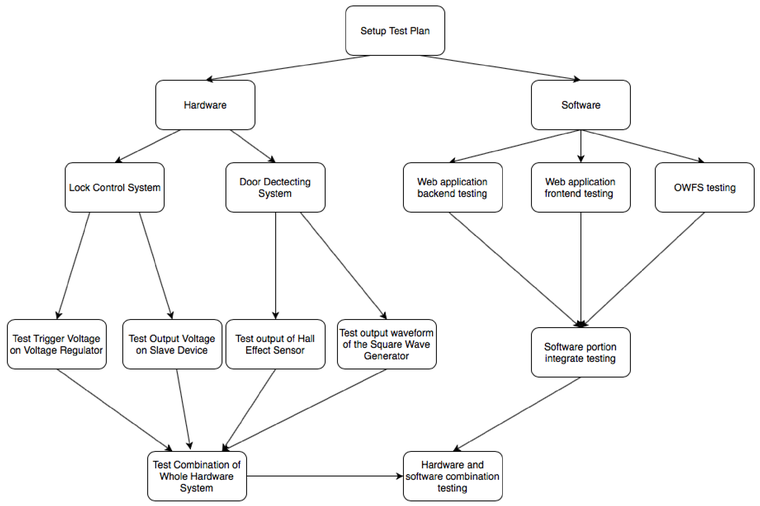




Voltage Regulator: Convert 12V voltage to 5V voltage to supply the DS2408 slave Device.
DS2408 Slave Devices: Assign a unique address for each PCB and control 8 programmable PIOs.
Latch circuit: Connect to the PIO 0 of DS2408. The latch circuit can turn the latch on and off based on nmos gate voltage.
LED circuit: Connect to the PIO 1 of DS2408. The circuit can turn the LED on and off based on different PIO output.
Hall Effect Sensor: Connect to the PIO 2 of DS2408. The circuit can detect if door is closed. The sensor will change the output status according to the magnetic flux density.
Master device: Send data to all DS2408 slave devices. The master device can control any specific PIO.

System description: The small PCBs with DS2408 slave device are placed in each locker. By changing the output status of PIO 0 and PIO 1, the slave device can control the latch and LED. All small PCBs are connected to the master device through one bus line. When users change the condition of latch or LED in any locker, the PIO status in OWFS will be changed. The master device will send the data change to the specific slave device by calling its address.

Testing



Conclusion

Even though the completion of the system is still in progress, the hardware design is fully completed. Our circuit can successful control the latch and LED in lockers, and the door detecting circuit can output different voltage based on the distance to the magnet in the locker. The frontend of website has all the required functions, grid list of lockers, alarm page, etc. The part that still need to be improved is the OWFS configuration of the newly added PIO 2 (door detecting circuit), and the controller of this PIO in the backend. The further step is adding more functions, such as accessing locker's information and availabilities outside the local server.

Acknowledgements

This senior design team, sdmay19-13, would like to thank Iowa State University(ISU), and college of Electrical and Computer Engineering(ECpE) for providing the excellent opportunity for students to form teams and to work on the professional design process. Especially, we want to thank the Electronic Technology Group(ETG), and our client and advisor, Lee Harker, for all the guidance and technical support. We have also appreciated all the contribution from the team, sdmay18-01, who has worked on this project before. Their design shows us many possibilities for this project.