Automated Locker Design Document

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Introduction

In this semester-long project, our team modified a locker in Alden High School to accommodate for a student with special needs. The locker implementation was changed from a standard number lock to a locker with an RFID scanned in it. The student will be given 2 RFID bracelets, and the school staff will be given RFID tags as well as the keys to the mechanical lock. The mechanical lock mechanism is present in case something goes wrong.

Basic Use

In order to open the locker, the user must push the red button on the front to turn the locker on. After the locker is on, the user has 15 seconds to hold up and scan an RFID tag, otherwise the locker will turn off again. After a successful scan, the button will light up, the solenoid will activate and access will be granted inside the locker.

Parts List

Parts that were used:

- Arduino Uno: used to control the system
- Relay: used to control turning on/off the solenoid
- RFID Scanner: used to scan Jacob's RFID tag
- RFID Tags: 125 kHz RFID tags
- Tumbler Lock: used for the manual override of the locker
- DC Power Supply: 2 x Dewalt Charger and Batteries
- Push button power switch breakout: used to toggle on the system and begin listening for an RFID
- 3D Printed Lock Housing: to house RFID and power button assembly on the locker
- Actuator
- Magnetic Push Latch
- Switch

Purchase Links of all the Parts Used:

1. Push button - https://www.adafruit.com/product/1400
2. Arduino - https://www.amazon.com/Arduino-A000066-ARDUINO-UNO-R3/dp/B008GRTSV6
3. Breadboard and test kit - https://www.amazon.com/REXQualis-Electronics-tie-Points-Breadboard-Potentiometer/dp/B073ZC68QG?ref_=ast_sto_dp
4. RFID Scanner - https://www.parallax.com/product/rfid-read-write-module-serial/
5. RFID round tag Quantity: 5 - https://www.parallax.com/product/rfid-r-w-30-mm-round-tag/
6. RFID card tag Quantity: 5 - https://www.parallax.com/product/rfid-r-w-54-x-85-mm-rectangle-tag-2/
7. Power Supply Quantity: 2 - https://www.amazon.com/DEWALT-DCB205CK-20-Volt-Lithium-Ion-Battery/dp/B015DEQVEG/ref=sr_1_1?dchild=1&keywords=dcb205ck+dewalt&qid=1615395203&sr=8-1
8. Push Button - https://www.digikey.com/en/products/detail/3489/1528-2316-ND/7349495?utm_campaign=buynow&utm_medium=aggregator&curr=usd&utm_source=octopart
9. Tumbler Locks - 1 of each: https://www.amazon.com/Prime-Line-Products-9945-Drawer-Cabinet/dp/B000BDB686/ref=sr_1_18?dchild=1&keywords=tumbler+lock&qid=1615849022&sr=8-18

https://www.grainger.com/product/COMPX-NATIONAL-Removable-Core-Plug-Cabinet-4TXZ4?opr=APPD&analytics=altItems_4TYA7

10. 2.1mm Power Jack cable for connection from Battery to Arduino
    https://www.amazon.com/Fancasee-Replacement-Degree-Pigtail-Supply/dp/B0851CBH87

11. Magnetic Push Latches:
    https://www.amazon.com/dp/B08NVNGM45?ref=ppx_pop_mob_ap_share

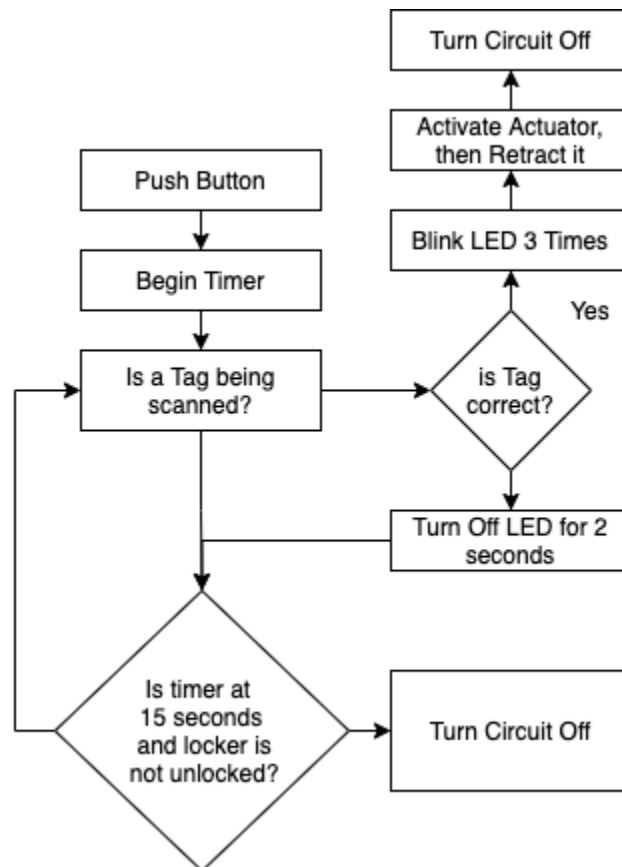12. RFID Card: https://www.amazon.com/dp/B01M1L7NHI?ref=ppx_pop_mob_ap_share

13. Linear Actuator:
    https://www.amazon.com/dp/B07X3Z68GV?ref=ppx_pop_mob_ap_share
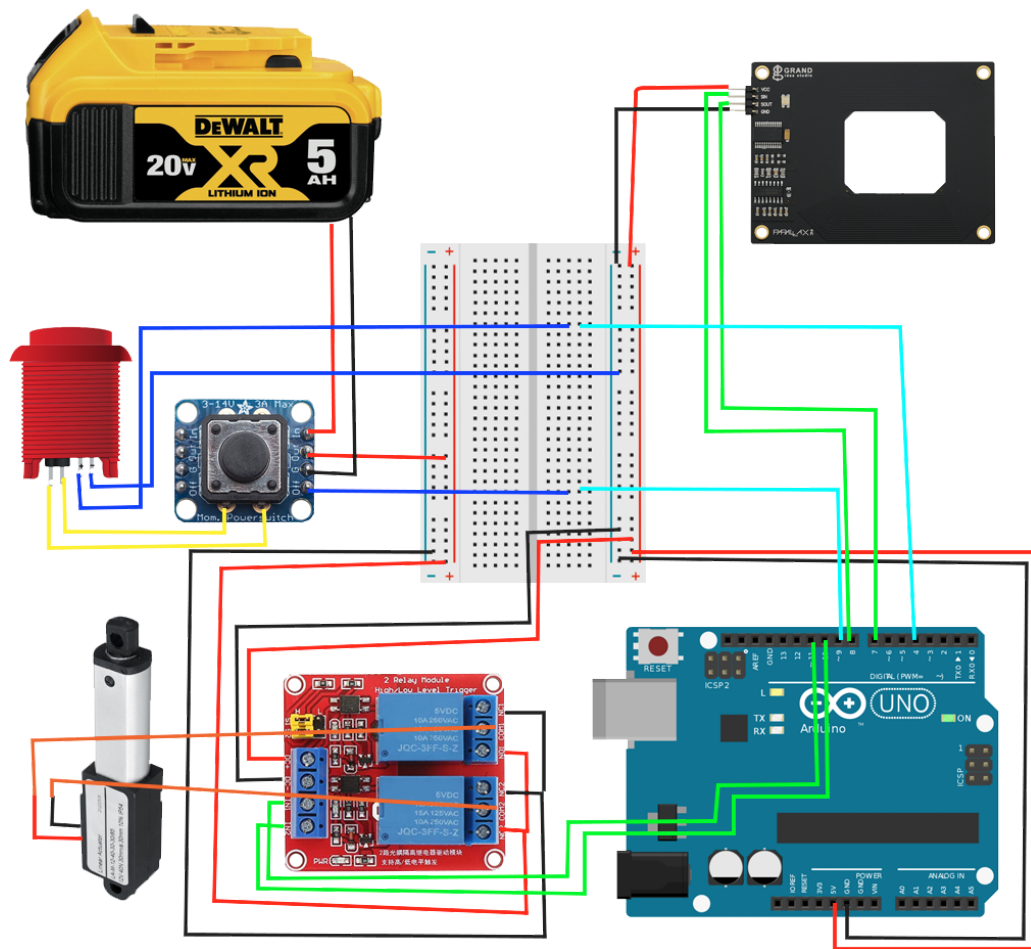
Software

The code for this project was written in the Arduino IDE. The CAD drawings were designed using AutoCAD. These drawings were of the parts that were then 3D printed for the locker.

Architecture Overview:

The Circuit

3D Printed Parts

The CAD drawings designed using AutoCAD were then 3D printed to be used in the locker. All the files are available in the team's GitHub repository.

Availability

The code, the CAD drawings, and the files that were 3D printed are all available on the Locker team's GitHub repository: https://github.com/shreyala/453-Locker-Project.

Maintenance

New RFID Tags

If new RFID Tags are purchased, please follow these steps to program the tags:

1. Download the code for the locker. The code is present in the GitHub repository under the filename locker.ino.
2. If you don't have Arduino IDE on your computer, please install it: https://www.arduino.cc/en/software.
3. Load the code for the arduino in the IDE.
4. Connect the Arduino attached to the locker to your computer.
5. Look for the line "char *validTags[] = {"1F00D790F8", "20007FA5BA", "0500023FDB", "0400C37327", "01009C3AA6" "
6. In this line, at the end, add the unique identification number for the tags that were purchased in the format: ,"(ID number of the tag)"};
7. Look for the line: "if(taginputL == validTags[0] || taginputL == validTags[1] || taginputL == validTags[2] || taginputL == validTags[3] || taginputL == validTags[4]"
8. Add the following at the end: || taginputL == validTags[5])
9. Save the code.
10. Verify the code.
11. Upload it.
12. The arduino should now be programmed to read the new tag.
13. Unplug the arduino, and the locker should be unlockable using the new tags.