**Trideum Senior Capstone Project Documentation**

In its entirety, this product emulates the physical systems of a structure equipped with an HVAC system, motion detection capabilities, an RFID security scanner, a fully operational elevator, and an alarm system. The product serves to demonstrate varying tiers of security vulnerabilities, mirroring their implications to a real-world building.

A three tiered wooden shelf with wires

Description automatically generated

**RFID Module**

A circuit board with wires connected to it

Description automatically generated

A diagram of a circuit board

Description automatically generated

In the schematic and diagram above, we have the RFID module. This is programmed to respond to an ID card and simulates someone scanning their card to get into the building. There are two LED’s, one red and one green. The red LED is on by default, and when the card is scanned, the Red led shuts off, and the green led illuminates.

**Motion Sensor Module**

A circuit board with wires connected to it

Description automatically generated

A diagram of a circuit board

Description automatically generated

In the above schematic and diagram, we have the module for the motion sensors. This works in sync with the buzzer module where the buzzer goes off when motion is detected. The security reason for this is there has to be security in a building for it to function. We also have an LED that illuminates when motion is detected, illuminating when someone walks into a room and lights come on.

**Buzzer Module**

A circuit board with wires connected to it

Description automatically generated

A diagram of a circuit board

Description automatically generated

In the schematic and diagram above, we have the buzzer module displayed. As previously mentioned, this module works in sync with the motion sensor module, sending out an alarm when motion is detected.

**HVAC Module**

A diagram of a circuit board

Description automatically generated

A diagram of a computer

Description automatically generated

In the above schematic and diagram, we have the module for the HVAC system. In this module, the fans are programmed to come on when the room reaches a certain temperature. Thermistors (thermal resistors) are used to measure the temperature and tell the fans when to come on. Also, in this module, there is a L293 motor driver chip that dictates the direction and speed of the fan. Also, each breadboard is connected to a separate power supply board, this is because the Arduino cannot process enough power for the fans.

**Elevator Module**

A computer screen shot of a computer

Description automatically generated

A diagram of a circuit board

Description automatically generated

In the above schematic and diagram, we have the module for the elevator system. In this module, there are three sensors each equipped with push buttons connected to the Arduino, and an L298 motor driver chip along with a 220-volt power supply, as well as the motor. The way this module works is that when the elevator box is at either of the sensors, the output will read 1, and the elevator box will not move until the pushbuttons are pressed and will stop when the target floor’s sensor reads 1.