Mechanical Overview

Year: 2021   **Semester:** Spring   **Team:** 4   **Project:** Virtual Queue
Creation Date: February 16, 2021   **Last Modified:** April 16, 2021
Author: Nathan Pietraszak   **Email:** npietras@purdue.edu

Assignment Evaluation:

Item	Score (0-5)	Weight	Points	Notes
Assignment-Specific Items				
Commercial Packaging Analysis 1		x2		
Commercial Packaging Analysis 2		x2		
CAD Model Illustrations		x4		
Project Packaging Specifications		x2		
PCB Footprint Layout		x2		
Writing-Specific Items				
Spelling and Grammar		x2		
Formatting and Citations		x1		
Figures and Graphs		x2		
Technical Writing Style		x3		
Total Score				

5: Excellent   4: Good   3: Acceptable   2: Poor   1: Very Poor   0: Not attempted

Comments:
Comments from the grader will be inserted here.

1.0 Commercial Product Packaging

1.1 Product #1 – SafeCount

The first commercial product is SafeCount from Irisys. SafeCount is a highly accurate system
that monitors the number of people entering and exiting an area using infrared sensors, and it is
able to interface to external systems such as a display monitor, traffic-style signaling lights, a
speaker for audio alerts, and a software dashboard for system management [1]. The SafeCount
itself is encased in a plastic box with dimensions of 7.67" x 4.33" x 1.25" [2]. The monitor,
lights, and speaker must all be purchased separately [1]. It is intended to be mounted on the
ceiling above the entranceway to monitor occupancy [1].

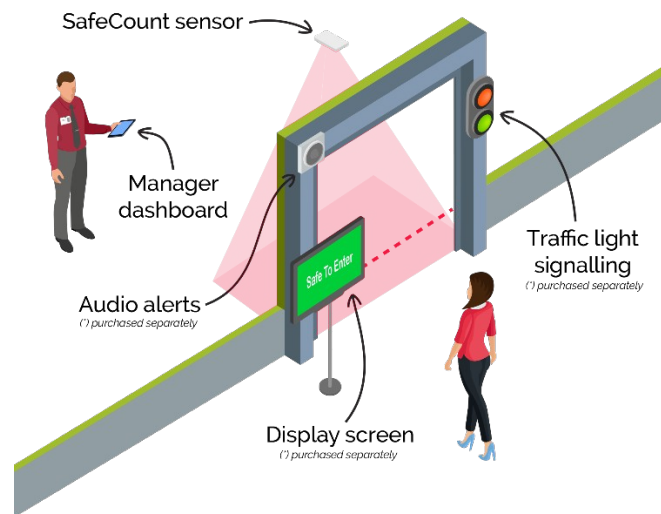*Figure 1. SafeCount sensor [2]*   *Figure 2. Potential SafeCount setup [1]*

The primary appeal of the SafeCount's packaging is its simplicity. It is a small sensor system and
its ability to be placed on the ceiling keeps it out of the way of customers and employees. As
most of the manager interaction is meant to occur via ethernet, there are no exterior control
mechanisms on the packaging, which only provides spaces for the sensors and two power
indicating LEDs. Making the Virtual Queue's doorway monitoring component compact, easy to
place, and simple in appearance is something we would like to replicate.

However, this simplicity is also the main drawback of the SafeCount system. Requiring the
components that interact with customers to be purchased separately is the primary issue, as on its

own the SafeCount is unable to interact with customers besides detecting them entering or exiting. While it will result in a larger package size, by including the screen, speaker, and other features such as the QR scanner and temperature sensor, we hope to make Virtual Queue an all-in-one package for businesses.

1.2 Product #2 – Irvine Temperature Screening Kiosk

The second product is the Irvine Temperature Screening Kiosk from Olea Kiosks (Figure 2). This kiosk is meant to be used to automate contact-less temperature screening to make sure people entering a business or workplace do not have a fever [3]. It features a large screen angled slightly upwards towards the user, with a thin stand attached to a small base. The device comes in two versions, one freestanding at a little over 4 feet tall, and another shorter variant meant to be placed on desks or other elevated surfaces [3].

Figure 3. Irvine Temperature Screening Kiosk [3]

Elements such as the tilted screen are aimed at making user interaction easier. The angled screen accounts for a variety of user height and prevents them from having to bend over as much to see it properly. In addition, the temperature taking device is placed at the top of the kiosk, so users do not have to move very much for their temperature to be taken. Another positive aspect is the fact that the kiosk can stand on its own, as it has a built-in base that can be placed anywhere. We plan to implement these three features in our design, as the screen needs to be easily readable and the Virtual Queue should be a standalone system that can be placed outside a store.

The differences between Virtual Queue and the Irvine kiosk largely come down to difference in intended use. Virtual Queue will have more sensors, requiring more openings in the exterior for the user to interact with the system. In addition, we will not be producing a short version, as the exteriors of most places of business would not have a suitable surface to place it on.

3.0 Sources Cited

[1]   Irisys. *SafeCount* [Online]. Available: https://www.irisys.net/products/safecount-occupancy-monitoring-solution/retail-stores

[2]   TEquipment. *Irisys SafeCount Sensor – Master Device / POE / White* [Online]. Available: https://www.tequipment.net/Irisys/SafeCount-Sensor-POE-W/Occupancy-Monitoring/

[3]   Olea Kiosks (September 3, 2020). *Irvine Temperature Screening Kiosk* [Online]. Available: https://www.olea.com/wp-content/uploads/2020/09/Temperature-Screening-Kiosk-with-Re-purpose-Data-Sheet-09032020.pdf

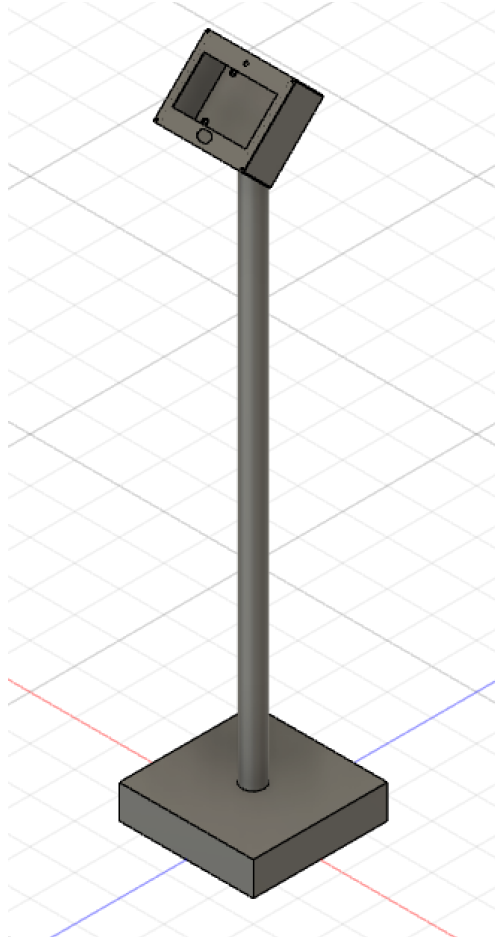**Appendix 1: CAD Model Illustrations**

Figure 4. Main Structure Isometric View

Main structure dimensions:
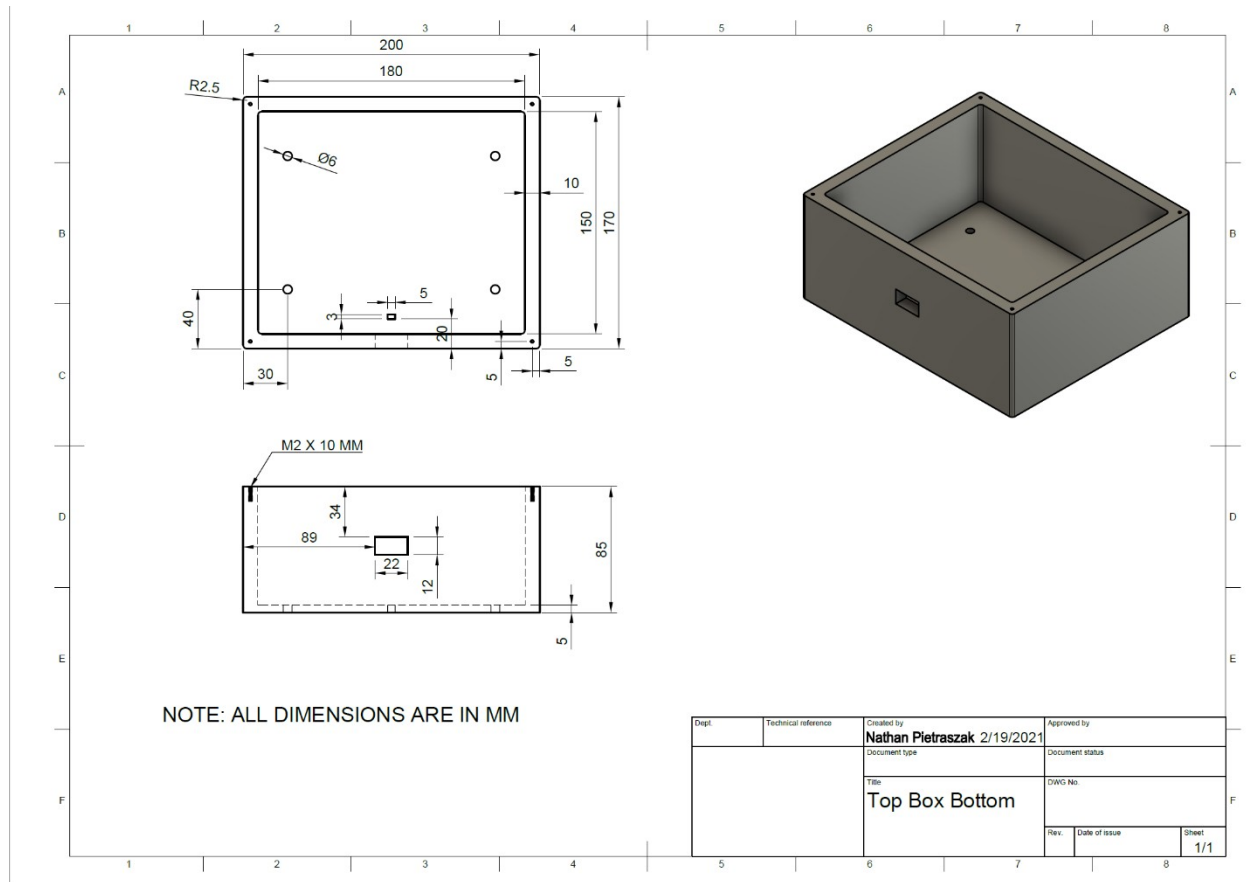Pole height: 1.25m
Base dimensions: 30cm x 30cm
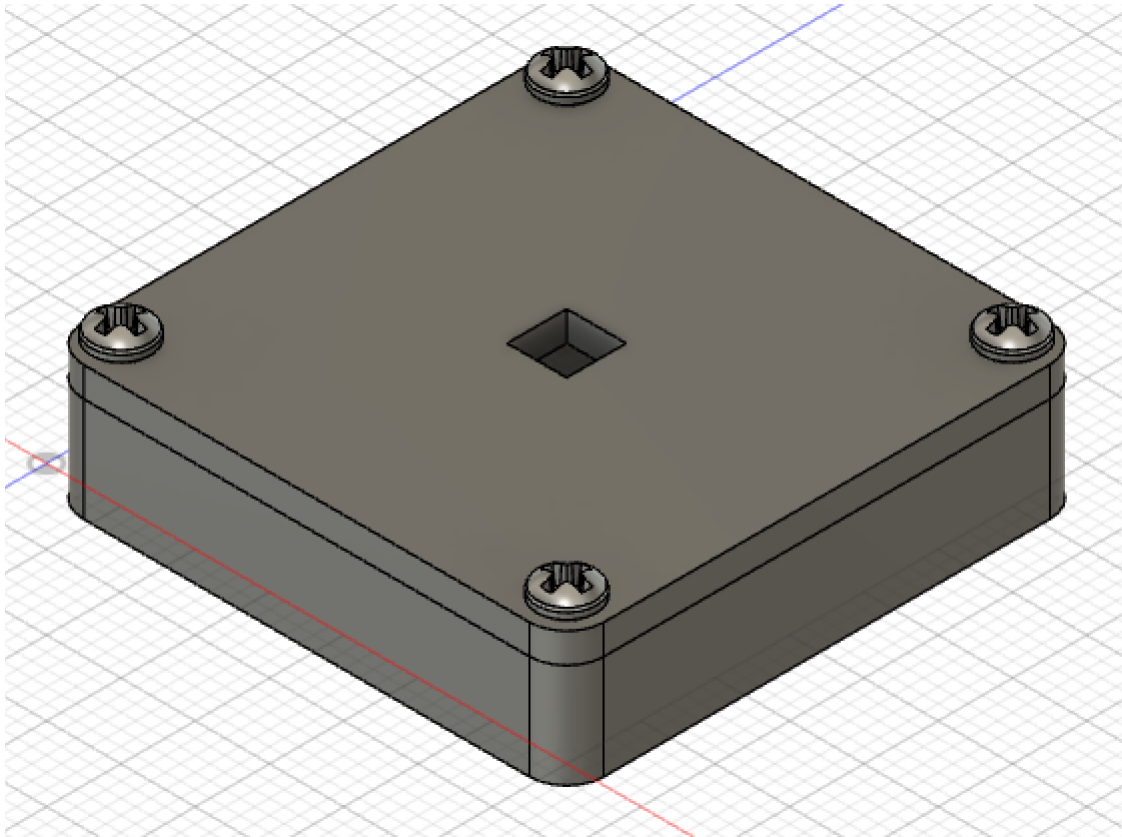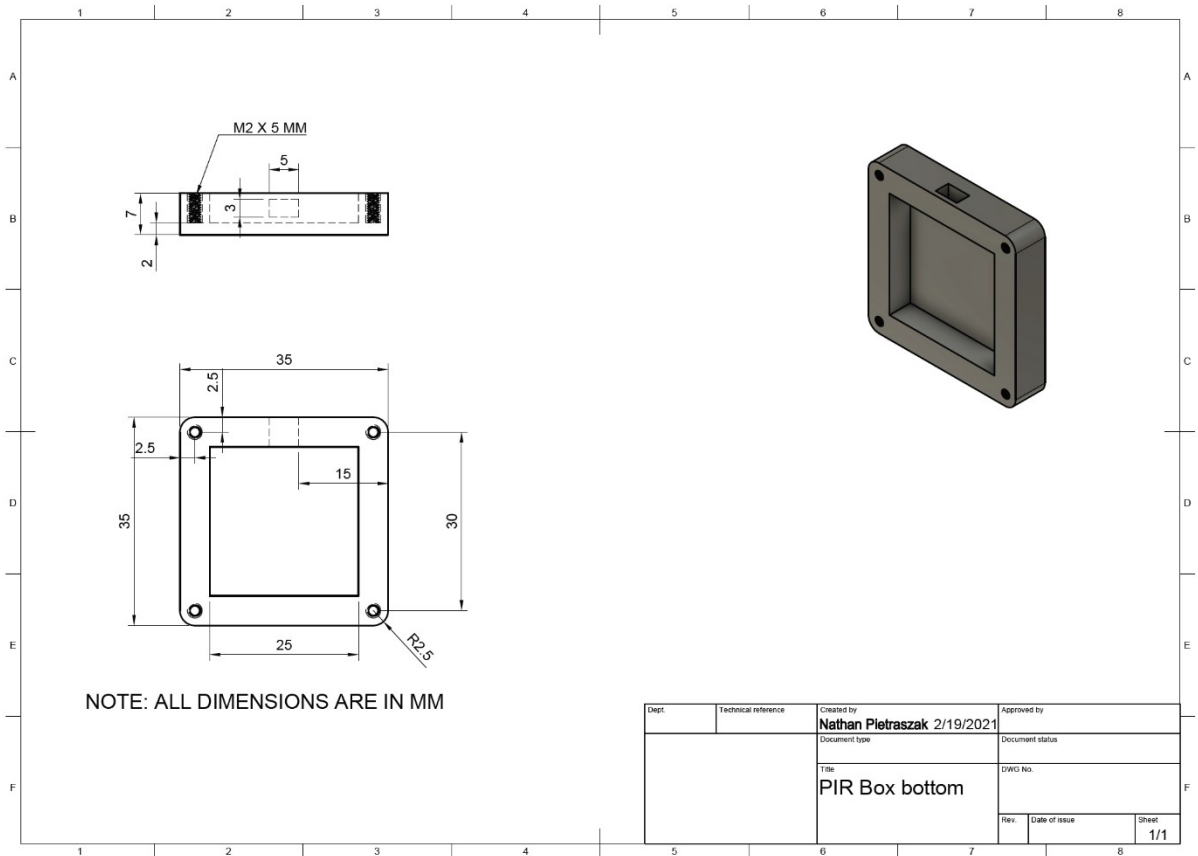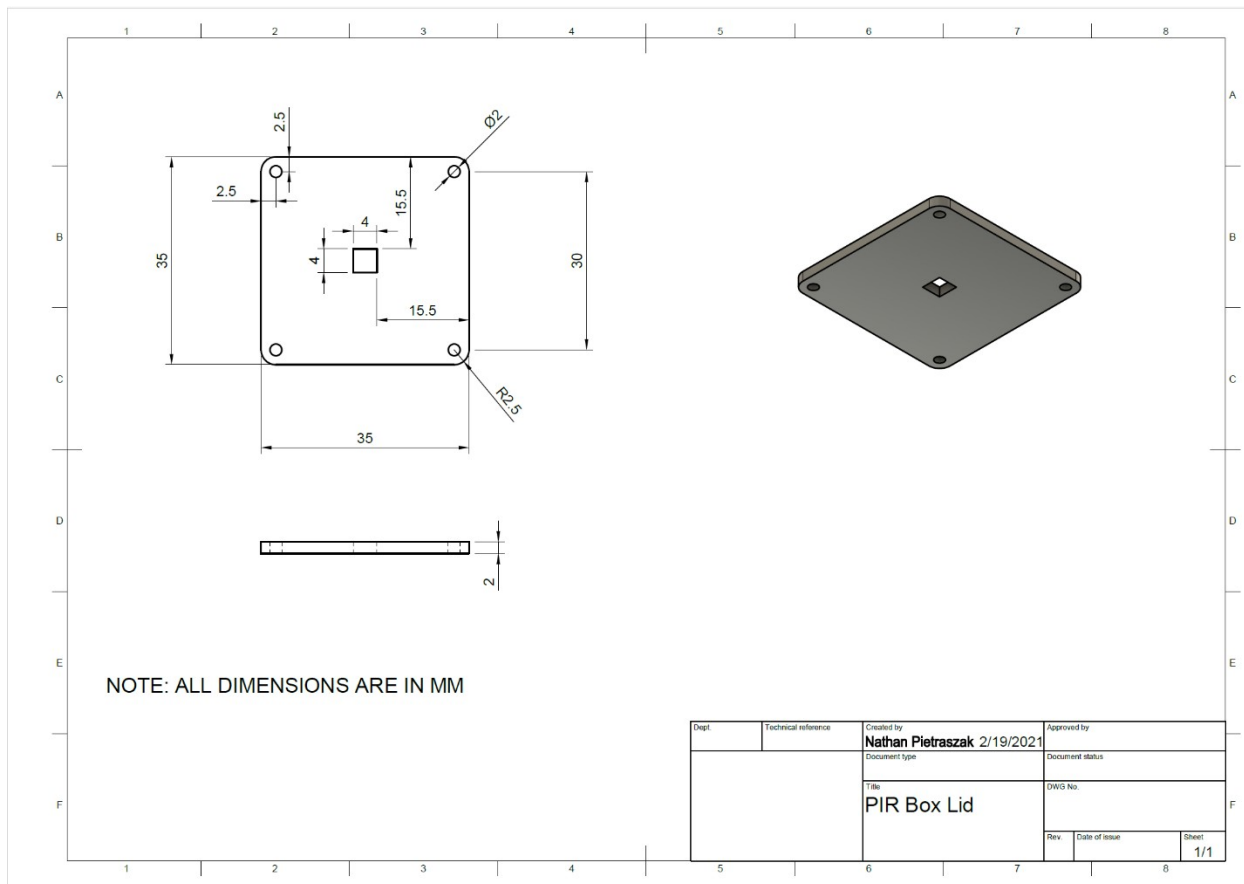
Figure 5. Main Component Box Bottom

Figure 6. Main Component Box Top

Figure 7. PIR Sensor Box

Figure 8. PIR Sensor Box Bottom

Figure 9. PIR Sensor Box Top

Appendix 2: Project Packaging Specifications

Material	Tooling	Weight	Count	Unit Cost
M2 x 6mm Phillips screws	Screwdriver	0.9 g	4	$0.06
M2 x 10 mm Phillips screws	Screwdriver	0.9 g	4	$0.07
M6 x 14 mm Phillips screws	Screwdriver	1.0 g	4	$0.07
M6 hex nuts	Hex wrench	16 g	4	$0.03
2 in x 5 ft PVC pipe	Waterjet	1.7 kg	1	$13.30
2 in x 2 ft PVC coupling	Waterjet	680 g	1	$1.20
0.093 in x 2 ft x 4 ft ABS sheet	Laser cutter	1.8 kg	1	$14.78
0.188 in x 2 ft x 2 ft ABS sheet	Laser cutter	1.8 kg	1	$38.10
2 in x 4 in x 4 ft Dimensional lumber	Band saw	2.7 kg	1	$4.55
PLA printing filament	3D Printer	~306 g	-	$0.03/g

Appendix 3: PCB Footprint Layout

85 mm (3.35 in)

JST Connector
(Battery)

Audio Amplification Circuit

51 mm (2.01 in)

Boost
Convertor &
Power
Passives

RA8875 (Display Driver)

ESP-01 (WiFi Module)

STM32L476VGT7
(MCU)

Qwiic Connector
(PIR)

DFR0660 (QR Reader)
Polarized Connector

10 mm

1 in