# ENAE450 Final Project Report

Brandon Newman, Sriman Selvakumaran, Adithya Sundar, Joshua Stone

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# 1 Introduction

# 2 Simulation

## 2.1 Methods

## 2.2 Results

# 3 Hardware

## 3.1 Methods

### 3.1.1 Navigation with Lidar

### 3.1.2 Aruco Marker Detection

For Aruco marker detection, our team used the opencv library to analyze the camera frame from the turtlebot.

First, we import opencv (`cv2`) and define the aruco detection variables. We also import the `Image` class for the camera subscriber:

```
import cv2
from sensor_msgs.msg import Image

dictionary = cv2.aruco.getPredefinedDictionary(cv2.aruco.
    DICT_4X4_1000)
parameters = cv2.aruco.DetectorParameters()
detector = cv2.aruco.ArucoDetector(dictionary, parameters)
```

Next, we created a subscriber to the `/image_raw` topic to get the camera data from the turtlebot:

```
self.scan_subscriber = self.create_subscription(
    Image,'/image_raw',self.frame_handler,10)
```

In the subscriber callback function, we use the open cv library to detect arucos on the frame:

```
def frame_handler(image_data, self):
    # get camera frame data
    frame = image_data.data
```

```
4
5       # detect arucos
6       (corners, ids, rejected) = detector.detectMarkers(frame)
```

TODO explain how we interfaced this with rest of code

### 3.2 Results

## 4 Retrospective

### 4.1 What Went Well

### 4.2 What We Would've Done Differently

### 4.3 Who Did What