Georgia Tech | School of Electrical and Computer Engineering
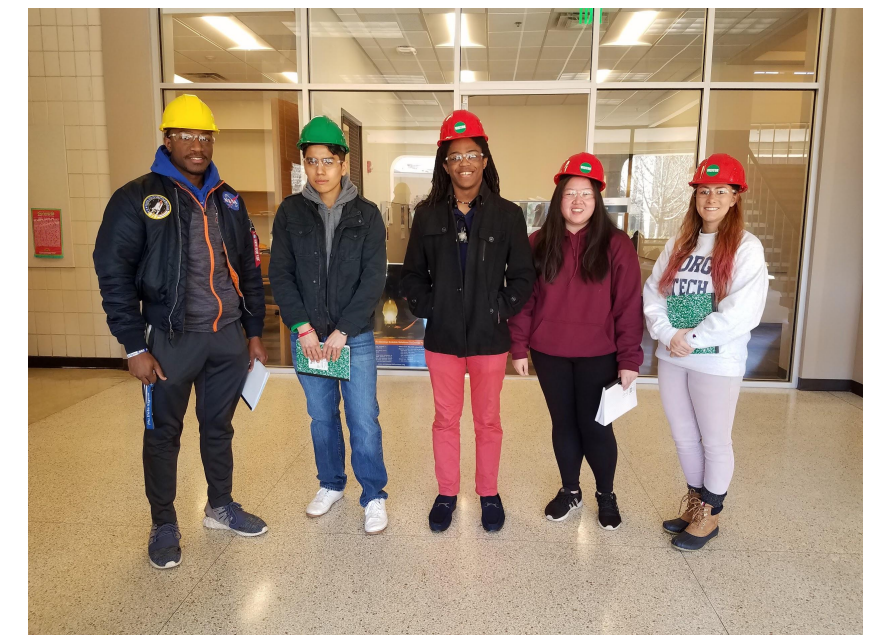
Powervault Inspection Robot

Stephanie Chan, Elizabeth Fuller, Adrian Muñoz, Nelson Raphael, Lemek Robinson

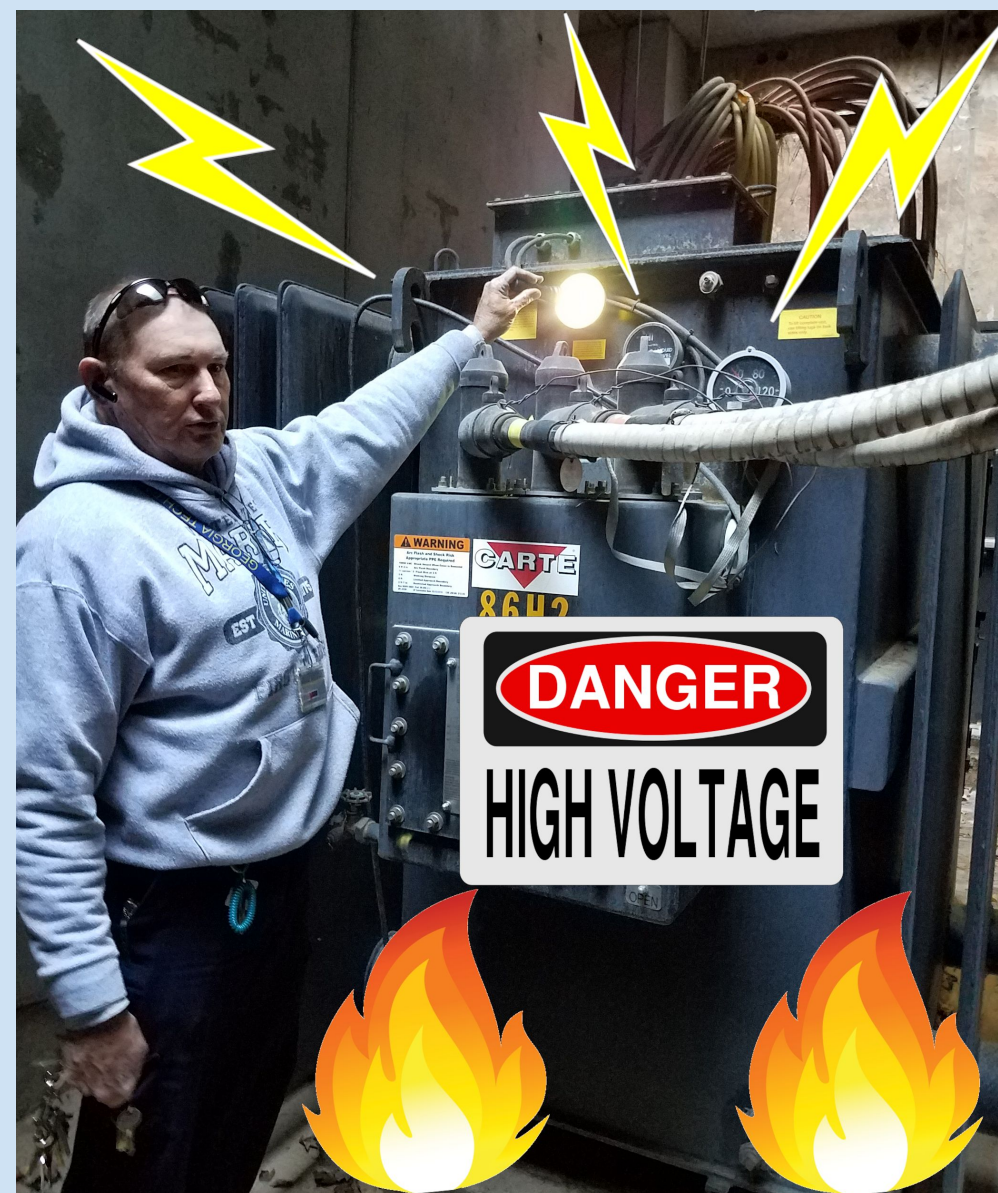### Advisor: Lukas Graber

Objectives

- Design a remote controlled robot that inspects power vaults
- Create a user-friendly GUI for inspection workers to use
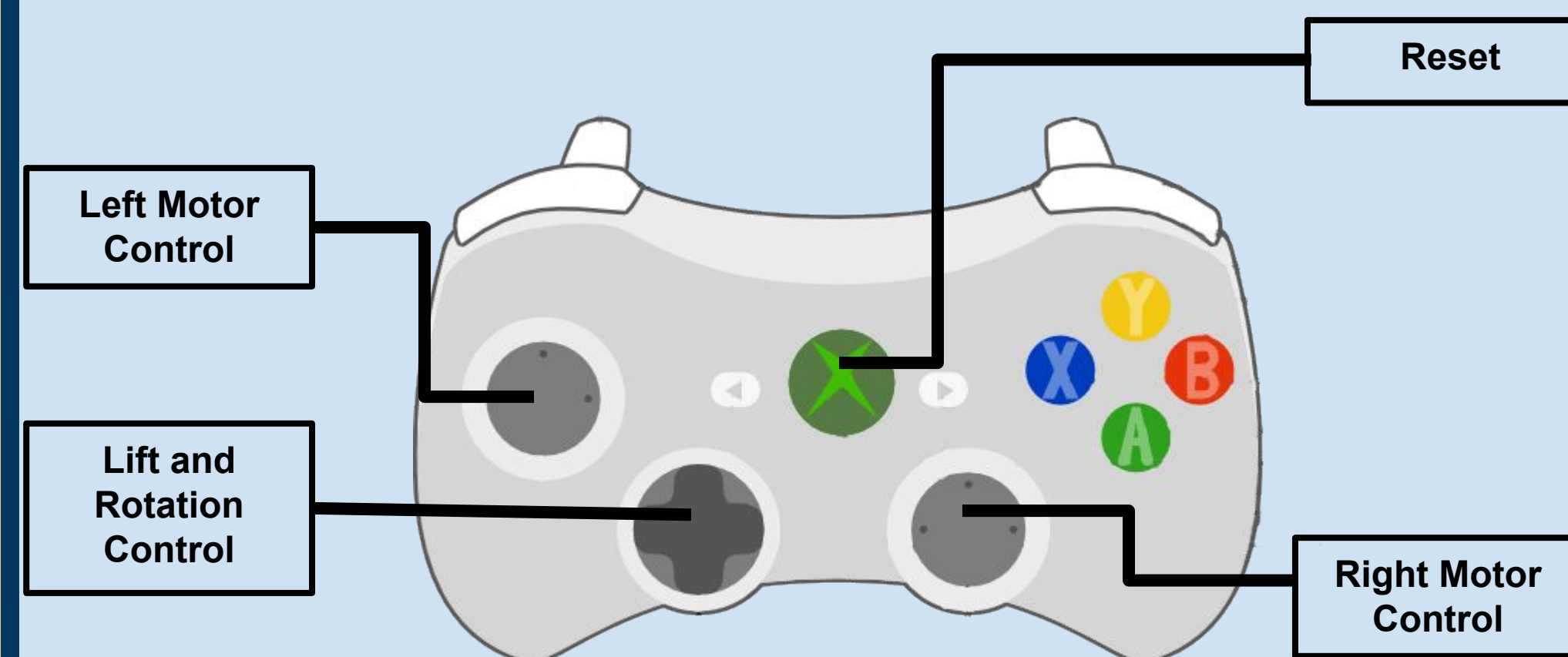- Assemble a sensor package to examine the quality of the environment using video and gas sensors

Motivation

- Protect inspection workers from the dangers of powervaults
  - Electrical parts are responsible for 80% of electrocution deaths among workers
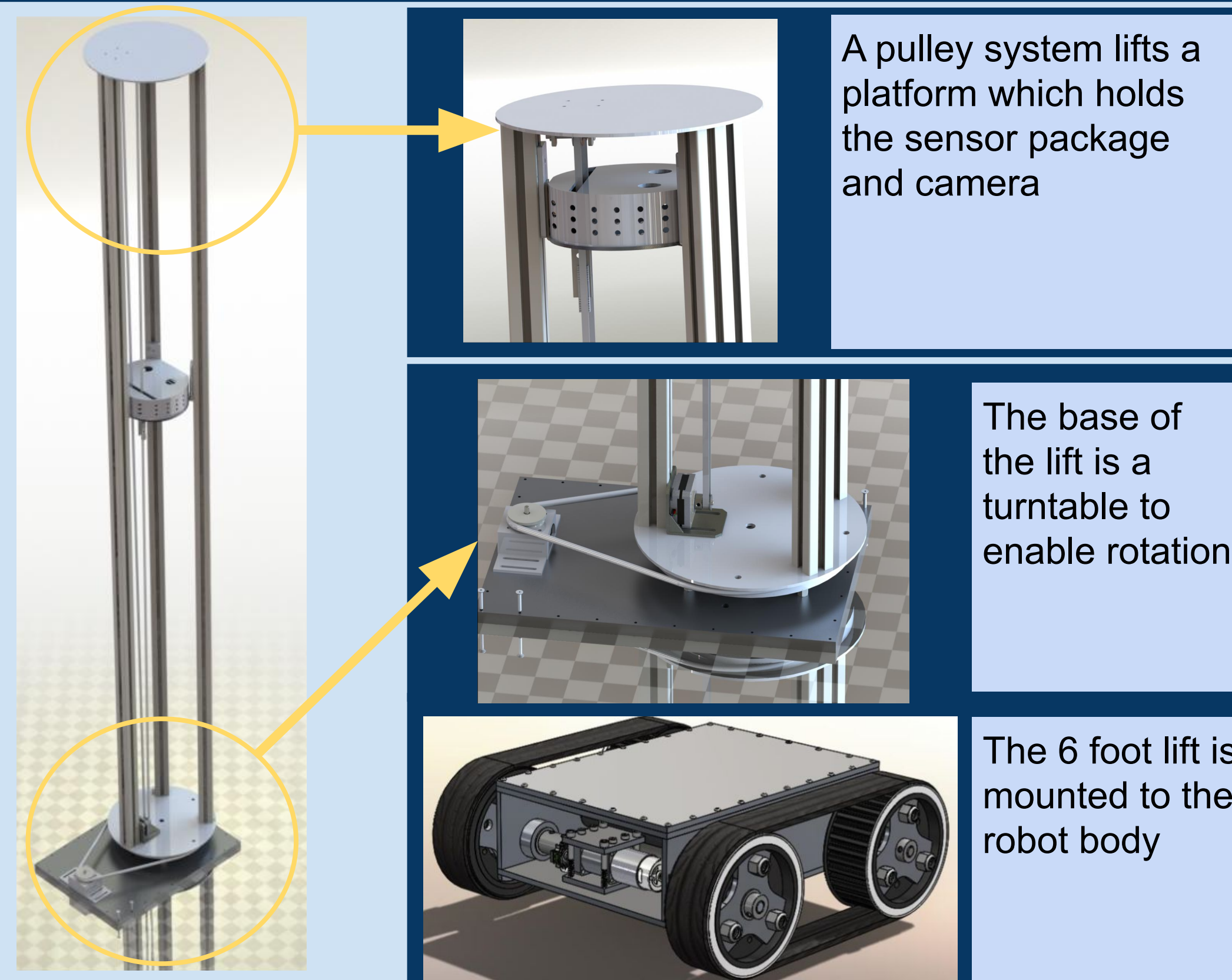- Simplify the process of logging data while inspecting powervaults

DANGER HIGH VOLTAGE

Controller Diagram

- An Xbox 360 controller is used to operate the robot's movement

Reset
Left Motor Control
Lift and Rotation Control
Right Motor Control

Design Overview

A pulley system lifts a platform which holds the sensor package and camera

The base of the lift is a turntable to enable rotation

The 6 foot lift is mounted to the robot body

GUI

Camera Feed
Air Quality
92 °F
Ambient Temp.
Line Plot (Audio)
Line Plot (Directional Temperature)

Hardware

User Side: XBox360 Controller —USB— Linux Computer
MQTT
Robot Side: Raspberry Pi Night Vision Camera —Video Stream— Raspberry Pi
Serial
Arduino Due —PWM Pin— Stepper Motor
PWM Pin / PWM Pin
Speed Controller (Left) — M
Analog Output
Speed Controller (Right) — M
CO Sensor | IR Temperature Sensor | Gas Sensor

Software

Xbox Controller button is pressed
Movement is published via MQTT broker
Raspberry Pi 3 subscribes to MQTT broker
Payload received? No / Yes
Raspberry Pi writes to Arduino Due
Arduino Due actuates motors

Sensor Data is found
Sensor Data is written to the Raspberry Pi
Raspberry Pi publishes to MQTT broker
Payload received? No / Yes
PC inputs data into GUI
GUI displays data graphically

Publisher — aQS, gCS, aTS, oTS publish — MQTT Broker — aQS, gCS, aTS, oTS subscribe — Subscriber
Sensor Readings

Publisher — motor Command publish — MQTT Broker — motor Command subscribe — Subscriber
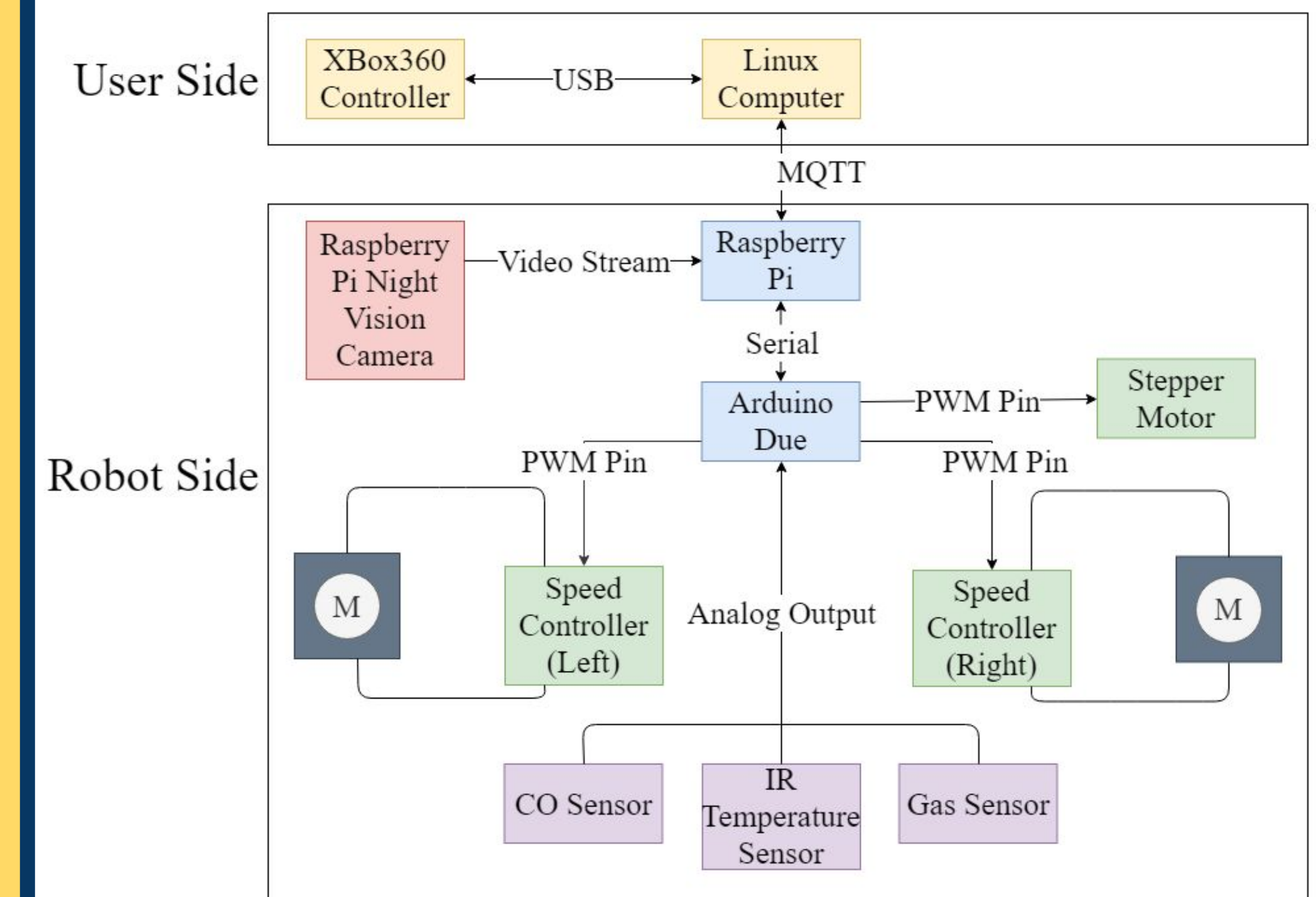motor Controller
Data flow from Broker to Subscriber
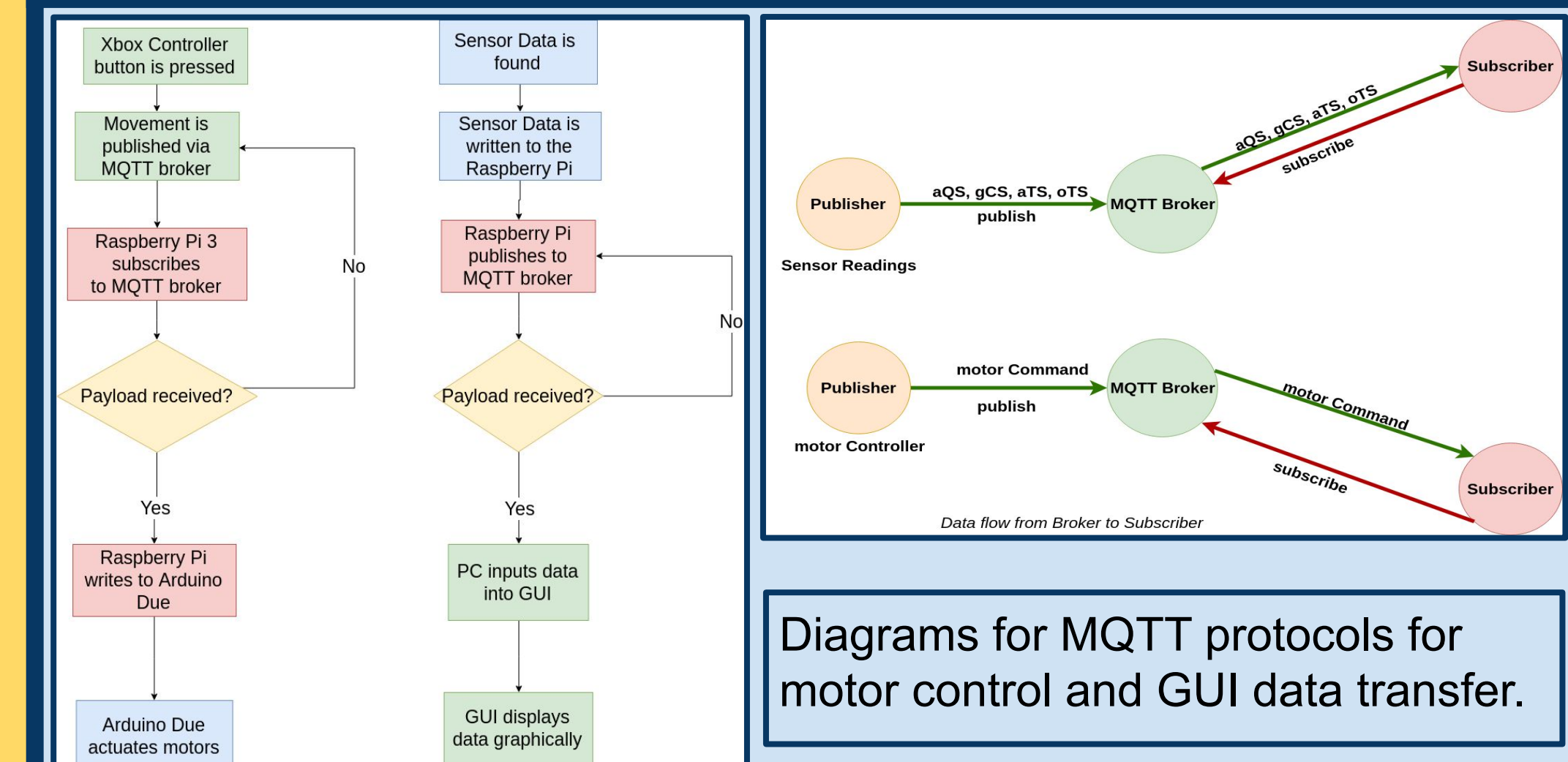
Diagrams for MQTT protocols for motor control and GUI data transfer.

Future Work

- Collapsible lift to increase mobility and stability
- Write a training manual to improve user-friendliness
- Implement audio capture into the hardware design