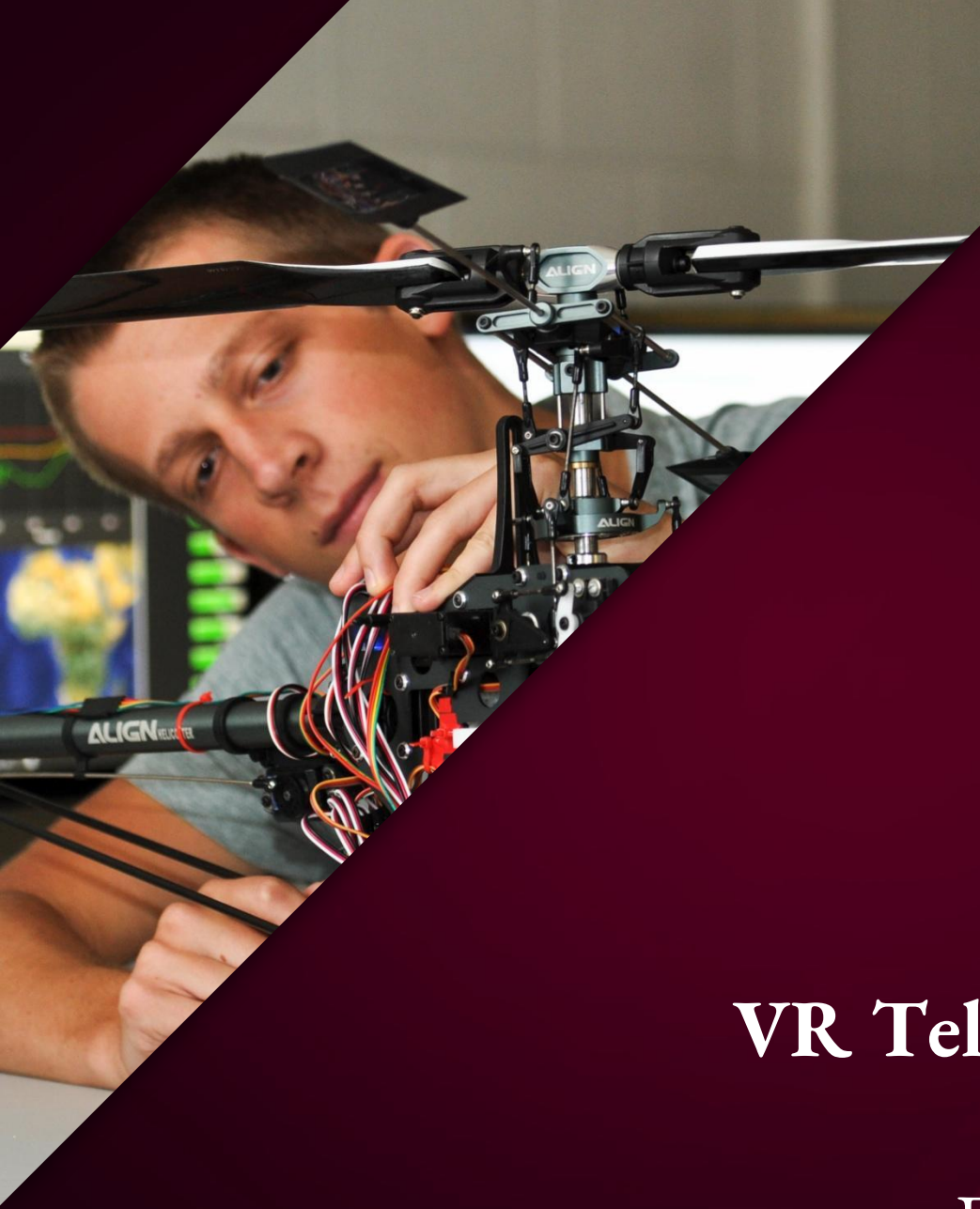


Dwight Look College of
ENGINEERING
TEXAS A&M UNIVERSITY

Aaron Ingram
Eduardo Calderon
Klin Rothenberger
Salvador Cuevas

VR Telepresence Robot Arm

Final Project Presentation

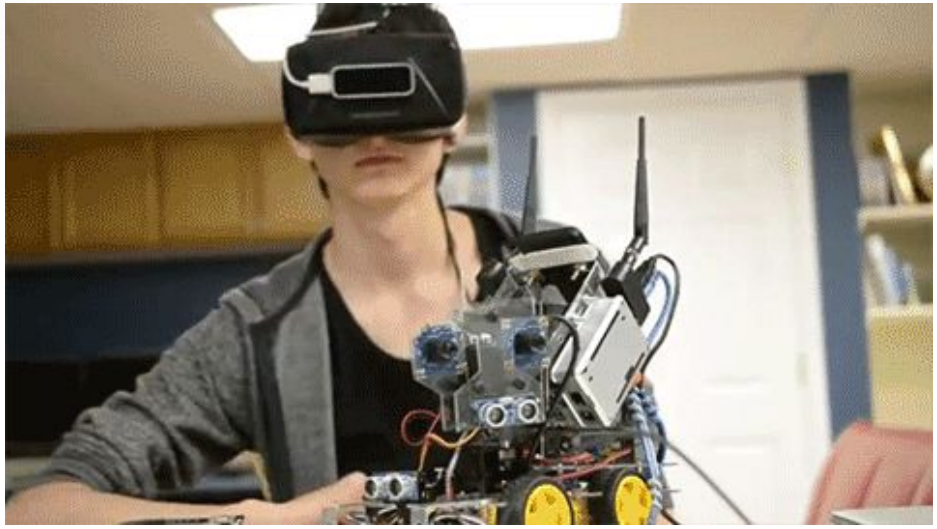
Problem Statement

- Robot Arms have non intuitive controls
- Telepresence is nearly non existent for users to see the robot arm from different locations
- Current implementations are extremely bulky/ unintuitive to use

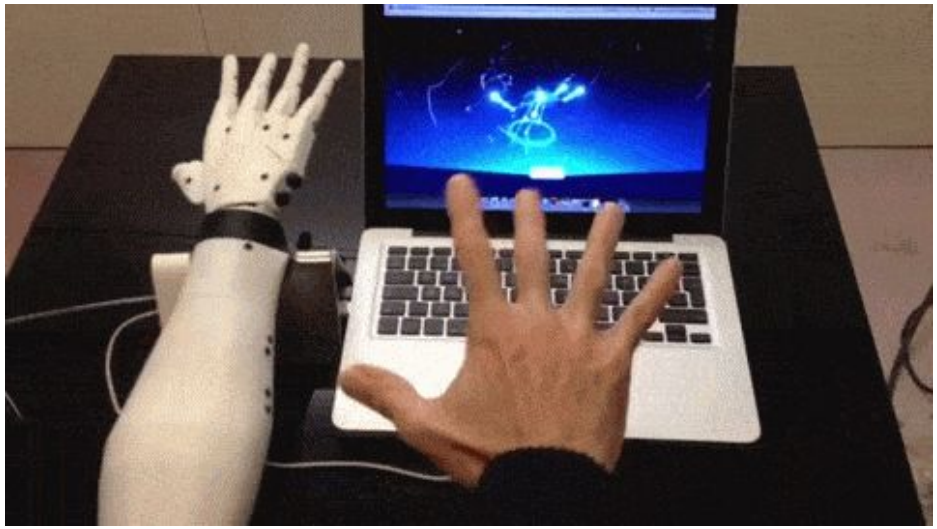
RoSS™ II Robotic Surgery Simulator

Original Concept

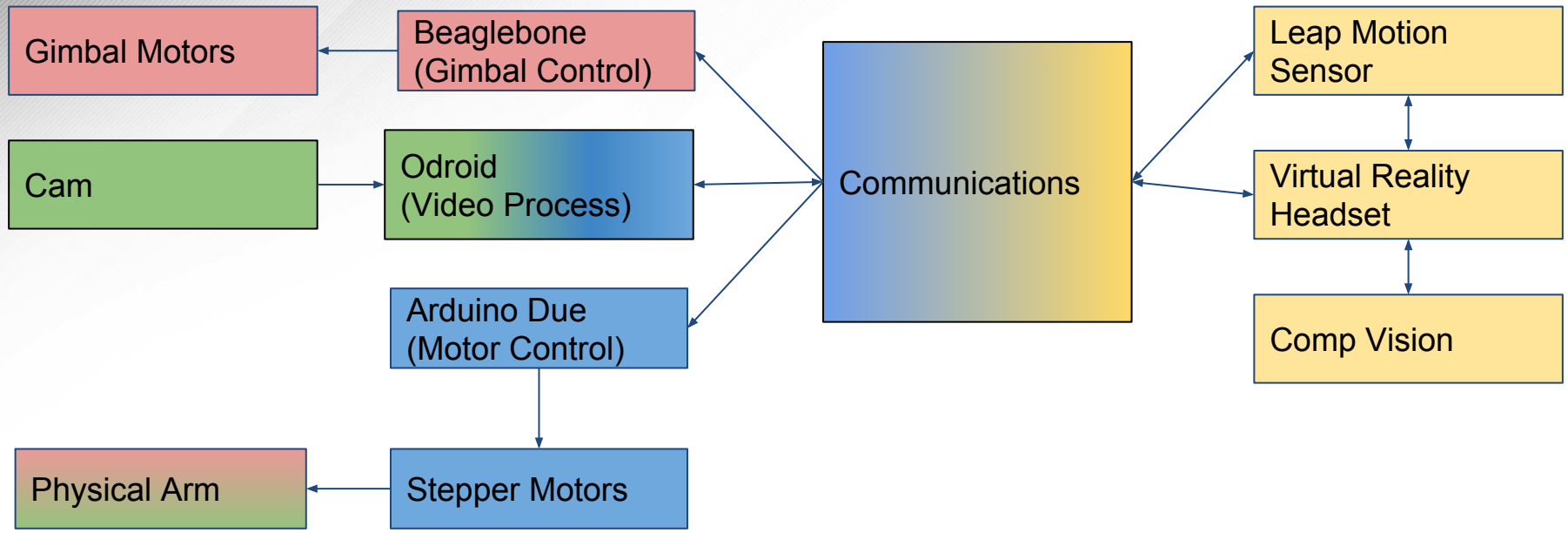
- User wears a Virtual Reality headset with stereoscopic video feed attached to the arm



- User controls the robotic arm using a Leap Motion infrared hand tracking sensor



System Overview



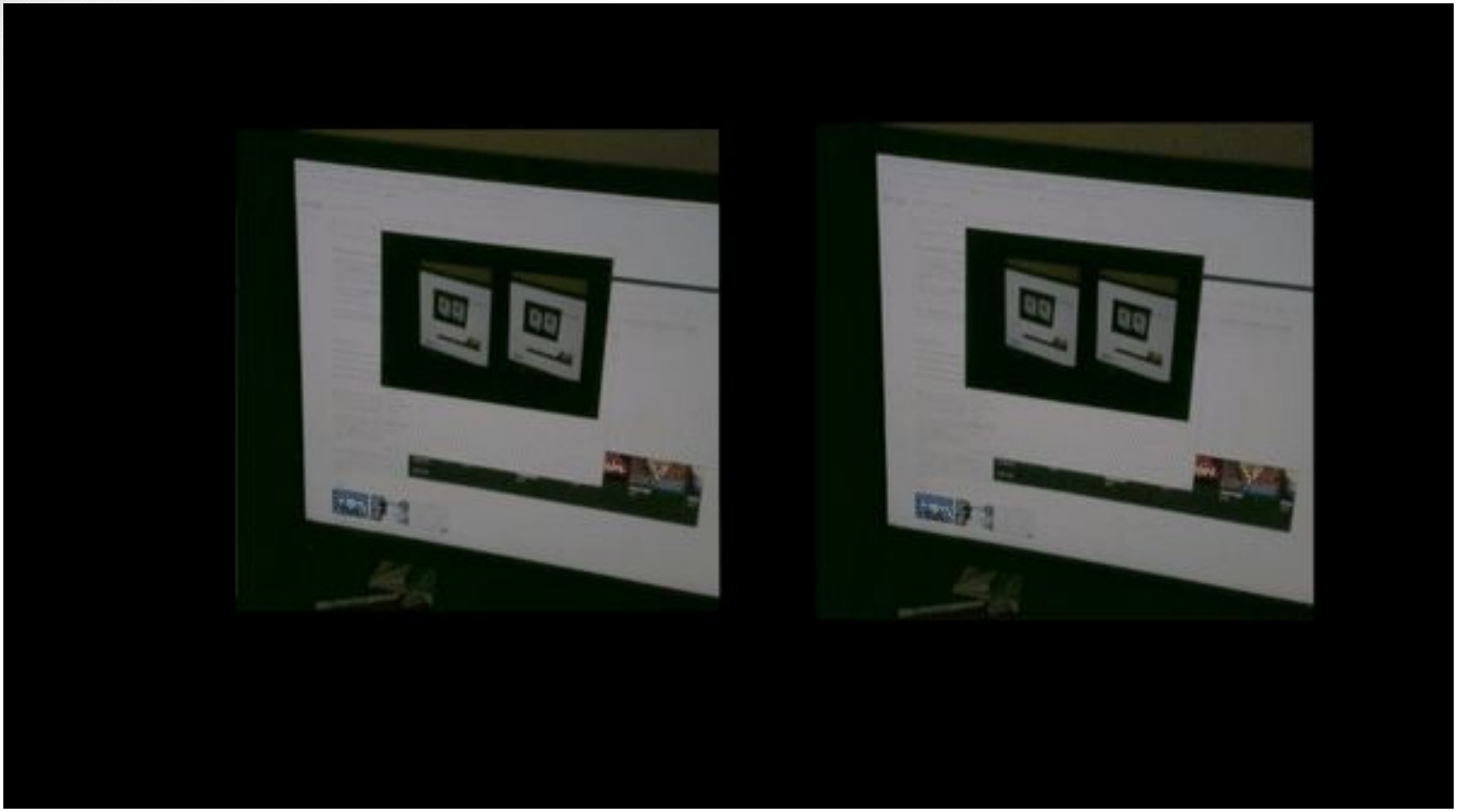
- Klin
- Salvador
- Aaron
- E.J.

Communications and Control Subsystem

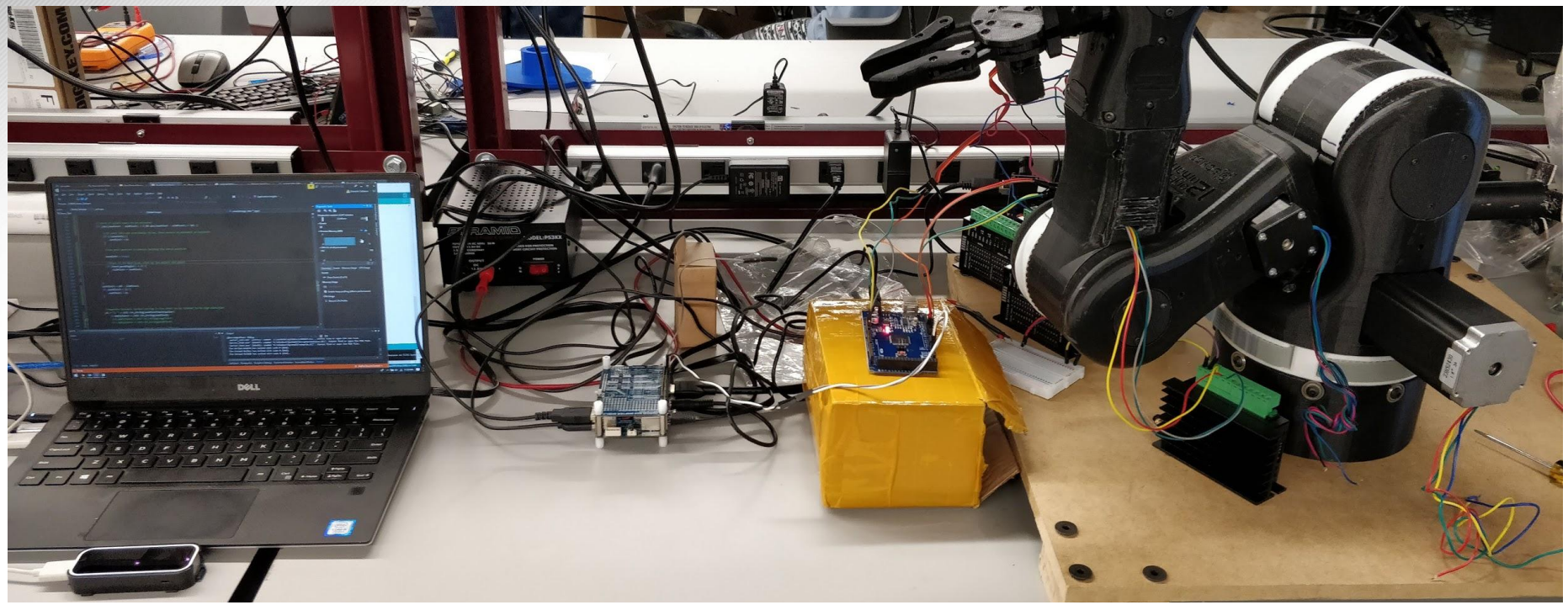
Requirements

- Video passthrough from camera to headset in near real time
- LeapMotion Communication to Arduino MicroController
- Angle Movement of Robot Arm within 15 Degrees of Human Arm

World Interaction While wearing Headset



Communications Testing



LeapMotion and Origin Computer	Odroid MicroController	Arduino Mega MicroController	Robot Arm
Receive Position Info from LeapMotion, Send Info via TCP Server	Receive from TCP Server, Send Info via Serial Communication	Receive from Serial, Send Write Commands to Motors	Receive Arduino Commands, Turn Motors to Position

Communications Testing

Communication Testing

- Camera to HMD (head mounted device) delay of 100-300ms
- Communication Pathway has a delay of ~200 milliseconds from user input to motor movement

Motor Control Testing

Motor Testing

- ~150 hand inputs given in testing session
- Beginning zero position and end zero position were ~13 degrees, which is within 15 degrees of each other

Initial Position

Final Position

Grabber Testing

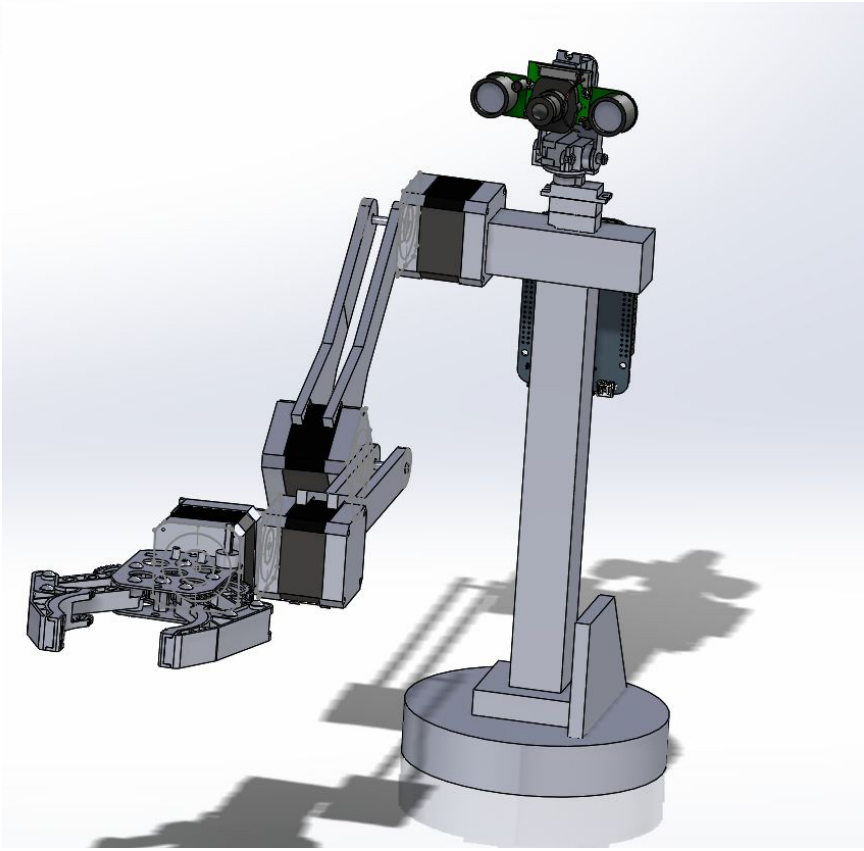
Grabber Testing

- Robot Claw able to hold items and move simultaneously
- Potential blocker with objects that restrict the servo's rotation

Arm/Camera Subsystem

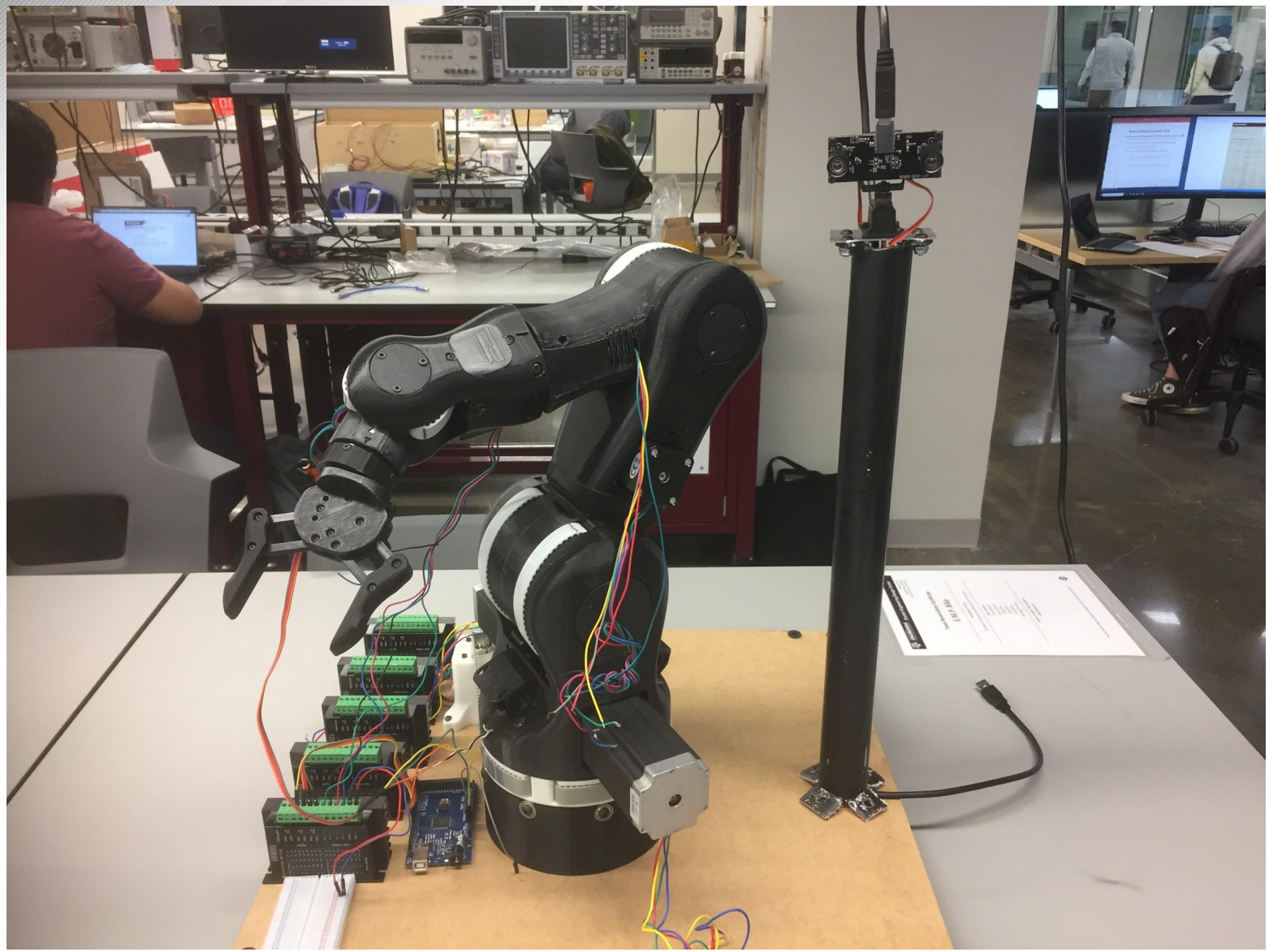
Requirements

- Minimum 4 axis of movement
- Stereoscopic (3D) camera mounted on 3-axis gimbal
- Stepper motors strong enough to move a 250g object



Original arm concept design

Final Arm Design



BCN3D MOVEO open source robot arm + gimbal mount

Dwight Look College of ENGINEERING
TEXAS A&M UNIVERSITY

Camera + Gimbal