**Project: Gesture Controlled Robot Arm**

**Goal**

A gesture-controlled robot arm. The physical arm will be constructed using the AX-12A servos, "Trossen" robot package. Computer vision will be used to track the movement of a human arm, and the arm will mimic the motion in real time.

Stretch goals:

1. Have the robot arm record or “learn” a particular motion and store the corresponding control commands for a given period and then repeat/loop the same motion (like a guitar loop pedal)
2. Introduce additional control mechanism: voice control using AI powered live transcription.

**Impact**

The software can be used in any robot arm to control it intuitively and effectively. This will augment the human ability to move objects from one place to another, thereby improving safety and efficiency in many industrial scenarios and beyond.

**Technical Plan**

1. Arduino along with an external power source will be used to manually control servo motors for initial testing. Python could read and write serial data to the Arduino to control the robot arm using ROS.
   1. Alternatively, a raspberry pi can be used instead of Arduino to directly run ROS in the robot arm.
2. Python, and the OpenCV library will be used to track a human arm and convert motion into control commands for the robot.
3. Whisper AI could be used for transcription.

YouTube link: <https://www.youtube.com/watch?v=TBRi6ecgQfc>

Sample code (GitHub repo): <https://github.com/Crazycurly/gesture_MeArm/tree/main>

*This is a similar project, but the arm is not very stable. More research could be done to how to stabilize. For example: Low pass filters for signals.*

**Milestones/high-level timeline**

Over thanksgiving break:

1. Acquire all required hardware components.
2. Assemble and manually test individual servo motors.

Week 1:

Get familiarized with open CV functions.

Week 2:

Start building basic hand tracking framework in OpenCV.

Week 3:

Start building basic hand tracking framework in OpenCV.

Week 4:

Develop algorithms to map OpenCV output to servo motor commands.

Week 5:

1. Optimize robotic arm stability.
2. Develop ROS nodes/functions to record motion for a given period.

Week 6:

1. Introduce voice command high level control.
2. Resolve any bugs.
3. Create a visual demo of the project.