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Real-Time Human Hand Pose Mimicry Using Computer Vision and Gazebo Simulation

1. Project Goals

The aim of the project is to mimic real time hand movements using a simulated robotic hand. The movement will be captured using a webcam and will control a robotic hand in Gazebo. The "stretch" goal is to have a robotic hand move in real life.

2. Description

The input data is going to be a video stream captured on a webcam, which will be processed using OpenCV. The processed stream will then be analyzed by MediaPipe Hand Landmarker to extract hand's joint positions. The primary goal of the project is to take these positions and have the model convert them to inputs that can be given to "hand" to mimic these positions.

The current model of the hand has 10 servos as an analogue for each knuckle and interphalangeal joint. While the model may change the goal will be to represent it in Gazebo, an application that allows simulations of robots modeled in URDF.

The technical model that will be used is Multilayer Perceptron Model (MLP). The task the AI is being trained to do is regression, it will need to predict how the joint angles map to servo inputs. The current plan is to train the model using PyTorch and to output the results in a format that can be used to manipulate the hand.

4. Project Timeline

Milestone 1: Capture hand movement with OpenCV and display joint positions obtained by MediaPipe Hand Landmarker.
Milestone 2: Simulate the hand in Gazebo using the real time video feed.