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Milestone 1: Mimicking Hand Positions in Real-Time

1. Project Summary:

The aim of the project is to simulate real-time hand movements in Gazebo, with the intention of applying it to a real-life model. The hand motions will be captured by a webcam, and through a series of transformations, control the joints of a URDF representation of the hand. The model will be a Multilayer Perceptron responsible for reading the hands joint positions, analyzed by MediaPipe Hand Landmark, and transforming them into valid inputs for an Inverse Kinematics to control the joints. Specifically, the model's aim will be to map invalid finger positions into positions achievable by the hand model, such as mapping splayed fingers to a high-five position, all while smoothing out the jitter from real-time hand tracking.

2. What Has Been Accomplished:

The pipeline for generating data and training the model has been set up, what remains is creating and labeling examples. I intend to capture the landmark representation of at least 5 hands in 10 poses, each labeled with the intended joint angles for the URDF. Afterwards, I will generate more examples by scaling and slightly modifying each landmark position. The URDF of the hand is mostly complete, what remains is scaling the joints and adjusting the positions to match the 3d printed model.

3. What Has Fallen Behind:

I had intended to have the data generated by now but fell behind as it took longer than planned to create and have the components work together.

4. Any Project Changes:

I had originally thought, I would need to have real-time hand processing set up to create a training set. However, since MediaPipe can create hand positions from images this is no longer required.