Pose Generation Algorithm

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1   Purpose

The goal of this algorithm is to generate a good set of training poses. A "good" set of poses is determined with the following metric. Performing a learning algorithm (gradient descent in this case) on this set of poses should result in convergence of all reasonable initial βs and the converged values should have good predictions for a test set of poses.

2   Explanation

The first step is to generate a set of poses to filter. This is done through random sampling of the entire joint space, specifically the subset of the joint space in which the pose is balanced and safe.

A balanced pose is defined to be a pose in which the x_{COM} is close to zero. The pose's x_{COM} is determined using DART. Poses in which their x_{COM} is lower than some threshold are then considered balanced. The threshold used in our case is 1 mm. The balanced pose of any pose is determined using `nlopt`, an optimization library.

A safe pose is defined to be a pose that has no collision. This includes self-collision as well as collision with a flat ground. Collision is implemented using DART's collision detector with a 3D robot model as input.

After we obtain a distribution of randomly sampled balanced and safe poses

3   Complete Algorithm