Pose Space Prior. We construct individual PCA models for each body part (e.g., shoulders, arms, spines, legs and feet) via CMU mocap database2 . With those part-wise PCA models, we are able to constraint the solution space into the physically meaningful area by minimizing the following objective function:

$$E_{prior}(\Theta) = || P_k^T (P_k(\Theta - \mu)) + \mu - \Theta ||$$

where $\mu$ is the mean vector of the PCA model, and Pk is the first k principle components of the PCA model. Here k is chosen to retain 95% of original variations.