A MULTIVARIATE GAUSSIAN PROCESS FACTOR MODEL FOR HAND SHAPE DURING REACH-TO-GRASP MOVEMENTS

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Abstract: We propose a Multivariate Gaussian Process Factor Model to estimate low dimensional spatio-temporal patterns of finger motion in repeated reach-to-grasp movements. Our model decomposes and reduces the dimensionality of variation of the multivariate functional data. We first account for time variability through multivariate functional registration, and then decompose finger motion into a term that is shared among replications and a term that encodes the variation per replication. We discuss variants of our model, estimation algorithms, and we evaluate its performance in simulations and in data collected from a non-human primate executing a reach-to-grasp task. We show that by taking advantage of the repeated trial structure of the experiments, our model yields an intuitive way to interpret the time and replication variation in our kinematic dataset.

Key words and phrases: Multivariate Gaussian Process, Dynamical Factor Analysis, Registration, Variance Decomposition, Experiment Structure, Reach-To-Grasp