Series expansion for functional sufficient dimension reduction

Functional data are infinite-dimensional statistical objects which pose significant challenges to both theorists and practitioners. Both parametric and nonparametric regressions have received attention in the functional data analysis literature. However, the former imposes stringent constraints while the latter suffers from logarithmic convergence rates. In this article, we consider two popular sufficient dimension reduction methods in the context of functional data analysis, which, if desired, can be combined with low-dimensional nonparametric regression in a later step. In computation, predictor processes and index vectors are approximated in finite dimensional spaces using the series expansion approach. In theory, the basis used can be either fixed or estimated, which include both functional principal components and BB-spline basis. Thus our study is more general than previous ones. Numerical results from simulations and a real data analysis are presented to illustrate the methods.