REVIEW OF SIGNAL RECONSTRUCTION USING KPCA

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ABSTRACT

Principal Component Analysis is a technique used to linearly transform an original set of variables into a set of uncorrelated variables of smaller dimension that represents most of the information. It is also possible to transform variables in a nonlinear fashion. One such method namely Kernel Principal Component Analysis is a nonlinear extension of PCA where the principal components are computed in a high dimensional feature space which is nonlinearly related to the input space. This nonlinear transformation is performed using Kernel functions. The underlying assumption being that since a PCA in a high dimensional feature space can be formulated in terms of dot products, it can also be performed using the Kernel functions. In KPCA, the input data is first transformed to a high dimensional feature space via a nonlinear mapping and linear PCA is performed in this feature space. This paper will focus on analyzing the theory behind the KPCA technique and its merits and demerits. This will also provide a review of the paper "The Signal Reconstruction of Speech by KPCA" by H Yan, X.G. Zhang and Y.D. Li published in the Proceedings of the ICSLP, October, 2000 where KPCA is used for denoising a speech signal.