Off-line signature verification by using proper orthogonal decomposition

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A signature is a legally accepted key to use in document authentication and personal verification. Especially, in the fields such as banking, insurance and document management. Many verification methods have been used to verify a person's identity using signatures. In this study, we present a novel approach for off-line human signature verification using Reduced Order Modeling (ROM) based on Proper Orthogonal Decomposition (POD). This method is a mathematical approach that converts the high dimensional data into a lower dimensional model, which extracts the most important features that represent the more characteristic features of the original data set. Here, we consider 30 different real signatures as our training data set to create the ROM and use a test data set, containing 10 images of different signatures to test the model performances. Main objective of this study is to test the performance of the ROM by reconstructing an input signature and verify the signatures in the test data set as genuine or forgeries. The required basis functions for the ROM are obtained by using the proper orthogonal decomposition. The eigenvalue spectrum is used to obtain the required number of basis functions. The results show that 15 Eigenfunctions are required to create the reduced order model. We showed that the ROM is able to successfully reconstruct the signatures. The quality of the signature is tested by the Structural Similarity Index Measure (SSIM). Future work will focus on identifying the signature as genuine and forgery using the reduced order model.

Keywords: Dimension reduction, Proper orthogonal decomposition, Reduced order model, Signature verification

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