

DETERMINISTIC COMPONENT EXTRACTION USING PCA FOR EVALUATION OF ROWING DATA

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INTRODUCTION: Human movement is intrinsically variable, both within and between individuals (Newell & Corcos, 1993). Kinematic rowing data is no different. It is believed that there is a need to separate the random elements of the rowing stroke from the deterministic components. Principle Component Analysis (PCA) may be used both as a filter to separate these components and as a method of analysis of the entire movement waveform, retaining potentially valuable temporal information (Deluzio et al, 1999). This research aims to analyse the use of PCA in the analysis of rowing kinematic data, utilising the entire waveform.

METHOD: Data was gathered from novice rowers performing a 2000m ergometer performance. The data gathered consisted of three dimensional joint angle data (sampling rate: 200Hz) from five joints throughout the body. Fundamentally from a biomechanical perspective these five joints (ankle, knee, hip, shoulder, elbow) can be seen to represent the quality of the rowing performance. The data was analysed using PCA methods in order to extract the most relevant information from the data set. This method of data reduction identifies a number of PCs representative of the kinematic data obtained from the rowing data set.

RESULTS: Results at present are only available from one of the participants. This data set shows the first three PCs identified to cover a high amount of variance (87%). This is identified from the eigenvalue spectrum. This also indicates that the residual components in this rower's movement patterns to be relatively small. Further assessment is required to assess the location of these components in terms of joint and landmark movement.

DISCUSSION: PCA is used in this study to obtain a reduced set of variables for a condensed description of the processes involved in the rowing stroke. PCA is applied to the rower's data to extract the pertinent information in the high dimensional rowing data by considering only those PCs that explain sufficiently high fractions of the entire data set in terms of its spread or variance. From the data set analysed three PCs can be identified to explain a large percentage of the variability in the rower's data.

CONCLUSION: This study identifies the use of PCA in feature extraction of kinematic rowing data. Whilst this method of data reduction and factor elimination is widespread in the area of gait analysis, it is not so common in rowing data. This is a work in progress to assess this niche and the full results of all the rowers will be available at the July conference.

REFERENCES:

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