

Registration of pedobarographic data sets in frequency domain

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Abstract:

Image registration, the process of optimally aligning homologous structures represented in images, has been used in a wide range of applications from object recognition to medical image diagnosis. It has also been used in the analysis of plantar pressure (pedobarographic) data, because it can support pixel-level analysis and the extraction of unique and relevant information.

In this work, two similar image registration algorithms were developed to estimate the rigid or similarity geometric transformation that best aligns two sets of pedobarographic data using Fourier transform properties. One of the algorithms determines the optimal alignment by maximizing the cross-correlation and the other one by maximizing the phase correlation between the data sets involved. Considering the mean square error (MSE) as a similarity measure, both algorithms revealed high accuracy when compared with explicit MSE minimization. Additionally, they presented high processing speeds, which allows their implementations in near-real-time applications. Finally, these methods were found to be quite robust to moderate levels of noise.

Keywords: Image registration; Fourier transform; FFT; Pedobarography; Plantar pressure data; Biomechanics.