INTRODUCTION
Image registration is the process of transforming an imaging dataset so that the features in it are properly adjusted to the homologous features in a second dataset. Computational methods of image registration are frequently applied to static and dynamic datasets.

EXPERIMENTAL METHODS
One of the registration methods that we have developed starts by matching the features segmented in each dataset. Then, the transformation is computed and applied to one of the datasets.

Besides the feature-based method, we have developed two methods based on the intensity of all pixels (or voxels) in the datasets. One starts by transforming the datasets from the Cartesian space into the Fourier space. Then, the translation, rotation and scaling are found and applied to one of the datasets. To cope with local deformations, a second method changes one of the datasets locally in order to maximize a similarity measure.

A method to register dynamic datasets in space and in time simultaneously was also developed. It starts by building a representative image for each dataset. Then, the representative images are registered in space, and the transformation found is used to initially register the datasets in terms of space combined with a linear temporal transformation to cope with the time. Finally, the registration is improved by iteratively optimizing a similarity measure both in space and time.

RESULTS AND DISCUSSION
Our registration methods have been used in several applications, including in the analysis of plantar pressure datasets, which is especially important in biomechanical studies related to gait and posture; in the diagnosis of Parkinson’s disease based on brain imaging; and in the building of enhanced 3D biomechanical models of organs and tissues, including the bladder, the pelvic floor, the vagina and the ear.

CONCLUSION
The feature-based methods are faster and more robust to large deformations than the intensity-based methods. However, superior registration results can be obtained if a local minimization process is carried out. Also, the feature-based methods can be more morphologically oriented, which is an advantage in cases with datasets acquired using different imaging modalities.

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