

Comparison of motion surrogate signal derived from MR images, respiratory belt and PCA-PET for motion correction in PET/MR

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Respiratory motion is one of the major causes of artefacts in chest imaging. Motion correction is therefore needed in PET/MR chest acquisitions, to restore the image quality and improve lesion detectability. In clinical practice the patient's breathing motion is detected via the use of external devices, whereas Principal Component Analysis (PCA) can produce a signal using only the PET raw data. This allows to avoid the cost of dedicated hardware, the added dose for the staff member in charge of setting it up and the additional time required to do so. The aim of this work is to validate the quality and accuracy of the PCA signal extracted from TOF-PET, via comparison with the internal motion extracted from a fast 2D MR sequence (via edge-detection) and a respiratory belt signal. The methods are applied on 13 cancer patients, acquired on the GE SIGNA PET/MR scanner, choosing the lower lung bed position. The results show that the three signals (PCA-PET, MR-derived and belt) are very highly correlated with each other. This proves that PCA produces an accurate and reliable surrogate respiratory signal, while confirming that the external motion of the chest and the internal motion of the organs are both good measures of the breathing pattern of the patient. The PCA-PET signal could therefore be utilised for respiratory motion extraction in PET/MR, avoiding the use of external devices and without the need for dedicated MR sequences.

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