A FAST CORRELATION TECHNIQUE FOR
MULTIMODALITY IMAGE MATCHING

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Advanced nuclear medicine imaging modalities such as single
photon emission tomography and positron emission tomography
provide valuable functional or physiologic information. As this
information is complementary to anatomic images obtained via Nuclear
Magnetic Resonance, the diagnostic potential of the Nuclear Medicine
images may be augmented by objective, accurate matching of the
different data sets.

Different techniques, such as correlation analysis, edge detection,
or fiducial landmarks have been proposed for image matching. They all
suffer from severe shortcomings with regard to either reliability and
precision or mathematical complexity resulting in unreasonable
calculation times.

We developed a new correlation analysis to compute the three
dimensional translational and rotational shifts of the image planes
necessary to combine or overlay the different images. Current
correlation analysis approaches are limited, as the coupling of the
registration variables requires an iterative, computationally expensive
algorithm. The approach described here improves upon past work by
first decoupling the translational and rotational components, thus
eliminating the iterative part of the algorithm and significantly reducing
the computational expense.

The input images are first transformed into images which are
translation invariant. These translation invariant images are converted
to polar coordinates and the rotation angles calculated. The rotational
corrections are applied to the original images, and then the translation
distances are calculated. Given the matching differences between the
two data sets, the NMR images are transformed so that they are aligned
with the PET images.