

MR-based PET Attenuation Correction - Method and Validation

Topic: Quantitation in Molecular Imaging

Presentation Time: Sunday, 10:36 a.m. - 10:57 a.m.

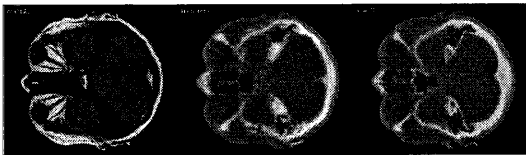
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PET/MR combines the high soft tissue contrast of Magnetic Resonance Imaging (MRI) and the functional information of Positron Emission Tomography (PET). For quantitative PET information, correction of tissue photon attenuation is mandatory. Usually in conventional PET, the attenuation map is obtained from a transmission scan, which uses a rotating source, or from the CT scan in case of combined PET/CT. In the case of a PET/MR scanner, there is insufficient space for the rotating source and ideally one would want to calculate the attenuation map from the MR image instead. Since MR images provide information about proton density of the different tissue types, it is not trivial to use this data for PET attenuation correction. We present a method for predicting the PET attenuation map from a given the MR image, using a combination of atlas-registration and recognition of local patterns.

Using "leave one out cross validation" we show on a database of 16 MR-CT image pairs that our method reliably allows estimating the CT image from the MR image. Subsequently, as in PET/CT, the PET attenuation map can be predicted from the CT image. On an additional dataset of MR/CT/PET triplets we quantitatively validate that our approach allows PET quantification with an error that is smaller than what would be clinically significant.

We demonstrate our approach on T1-weighted human brain scans. However, the presented methods are more general and current research focuses on applying the established methods to human whole body PET/MRI applications.



Left: The patient MR image. Middle: The "Pseudo-CT" as predicted using our method. Right: The real CT image.

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