

MEETING ABSTRACT

Open Access

# Image reconstruction of mMR PET data using the open source software STIR

Pawel Markiewicz<sup>1\*</sup>, Kris Thielemans<sup>2</sup>, Ninon Burgos<sup>1</sup>, Richard Manber<sup>2</sup>, Jieqing Jiao<sup>1</sup>, Anna Barnes<sup>2</sup>, David Atkinson<sup>4</sup>, Simon R Arridge<sup>1</sup>, Brian F Hutton<sup>2</sup>, Sébastien Ourselin<sup>1,3</sup>

From PSMR14: 3rd Conference in PET/MR and SPECT/MR  
Kos Island, Greece. 19-21 May 2014

<sup>1</sup>Centre for Medical Image Computing, University College London, London, UK

Simultaneous PET and MR acquisitions have now become possible with the new hybrid Biograph Molecular MR (mMR) scanner from Siemens. The purpose of this work is to create a platform for mMR 3D and 4D PET image reconstruction which would be freely accessible to the community as well as fully adjustable in order to obtain optimal images for a given research task in PET imaging. The proposed platform is envisaged to prove useful in developing novel and robust image bio-markers which could then be adapted for use on the mMR scanner.

STIR (Software for Tomographic Image Reconstruction [1]), an open source C++ library, has been used as a basis for this platform. However, a number of practical issues have to be addressed before useful reconstructed images can be obtained. Many of the practical issues have been addressed and reconstructions of two datasets (phantom and human brain) are demonstrated.

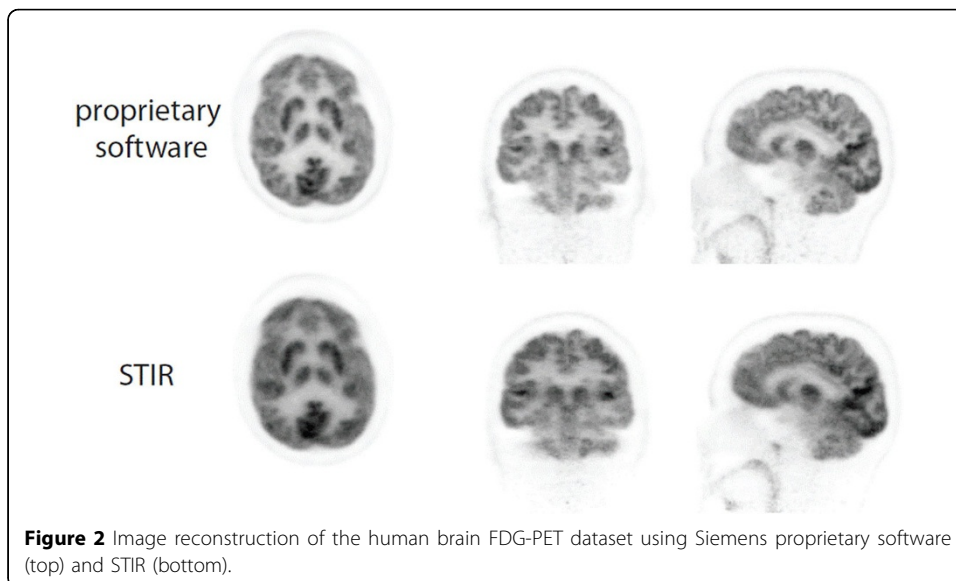
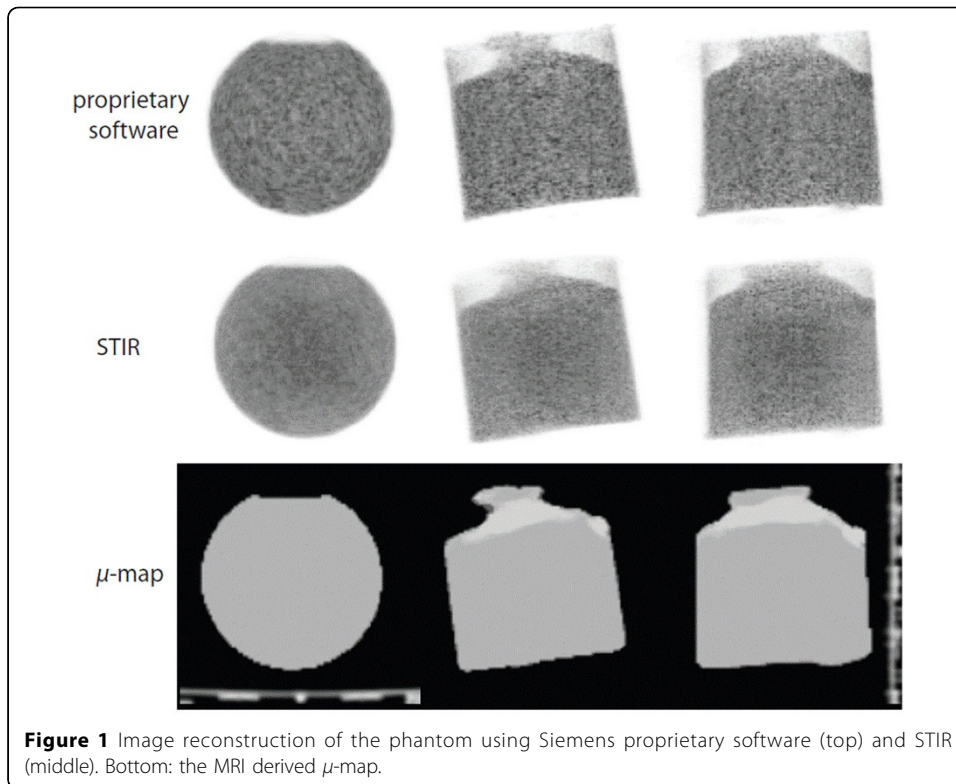
The reconstruction pipeline involves the following:

- Conversion of the Siemens Dicom files to the STIR interfile format.
- Histogramming the emission data.
- Component-based normalisation.
- Estimation and correction for attenuation and scatter using atlas based  $\mu$ -maps [2].
- Correction for randoms.
- Iterative image reconstruction ([3-5]).

Two datasets were used: uniform cylinder phantom and FDG-PET human brain scan. Figure 1 shows the OSEM reconstruction using the of-line version of the Siemens Healthcare reconstruction software which was made available for this project (top); the STIR reconstruction (middle); and the  $\mu$ -map including the bed component (bottom).

The reconstruction of the FDG human brain dataset is presented in Figure 2 using Siemens proprietary software (top) and the proposed STIR pipeline (bottom).

It was demonstrated that STIR image reconstruction of PET mMR data is possible paving the way to more advanced models included in the pipeline of 4D PET reconstruction.



#### Acknowledgements

The Dementia Research Centre is an Alzheimer's Research UK Coordinating Centre and has also received equipment funded by Alzheimer's Research UK and Brain Research Trust. Sébastien Ourselin receives funding from the EPSRC (EP/H046410/1, EP/J020990/1, EP/K005278), the MRC (MR/J01107X/1), the EU- FP7 project VPH-DARE@IT (FP7-ICT-2011-9-601055) and the NIHR Biomedical Research Unit (Dementia) at UCL. This work was also supported by researchers at the National Institute for Health Research University College London Hospitals Biomedical Research Centre (NIHR BRC UCLH/UCL High Impact Initiative).

#### Authors' details

<sup>1</sup>Centre for Medical Image Computing, University College London, London, UK. <sup>2</sup>Institute of Nuclear Medicine, University College London, London, UK. <sup>3</sup>Dementia Research Centre, University College London, London, UK. <sup>4</sup>Centre for Medical Imaging, University College London, London, UK.

Published: 29 July 2014

#### References

1. Thielemans K, et al: **STIR: software for tomographic image reconstruction release 2.** *Phys Med Biol* 2012, **57**(4):867-883.
2. Burgos N, Cardoso M, Modat M, Pedemonte S, Dickson J, Barnes A, Duncan JS, Atkinson D, Arridge SR, Hutton BF, Ourselin S: **Attenuation Correction Synthesis for Hybrid PET-MR Scanners.** *MICCAI* 2013, 147-154.
3. Green P: **Bayesian reconstructions from emission tomography data using a modified em algorithm.** *Medical Imaging, IEEE Transactions* 1990, **9**(1):84-93.
4. Hudson H, Larkin R: **Accelerated image reconstruction using ordered subsets of projection data.** *Medical Imaging, IEEE Transactions* 1994, **13**(4):601-609.
5. Alenius S, Ruotsalainen U: **Bayesian image reconstruction for emission tomography based on median root prior.** *European Journal of Nuclear Medicine* 1997, **24**(3):258-265.

doi:10.1186/2197-7364-1-S1-A44

**Cite this article as:** Markiewicz et al.: Image reconstruction of mMR PET data using the open source software STIR. *EJNMMI Physics* 2014 **1**(Suppl 1):A44.

**Submit your manuscript to a SpringerOpen<sup>®</sup> journal and benefit from:**

- Convenient online submission
- Rigorous peer review
- Immediate publication on acceptance
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

---

Submit your next manuscript at ► [springeropen.com](http://springeropen.com)

---