Breathing motion correction in SPECT

https://www.creatis.insa-lyon.fr/site7/fr/node/46456

Context

Single Photon Emission Computed Tomography (SPECT) is a key tool for imaging the in-vivo distribution of targeted agents in cancer treatment, both for diagnosis or therapeutic purposes (Targeted Radionuclide Therapy). The CREATIS laboratory and the Léon Bérard cancer center are investigating SPECT quantitation, from Monte Carlo simulations to the processing of patient images [2].

One challenge in SPECT is breathing motion which *has a large effect on SPECT activity quantitation* [1]. The goal of this internship is to develop an algorithmic method to correct for breathing motion in SPECT reconstruction and improve SPECT quantitation. The project is a collaboration with Kitware Lyon (France) and it may be extended to a PhD fellowship.

Objective

The purpose of this master internship is to develop respiratory-correlated 4D SPECT reconstruction. The developments will use and enhance the Reconstruction Toolkit (RTK, `http://www.openrtk.org`).

Tasks

- Develop an algorithm to extract the breathing signal from SPECT projections,
- Develop 3D SPECT reconstruction,
- Validate the development on Monte Carlo simulations using Gate (`http://www.opengatecollaboration.org/`),
- Apply the developments to real data acquired on the GE Discovery NM 670 SPECT system available at Nuclear Medicine department (Lumen).

Required skills

- **Education**: master student in medical physics or image processing.
- **Scientific interests**: computer sciences (medical image processing), medical physics, nuclear imaging.
- **Programming skills**: Python, C++ (ITK, RTK).
- **Languages**: Command of English required, French optional.

Practical information

- **Supervision**: Simon Rit and David Sarrut.
- **Location**: Centre Léon Bérard, Lyon, France.
- **Period**: 2018 (duration negotiable).
- Send CV, master marks and a brief statement of interest by email to Simon Rit (simon.rit@creatis.insa-lyon.fr).

References

[1] R. Bastiaannet, M.A. Viergever, and H.W.A.M. de Jong. Impact of respiratory motion and acquisition settings on SPECT liver dosimetry for radioembolization. *Medical Physics*, 2017.

[2] D. Sarrut, J.-N. Badel, A. Halty, G. Garin, D. Perol, P. Cassier, J.-Y. Blay, D. Kryza, and A.-L. Giraudet. 3D absorbed dose distribution estimated by Monte Carlo simulation in radionuclide therapy with a monoclonal antibody targeting synovial sarcoma. *EJNMMI physics*, 4:6, December 2017.