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(G*) Segmentation Interface in Dynamic Nuclear Medicine: Techniques for the Reliable Use of Medical Physics Images (Tru-M.P.I.)

Wednesday 21 June 2023 14:15 (15 minutes)

Purpose: In the context of previous analysis of dynamic nuclear medicine acquisitions, a lack in available software was noticed: commercial systems are too opaque and do not allow a sufficiently flexible use. To tackle this challenge, home-made scripts were devised, which were then packaged for wider use. The goal is two-fold: dissolve difficulties specific to dynamic nuclear medicine using new and old tools and make these available to a greater number of scientists in a simple and convivial way. The software Techniques for the Reliable Use of Medical Physics Images (Tru-M.P.I.) was created with this endeavour in mind.

Content: Using freely available and open-source Python packages, a Graphical User Interface (GUI) was created to allow users of various backgrounds and interests to use the devised tools efficiently.

Within this interface, it is possible to extract a 4-D image from Dicom files and then segment it according to various schemes, with all the relevant parameters selectable by the user. The resulting segmentations can be visualized directly, as well as the extracted Time-Activity Curve (TAC). These segmentations can be deformed, used to compute error bars, or extract the pharmacokinetic parameters.

Various utilities are also included to offer a better user experience, such as the possibility to export the results in various formats.

Included Schemes: Segmentation schemes include, so far, an ICM, a filling algorithm, and a gradient method.

Methods to compute error bars and for deformations include translations, rotations, expansions, and reflections.

Methods to extract the pharmacokinetic parameters are based on nested sampling, via the Dynesty package.

Verification: The tool was tested on various dynamic nuclear medicine acquisitions, namely from phantoms and rats. As testing will progress, further tools and segmentation schemes will be added, following the current needs of the field.

Future Development: The scripts and GUI will be made available to scientists and researchers. Feedbacks, suggestions, and enquiries will be welcome and required in order to improve the current state of the project.

Keyword-1

Nuclear Medicine

Keyword-2

Imaging

Keyword-3

Software Tool

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