Biomedical
Image Quantification

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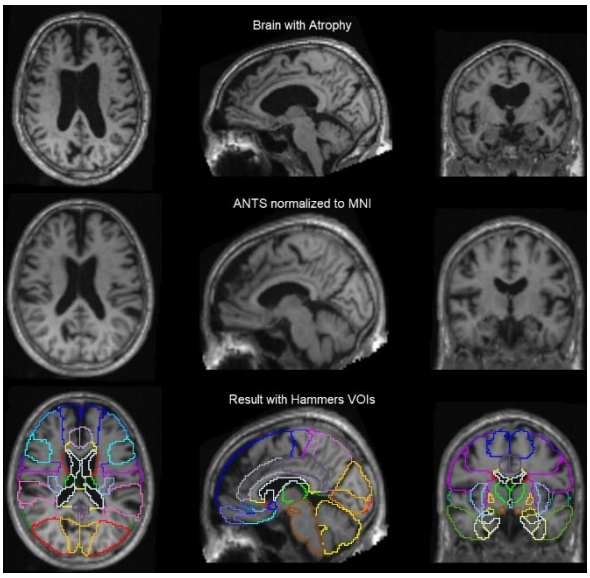
Highlights of PMOD Version 4.3

(available since October 2021)

The new annual version 4.3 has been released on October 28, 2021. All 13 available tools have been further strengthened and streamlined. Here are a few outstanding innovations:

Elastic Matching with ANTS SyN Methodology (PFUS)

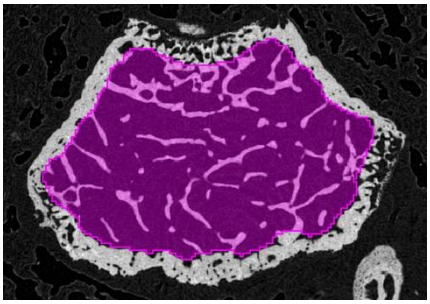


The elastic matching in PMOD has mostly been focused on brain image normalization. In an effort to extend the application domain and aiming at maximum accuracy, the acclaimed SyN methodology of ANTS (Advanced Normalization Tools) is made available to PMOD users. The code has been natively implemented to maintain generic computer system portability.

The example illustrates the result of an ANTS brain normalization. The MRI of a patient suffering from severe atrophy has been elastically matched to a template in the MNI space. The VOIs illustrate the location of the Hammers atlas VOIs on the normalized image.

AI Improvements and Applications (PAI)

The PMOD Artificial Intelligence (PAI) framework introduced with version 4.2 is being further developed in terms of functionality and usability. In addition to image segmentation, image classification tasks are now also supported, opening the PAI application field even wider.

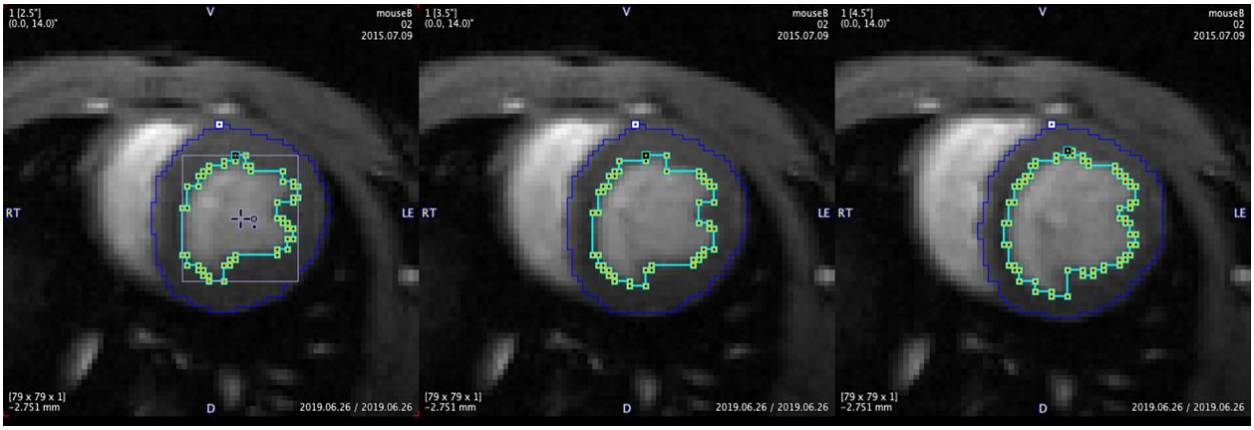


Currently, the real-life performance of PAI-based applications is proven in various pilot projects. The capture to the left illustrates an early result of a PAI-based trabecular bone segmentation from a μCT image of an ex-vivo femur specimen. The segmentation was calculated in PSEG using a UNET-type artificial neural network which had been trained using 300 manually segmented training images.

Once the PAI infrastructure has been set up, it will be easy for PMOD users to establish similar, customized segmentation solutions for their own specific applications.

Relaunched Tool for the Analysis of Cardiac MR (PCARDM)

The PCARDM tool has been available for many years, mainly addressing the quantification of cardiac gadolinium first pass perfusion scans. It is newly launched as the 13th PMOD tool, targeting cine data for the assessment of cardiac function. Trained using PAI technology got human and mouse data, the ventricle is now reliably segmented in the short-axis images so that the beating function can be meaningfully analyzed.



Improvements and Extensions in the 13 existing PMOD Tools

All 13 PMOD tools were subject to a rigorous revision and improvement process. The main highlights are listed below. Please refer to the Release Notes for a comprehensive compilation.

General

– Merge facility for static images extended for ImmunoPET data with long half-lives.
– Ability to show globally scaled MIP images along a time series.
– Images containing 3 or 4 animals can be directly split into separate volumes per subject.
– Machine learning functionality integrated in PVIEW for training and prediction.

VOI Functionality

– Improvements in performance and RAM usage for processing very large image volumes.

PKIN

– Reorganization and improvement of macros for sequentially fitting multiple models.
– Layout adjustments for better organization of fitting history and model filtering.
– Look & Feel is now similar to the other tools.

PNEURO/PNROD

– QC options for batch operation extended by VOIs, TACs and parametric maps.
– PVC related protocol extension to ensure exact reproducibility in the case of modified VOIs.

PFUS

– Major performance improvements when displaying and comparing fused images.
– Elastic ANTS-based matching added including visualization/saving of intermediate states.
– Improvements of protocols: execution is optional, matching parameters are included in protocol, and data unit handling considers the image format types.

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