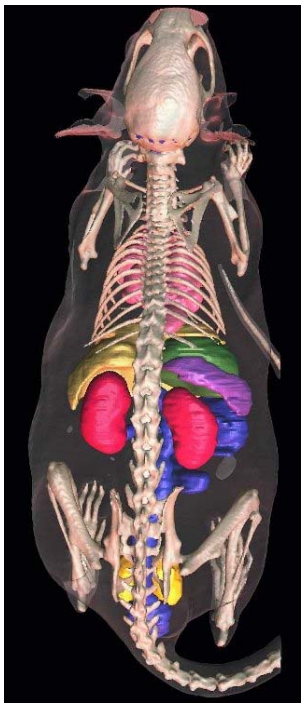
Biomedical Imaging

Small Animal Imaging and 3D Data Analysis

Biomedical Image Processing

ORNL developed tomographic image reconstruction algorithms and model-based 2D organ segmentation software to enable biologists to automatically screen mouse image data to find phenotypes of interest. This 2D image segmentation software was extended to 3D in collaboration with Texas Tech University.



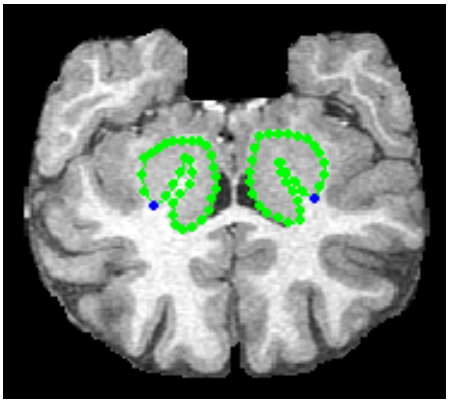
Rendering of segmented mouse micro-CT data set.

The success of this development effort put ESTD in position to compete for and win two follow-on small animal imaging projects funded by DOE and NIH that both employ the existing MicroCAT technology and extend ESTD's medical imaging capabilities to a nuclear modality: single-photon emission computed tomography (SPECT) which allows monitoring of physiologic processes within the animal. A tracking system is under development to continuously determine the position of the animal's head to within 0.1 mm in 3D space. This will allow SPECT imaging to be performed while the animal is awake, because the animal's movements can be corrected by removing motion-induced blurring. The clinical applications that this technology targets are nuclear imaging of small children, Alzheimer's patients, Parkinson's patients, and others who are unable to remain still during a medical imaging scan.

ISMV is applying image segmentation tools to clinical applications. We are working with Columbia University and Texas Tech University to extend our image processing tools to assist doctors in mapping out the various functional regions of the brain in images produced by magnetic resonance imaging (MRI) systems. The brain MRI image data is overlaid with nuclear images generated by a positron emission tomography (PET) system to help the doctors quantify the effectiveness of new drug delivery systems for the brain.

Capabilities & Tools

- X-ray CT and SPECT Imaging Instrumentation
- Advanced Tomographic Reconstruction
- 2D and 3D Model-based Data Segmentation



Segmented brain structure using shape models.

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