



## Model-based Segmentation of Biomedical Images

### Data Analysis in Small Animal and Clinical Medical Image Data

The ISMV group has developed model-based 2D and 3D segmentation software to enable biologists to automatically screen mouse image data to find phenotypes of interest. This work has been accomplished in collaboration with Texas Tech University with funding from ORNL, the National Institutes of Health and the Department of Energy.

These advanced segmentation tools were primarily developed for small animal imaging data analysis such as rapid phenotype screening and anatomic-based quantification of isotope from nuclear images (e.g. single photon emission CT or SPECT). The images on the right show 2D and 3D results from model based segmentation tools applied to small animal micro-CT data sets.

ISMV is also applying these same image segmentation tools to clinical medical image analysis problems. 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. Preliminary results of the 2D and 3D algorithms as applied to human brain MRI images are shown in the bottom figure.

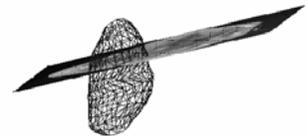
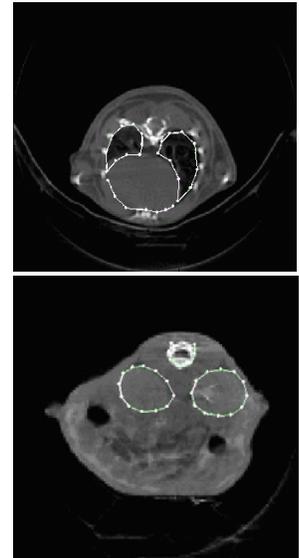
#### Capabilities & Tools

- 2D and 3D Model-based Data Segmentation
- Phenotype Screening
- Computer-Aided Diagnosis

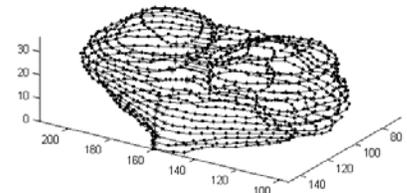
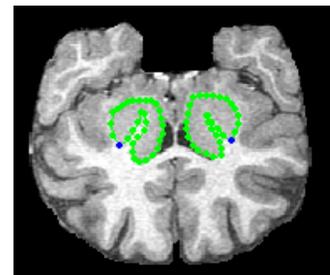
#### Point of Contact:

Shaun S. Gleason, Ph.D.  
Senior R&D Staff, Image Science & Machine Vision  
Engineering Science and Technology Division  
Oak Ridge National Laboratory  
P.O. Box 2008, MS-6010  
Oak Ridge, Tennessee 37831-6010

Office: (865) 574-8259  
E-mail: gleasonss@ornl.gov



2D segmentations of mouse heart/lung (top) and mouse kidneys (middle). 3D segmentation of mouse kidney (bottom).



MRI human brain segmentation: striatum in 2D (top) and cerebellum in 3D (bottom).