

ESTD

Engineering Science &
Technology Division

Animal Tracking for micro-SPECT-CT Imaging

In a program funded by DOE's Office of Biological and Environmental Research, a single-photon emission computed tomography (SPECT) system has been developed which allows monitoring of physiologic processes within small animals. A motion tracking system based on infra-red illumination of retro-reflective markers has been developed to continuously determine the position of the animal's head to within 0.05 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: (1) nuclear imaging of small children, (2) Alzheimer's patients, (3) Parkinson's patients, and (4) and others unable to remain still during a medical imaging scan.

The anatomic structure of the mouse is captured by performing an x-ray CT scan of the animal on ORNL's micro-CT scanner. The anatomic information provided by the CT scan provides a reference map to help determine where in the body SPECT radioisotope is localizing. In the figure on the right, an animal with amyloidosis has been scanned by both the x-ray micro-CT scanner as well as the SPECT scanner. By registering and fusing the two data sets one can more easily determine that the animal's spleen is diseased by abnormal levels of amyloid protein.

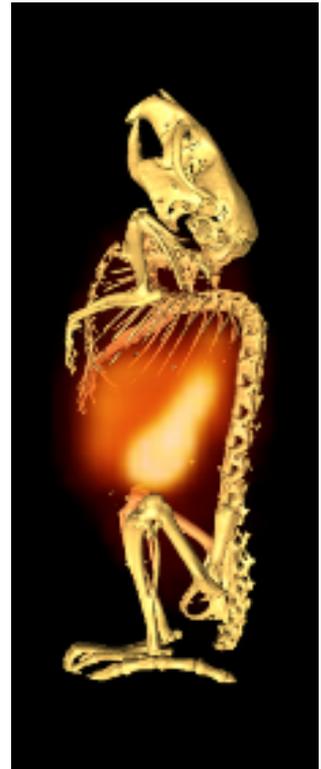
Capabilities & Tools

- X-ray CT and SPECT Imaging Instrumentation
- Motion Tracking Technology
- Pose-corrected Tomographic Image Reconstruction

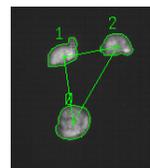
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Rendering of x-ray CT mouse skeleton with fused SPECT data showing amyloid in spleen.



Mouse in SPECT tracking system (top). Segmented reflective markers used for pose measurement (bottom).