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Feasibility of performing whole body micro-CT mouse imaging in less than a minute

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Recent developments in the field of micro-CT imaging have revolutionized the ability to examine in vivo the living experimental animal models such as mouse with acceptable spatial resolution according to the animal size. One of the main requirements of in vivo imaging for biological researchers is a reduced acquisition and reconstruction time for screening purposes. We previously introduced inline acquisition and reconstruction architecture to obtain in real time the 3D attenuation map of the animal [1]. The micro-CT system, component of the AMISSA platform, is based on commercially available X-ray detector and micro-focus X-ray source. The reconstruction architecture is based on a cluster of PCs where a dedicated data communication scheme combining serial and parallel treatments is implemented. One of the key points is to take full advantage of hyperthreading capabilities proposed by recent processors. A dedicated data acquisition system is also developed to obtain high performance transmission rate between the detector and the reconstruction architecture. With the proposed architecture, we demonstrated that is already possible to obtain a real-time reconstructed image of a whole body mouse in 358s. This value corresponds to the time required to acquire 768 projections of 2048x2048 pixels and to backproject them inside a volume of 140 Mega voxels with 100µm spatial resolution. In order to decrease this acquisition/reconstruction time, several parameters have to be optimized such as the binning of the projection and the number of projections. The aim of this abstract is to demonstrate the possibility to reach an acquisition/reconstruction procedure in less than 20s for the entire body of the mouse fulfilling the requirements of in-vivo imaging.

[1] Brasse D et al, Towards an Inline Reconstruction Architecture for micro-CT Systems, Phys. Med. Biol. 50 (2005) 5799-5811.

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