

A 4D reconstruction algorithm for cerebral perfusion CT

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Cerebral perfusion x-ray computed tomography (PCT) is a powerful tool for noninvasive imaging of hemodynamic information throughout the brain. Conventional PCT requires the brain to be imaged multiple times during the perfusion process, and hence radiation dose is a major concern. We propose a PCT reconstruction algorithm that allows for lowering the dose while maintaining a high quality of the perfusion maps. It relies on an accurate estimation of the arterial input function (AIF), which in turn depends on the quality of the attenuation curves in the arterial region. Our method accurately models the attenuation curves inside the vessel and arterial regions and optimizes its shape directly based on the acquired x-ray projection data. The proposed algorithm is validated with simulation and real clinical experiments. Quantitative and qualitative results show that vessel and arterial attenuation curves can be accurately estimated from only few x-ray projections.