

Distributed X-ray Source Development

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Abstract

Distributed x-ray sources have unique capabilities, which can enable break-through medical imaging system performance. In particular, the distributed x-ray source or “multisource” from GE has high instantaneous power, fast source switching, consistent focal spot sizes, large angular coverage, and high reliability [1]. This multisource is scalable from 1 to 2 rows of sources with source spacing in each row at 25mm currently with potential reduction down to 10mm. The multisource is being scaled up from 8 to 32 sources for the Inverse Geometry Computed Tomography (IGCT) application [2,3], which offers up to 70% x-ray dose reduction, cone-beam artifact reduction, and higher temporal resolution compared to conventional CT systems. Another multisource application is digital breast tomosynthesis (DBT). Today’s DBT systems rely on physically moving a conventional x-ray source over an arced path to obtain views at the required angles. A multisource not only eliminates mechanical motion and provides a faster scan, it also allows for multiple x-ray spectrums (W, Rh, Re) at interleaved positions. Lastly, an x-ray multisource enables vascular surgeons to see a real-time 3D view of an interventional tool inside the blood vessels that they are navigating through. The ability to adjust electron beam current for each source (i.e, virtual bow-tie) provides the precise amount of x-ray dose required at each view for a particular patient’s size thus eliminating excess dose in both IGCT and vascular tomography. This paper summarizes the current multisource development work, challenges, and application benefits.

References

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Learning Objectives

- 1) understand x-ray multisource architecture and performance
- 2) understand medical imaging system benefits from x-ray multisource