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MANAGEMENT

TETRAHEDRON BEAM COMPUTED TOMOGRAPHY WITH MULTI-PIXEL X-RAY SOURCE

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Background

About 70 million computed tomography (CT) scans are performed in the United State alone each year. Traditional helical scanners use a single point x-ray source that rotates around the patient, acquiring images in sequential slices, which results in high quality images. But these helical scanners are very expensive and cumbersome, thus are difficult to be used in surgery rooms and radiation treatment vaults. More recently, compact cone beam CT scanners were introduced to be used in image guided radiotherapy and intervention. However, the tradeoffs of using CBCT are poorer image quality due to large amounts of scattered radiation and suboptimal detector performance. There is a strong need in the CT market for a scanner that can acquire high-quality images in a compact geometry.

Technology Description

A novel tetrahedron beam CT (TBCT) invented by Radiation Oncology faculty at the Washington University School of Medicine effectively reduces scattering to improve image quality, and has reduced size and cost, and improved mobility in comparison to a helical scanner. A high-power, cost-effective multi-pixel linear array x-ray source has been developed using thermionic emission cathodes. With this source TBCT is able to produce image quality comparable to that of helical CT. Based on the current prototypes, the TBCT system will cost substantially less than currently available CT scanners and have a much smaller footprint.

Applications

- Medical x-ray imaging: diagnostic and therapeutic
- X-ray security scanners
- Portable CT for remote locations or ambulance

Field

Computed Tomography, X-ray Source

Stage of Development

Patents have been issued for the full-system (TBCT), and are pending for the multi-pixel source. A prototype of the full TBCT system has been tested. The prototype for the multi-pixel x-ray source has successfully addressed issues regarding thermal management and flashover. Next steps are to introduce the full-system prototype for clinical testing.