Region-Specific Dose Reduction in Radiation-Based Imaging

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OTHER INFORMATION

KEYWORDS

Imaging, Diagnostic, X-ray, CT, dose reduction, ionizing radiation

CATEGORIZED AS

- **Imaging**
  - Medical
- **Medical**
  - Imaging

RELATED CASES

2009-350-0

SUMMARY

Investigators at UCLA have developed a novel system to site-specifically reduce ionizing radiation exposure in x-ray based imaging modalities. Use of this method will vastly improve upon the safety profiles of these systems, without adversely affecting their imaging capabilities.

BACKGROUND

X-ray based imaging modalities are a vital and necessary component of medical procedures throughout the world. Without doubt, their use has made a profound impact on human healthcare over the last century, and has resulted in the alleviation of pain and a countless number of lives saved. Similar imaging technologies are currently being introduced into the security sector and can be used for scanning individuals for threatening devices such as security checks in airports. Despite their significant contribution to the fields of medicine and security, the potential risks associated with imaging modalities incorporating ionizing radiation cannot be overlooked. Cancer induction is the primary radiation-related risk from the low energy radiation produced by these imaging modalities. Radiation induced cancer risk depends on the dose absorbed in radiosensitive organs. An enhanced awareness of the risks associated with ionizing radiation and a significant increase in the use of radiation based modalities has emphasized the need for the advancement of dose reduction techniques in x-ray based imaging technologies.

INNOVATION

Researchers at UCLA have developed a novel system to reduce ionizing radiation exposure to radiosensitive tissue in X-ray based imaging modalities which use multiple X-ray projections to obtain an image of human anatomy. This system first localizes radiosensitive tissue through evaluation of a patient's anatomy. This information is then relayed to the controlling unit of the X-ray machine, which is responsible for dispersing the radiation. During a scan, the controlling unit will modulate the amount of radiation emitted, reducing the intensity of the beams that transverse the radiosensitive tissue. In order to maintain image quality, the scanner will compensate for this reduction by increasing the amount of radiation sent through the surrounding tissue. After the incident radiation beams are projected through the person being imaged, the resulting intensities are measured by detectors. A computer will analyze this information, take into account the variation in applied radiation intensity, and apply specific reconstruction techniques to generate an image incorporating on the known beam intensities. The net effect is a safer scan that does not compromise image integrity.

APPLICATIONS

This system has strong application for Computed Tomography (CT), or for any other device that uses multiple radiation emitting sources, or source locations, to image objects with radiosensitive areas (such as C-arm and inverse geometry CT).

ADVANTAGES

- Effectively reduces the amount of radiation exposure to radiosensitive tissue.
- Produces a safer scan that does not compromise image integrity.
- Can be integrated into existing imaging modalities.
- Can be combined with additional dose reducing technologies to improve the safety profile of current x-ray based systems.

STATE OF DEVELOPMENT

This system has been extensively tested and validated in simulation.

PATENT STATUS

Patent Pending

RELATED MATERIALS

- Angel E, Yaghmai N, Jude CM, Demarco JJ, Cagnon CH, Goldin JG, Primak AN, Stevens DM, Cody DD, McCollough CH, McNitt-Gray MF. Phys Med Biol. 2009 Feb 7;54(3):497-512. Epub 2009 Jan 6

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