Contribution ID: **76** Type: **not specified**

Real-time scattered radiation exposure estimation system during X-ray fluoroscopy using PHITS results/PHITS の結果を用いた X 線透視検査時のリアルタイム散乱線被ばく推定システム

Thursday, 16 November 2023 15:00 (2 hours)

The control of occupational exposure in fluoroscopy and interventional radiology is critical due to the risk of radiation exposure. Current dosimetry measurements have limitations, such as incomplete whole-body measurements and lack of real-time measurements. To improve radiation awareness, we have developed a system that displays 2D scattered radiation distribution and estimates the surgeon's radiation dose in real time.
Using the Monte Carlo code PHITS [1], a scattered radiation simulation for X-ray fluoroscopy during the examination was performed. Three-dimensional data of scattered radiation was mapped into the X-ray room using an AR marker. A two-dimensional scattered radiation display was created. A real-time scattered radiation exposure system has been developed to track a surgeon's body using AzureKinect. The system's accuracy in distance and dose was tested, comparing measurements with a laser rangefinder and dosimeters.
The system estimated the dose and accurately visualized the radiation distribution. Distance accuracy improved as the surgeon moved closer to the camera. Distance accuracy decreased as the distance from the camera exceeded the body tracking capability. Dose estimates were 0.6 to 1.2 times higher than actual measurements. Dose accuracy was lower in the chest and pelvis areas, likely due to surface mounting of the dosimeters and body tracking of the system for torso measurements.

References

[1] Sato T, Iwamoto Y, Hashimoto S, et al. Features of Particle and Heavy Ion Transport code System (PHITS). version 3.02. J Nucl Sci Technol; 2018; 55

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Session Classification: Poster presentation