"Accelerated Monte Carlo Code for Fast CT-Based Dose Calculations in Brachytherapy"

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Applications

- Quickly calculate radiotherapy dose distributions
- Incorporation into existing Monte Carlo systems

Advantages

- Dose calculation time averages under 10 min
- Accounts for variations and interferences
  - Variations in tissue density
  - applicator shielding and self-absorption
  - attenuation
  - air-tissue interferences
- Easily integrated into existing Monte Carlo systems
- Highly accurate - less than 2% statistical uncertainty

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Market Need

External Beam Radiotherapy is one of the most widely used treatments for cancer. In order to accurately deliver the radiation beams to the tumor region, clinicians must pre-calculate the desired dose distributions. The Monte Carlo simulation is a dose calculation engine first designed in the 1940's. While initially taking excruciatingly long periods to calculated, it has been continually been updated such that current versions can calculate a dose distribution in approximately 2-3 hours. Yet, this period of time is still too long to be practical for use in real-time clinical planning. Thus, it continues to be a priority of researchers to devise updates to Monte Carlo in order to speed up calculation times for real-time use.

Technology Summary

VCU oncologists have developed an improvement on the existing Monte Carlo technology that has an average dose calculation time of less than 10 minutes with a statistical uncertainty of less than 2%. The technology utilizes CT images of the patient to create a tissue density map. This map is utilized to improve ray-tracing efficiency in order to accurately calculate, and thus fine tune, the dose delivered to the target. Not only fast and accurate, this technology is able to account for complex applicators, such as those used for gynecological cancer, interstitial brachytherapy, and permanently implanted applicators without sacrificing speed or efficiency.

Technology Status

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