Automatic determination of beam configurations for patient-specific radiation therapy planning

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Patent Information

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Patent Title: AUTOMATIC DETERMINATION OF RADIATION BEAM CONFIGURATIONS FOR PATIENT-SPECIFIC RADIATION THERAPY PLANNING
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Value Proposition

Radiation treatment planning involves complex decision making that takes into account all aspects of a patient's conditions and treatment constraints. The treatment design includes parameters such as beam angles, beam ranges, beam energies, beam sizes, dose limits or volume limits, and associated priorities for sparing various organs or anatomy structures. For cases in the thorax, abdomen and upper pelvis, and the brain, the selection of the incident angles of the treatment beams is a critical component of designing planning parameters. Current practice of selection of best beam angles or ranges relies heavily on personal experience, assumptions and estimations, and general knowledge. These solutions can be computationally very expensive and do not handle non-coplanar beam angles.

Technology

These systems and techniques efficiently and automatically determine beam configurations for intensity modulated radiation therapy (IMRT). The design of the beam configuration is based on data-driven knowledge and physics principle-driven mathematic models. It also takes into consideration the patient's specific physiological conditions, physician's dose prescriptions and organ sparing goals, and collectively reaches a beam configuration that best suit the patient's case. The system models an expert's knowledge on beam configuration by learning from databases of existing high-quality plans by expert planners, or by simulating high quality IMRT/VMAT plans using Pareto front plans generated by the multi-objective optimizations or similar systems.

Advantages

- Reduces planning and computational time
- Incorporates both coplanar and non-coplanar beam angles to improve plan quality