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MLC Optimization for VMAT Treatment Planning. SARAH CHAMBERLAIN, State Univ of NY - Fredonia, DARYL NAZARETH, SAMUEL FRENCH, Roswell Park Cancer Institute — In a linear accelerator used for radiation therapy, the Multi Leaf Collimator (MLC) is the final barrier that shapes the x-ray beam before the beam is incident on the patient anatomy. The MLC contains 120 leafs, that are able to slide independently in and out of the field during treatment delivery. In Volumetric-Modulated Arc Therapy (VMAT), a form of x-ray therapy, the gantry rotates almost 360 degrees about the patient, allowing the x-ray beam to be delivered continuously during motion. This complex mode of treatment is planned using sophisticated commercial clinical software which takes the organs at risk (OAR) constraints, the prescription dose, and the anatomical CT image as input, and uses optimization algorithms to determine the configuration of each leaf for an optimal treatment plan. In order to optimize the treatment plan further, we use a Monte Carlo software package, Electron Gamma Shower (EGS) with add-ons BEAMnrc and dosxyznrc, which calculate dose distributions by simulating the individual path of particles through the linear accelerator to a phantom or patient CT image. In order to use the BEAMnrc algorithms, software was developed in the Matlab environment that extracts the patient plan's data from Eclipse and performs dose calculations with BEAMnrc. The Matlab software will use Dose Volume Histograms to evaluate the plan, and then BEAMnrc will modify MLC leaf positions and recalculate dose in order to optimize a clinical objective function. This will result in a method that improves VMAT treatment plan quality.

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