

AbstractID: 7204 Title: A Virtual Frame System for SRS Planning

Purpose:

Stereotactic radiosurgery with the Gamma Knife (GK) (Elekta, Stockholm, Sweden) is oftentimes unnecessarily complicated by sub-optimal placement of the stereotactic frame; in some cases, treatments must be aborted. The GK treatments are frequently prolonged by the time required for Leksell Gamma Plan (LGP) RTP. We are developing a *virtual* frame tool for GK SRS which will 1) provide the neurosurgeon with visual and quantitative guidance for optimal frame placement and 2) facilitate the creation of preliminary treatment plans within LGP using pre-treatment or non-stereotactic MR studies.

Method and Materials:

A Gamma Knife virtual frame (GKVF) placement system exploits the framework of the Pinnacle3 treatment planning system (Philips Radiation Oncology Systems, Fitchburg, WI) which provides the capability to load and subsequently manipulate externally-created triangular surface mesh objects (in VTK format) within its internal (image-referenced) coordinate system; natively-created or manipulated meshes can be exported in these internal coordinates. We have created, e.g. mesh representations of the Leksell frame, including the posts and fiducial indicator box. We have developed interactive Pinnacle scripts and external C++ codes to aid the user in optimizing frame placement.

Results:

Given a set of lesions to be treated, the GKVF software currently provides the ability to 1) interactively place a 3D mesh representation of the Leksell frame on a patient's MR study and test for clinical tenability using a fast collision detection algorithm -- accessible regions for various GK modalities are indicated with computed surface meshes -- and 2) "paint" virtual fiducials onto DICOM MR copies of the patient's original study based on the current virtual frame location, which, together with the GKVF system's ability to generate virtual "skull and frame" measurements, facilitates LGP dose planning on the painted image sets.

Outlook:

Currently under development is a quantitative mechanism to guide the neurosurgeon in actual frame placement.