Planning App User Guide

Overview

The .decimal Astroid Planning App is used for treatment planning of proton radiation therapy treatments. The Astroid Planning App is an interactive end user application that leverages the existing .decimal Dosimetry App functions for device creation, dose calculation, and optimization to facilitate efficient development of proton radiation treatment plans.

Purpose

The purpose of this document is to provide guidance on the setup, access, and usage of the Astroid Planning App.

Getting Started

Proper use of this software is critical to safe and effective treatment of patients using plans generated by this application. Users are expected to read and understand this complete User Guide including the Instructions for Use, which outlines the general usage principles and limitations of the Astroid Planning App. Users must read and understand these instructions before operating the system for clinical use. Refer to each section below for complete details:

- **Instructions for Use**
    - Overview and Indications for Use
    - User Responsibilities
    - Warning
    - Intended Use
    - User Profile
    - Product Features
    - Data Model

Precautions

It is the responsibility of those utilizing this application to ensure all that all usages of this product relating to patient treatments are performed by trained and qualified personnel only and that such personnel is aware that the quality of any generated treatment plans is highly dependent on the quality and correctness of the input data; therefore if any questions or uncertainties exist regarding the quality, units, or identification of input data arise, they must be investigated and resolved before the data are used.

Initial Setup

Once Astroid has been purchased, Astroid staff will assist with beam model creation, software installation, and user training. Users will be generally be trained at two separate levels, system administrators and end users. System administrators will be setup with appropriate access and tools for managing software including both the local and cloud resources. End users will be primarily trained on the details of generating high-quality treatment plans using the local client portion of the application suite. The beam modeling and equipment setup processes are explained more fully in the Dosimetry App Commissioning Guide.

Installation

The Astroid Planning App includes both a local User Client and a cloud-based calculation provider, therefore, there are specific requirements on computers in which the local client application can be installed. Please see the System Requirements page for details.

Site Settings and Defaults

The astroid Planning App provides a RKS record for specifying site level configurations and defaults. The RKS entry exists at the root level of the realm for which the app is installed. The record holds a site_info, whose definition can be viewed at the astroid Manifest Documentation site. An empty

sample json version

of the site_info is provided.

To update the site_info RKS record, perform the following steps. Note: you must have Thinknode *"iam:buckets:unlockEntries"* policy permissions in order to unlock this RKS record to update it.

1. Using the Thinknode Client or manual RKS GET routes view the RKS records for the realm in which you wish to update the site_info
2. Find, or create if it's missing, the RKS record named "site_info" at the root level of the RKS entries
3. Unlock the site_info RKS record using the Thinknode PUT /rks/:id/unlock route
4. Edit the site_info by either:
    1. Editing in place the site_info data using the Thinknode Client or
    2. Post new site_info data as an immutable object and update the Reference ID for the RKS entry
5. Lock the site_info RKS record using the Thinknode PUT /rks/:id/lock route to prevent unrestricted changes.

Site Facility Model

The site_info for the astroid Planning App references the astroid Dosimetry App machine model. This model must be posted and referenced from within the site_info rks record.

Keyboard and Mouse Controls

Astroid utilizes keyboard shortcuts to help streamline many commonly used functions and display controls. A complete listing of these shortcuts along with a full description of the mouse controls is located at the Keyboard and Mouse Controls page.

Tutorials

Task Descriptions

The following task descriptions are thorough guides providing complete information about each task within the Astroid Planning Application.

- Launching the Astroid Planning App
- Uploading a DICOM Patient
- Importing Patient Data
- Courses, Intents, and Directives
- Patient Models
- Creating a Plan
    - Structures
    - Dose Grid
    - PBS Beams
        - Defining an Aperture
    - Fraction Groups
    - Defining Constraints
    - Setting Objectives
    - Astroid Optimization
        - Feasibility & Constraints
        - Running the Optimizer
        - Dose Normalization
        - Navigating the Solutions
    - Using the Plan History
    - Publishing a Plan
- More coming soon …

End-to-End (Plan) Walkthroughs

The following walkthroughs will take you through the process of creating complete treatment plans in the Astroid Planning App. They provide detailed steps so that any user can begin using the software. Each guide covers a specific type of treatment plan, and although some walkthroughs share certain steps, each has been written as a self-contained unit so that you may begin with whatever guide is the most useful.

  - [Prostate Plan Walkthrough](#)

System Usage

Improper System Usage

When using the Astroid Planning App, as with any complex program, there is the potential for misuse. The various Astroid Apps comprise a suite of radiotherapy treatment planning tools that are intended to be used by experienced and knowledgeable professionals working in the field of radiation therapy.

Known Application Limitations

Below are listed the known application limitations, defects, or inconsistencies.

General

1. The Astroid Planning App is pre-510(k) at this time and has not been validated for use in actual patient treatments
2. Astroid uses only IEC 61217 coordinate systems (i.e. machine based coordinate systems are NOT available at this time)
3. If a user's computer is abruptly shut down (e.g. computer crash or power failure) while the Astroid Planning App has a plan open, there is a potential for the user's local data cache index file to become corrupted. If this happens, generally the Planning App will automatically close (crash) whenever the user tries to open the plan that was active at the time of crash. In order to fix this, the user must close the Planning App and delete the entire cache folder. The default directory location for this folder should be C:\Users\(username)\.launcher\(thinknode domain)\cache. If the location has been changed, the new location can be found within the Planning App from the *View–>Settings* menu.

Importing

1. When importing a new patient, the default physician will be set from the DICOM file. When this physician selection is changed, either during import or later in the Patient Overview, there is no way to re-select the original from DICOM physician.

Structures

1. When changing a structure type from a TARGET, whether at the Patient Model or Plan level, if that structure was an existing optimization constraint or objective with maximize options selected, those options will continue to be selected and will unable to be changed in the UI. They can be

viewed in the optimization constraint and objective summaries, but will not be editable unless the structure type is changed back to TARGET.
    1. This can result in you having constraints or objectives that might not be ideal for this type of structure. Always double check the constraint/objective summaries if you need to change a structure type from TARGET after you've added optimization parameters to that structure.
2. Structures that are expanded in the axis of the CT image slices will have the expansion distance limited by the CT image spacing. So the expansion distance may appear to be an incorrect distance.
3. When creating a new target for a PBS beam via the Create subtask from the Geometric Target drop down, you are able to create a non target structure and have it be selected in this drop down. This is only possible when the Create subtask automatically populates the dropdown upon finishing, and you will not be able to select this target manually if you change the selection.

Facility Model

1. When multiple machines are defined in the facility model each room must have a unique name within the entire facility model. The treatment_plan references a treatment_room by it's name and assumes this name will only exist one time in the facility model.\

Machine/Patient Collision

1. Astroid does not detect possible collisions between the patient and snout or the treatment table and snout. It is the users responsibility to ensure that there is enough distance between the patient/table and the snout so as to avoid collisions.

See Thinknode Errors for common problems that can occur during usage of the Planning app.

Should you discover or suspect any additional errors or limitations not noted above, please alert the .decimal Astroid Planning App development team by providing creating a ticket at dotdecimal.freshdesk.com including details of your concerns and steps to reproduce the issue. All concerns will be addressed as quickly as possible and follow up with the submitter will occur throughout the inquiry and correction process.

Results API

The results API is provided to facilitate a controlled and consistent means for accessing necessary treatment plan details and information. The Results API is most frequently used by customers wishing to develop custom treatment plan reports for clinical patients. From the results API treatment plan data can be accessed, including (but not limited to): patient geometries, prescriptions, beam information, spot placements, and plan dose results. It should be pointed out that when users generate custom plan reports they must include an indication of the coordinate system in which any position information is being displayed and users should be reminded that all Results API position data is provided in IEC 61217 coordinate systems at this time. Plan reports must also include a list of any density reassignments that were used in the plan.

Most Planning Results API functions must be called using Thinknode meta requests. Because of this added complexity, an example function call has been added for end user convenience.

Available Functions

For a comprehensive list of available Planning Results API functions, please refer to the Results API Function List.

Example

In the .decimal astroid-script-library there is a script called *planning_results_api_example.py* that provides a basic example in calling and accessing the results API meta functions.

In this particular example the *generate_plan_summary_request* is the API function being called by the generator and meta function as this is a common function to use in extracting data for use in generating treatment plan reports.

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Last update: **2021/07/29 18:22**