

# Radiotherapy Support Functions (RSF)

Radiotherapy Support Functions are, as a basic description, general radiotherapy worker functions. RSF functions are used both various Dose Calculation Functions and Design Task Functions. The RSF function category encompass the remaining functions not classified as a DTF or DCF.

## Image Processing

Below is a list of some common image processing functions and a brief explanation of their intended usage (Specific details of each function, argument parameters, and return values are provided at the [Dosimetry App Manifest Guide](#)).

- **override\_image\_inside\_structure:**
  - Returns a new 3D image where the value of each voxel that is more than cutoff % contained within the structure is set to the provided override value.
- **override\_image\_outside\_structure:**
  - Modifies an image where the value of each voxel that is more than cutoff % contained within the structure is set to the provided override value (values outside the structure are not modified).
- **override\_image\_variant\_outside\_structure:**
  - Returns a new 3D image where the value of each voxel that is more than cutoff % outside the structure is set to the provided override value.
- **image\_histogram:**
  - Creates a histogram using the specified 1D image
- **combine\_images:**
  - Combine multiple images into single image
- **image\_bounding\_box:**
  - Returns the bounding box of a image
- **image\_min\_max:**
  - Get the minimum and maximum values in the given image.
- **image\_list\_min\_max:**
  - Get the overall minimum and maximum values for a vector of images.

## Contour and Structure Modification

Below is a list of some common polygon, polyset, and structure manipulation functions and a brief explanation of their intended usage (Specific details of each function, argument parameters, and return values are provided at the [Dosimetry App Manifest Guide](#)).

- **polygon\_centroid:**
  - Computes the geometric center of a polygon
- **scale\_polygon:**

- Scales a polygon shape in XY (independently) based on a vector2D factor
- **polyset\_expansion:**
  - Expands a polyset uniformly around the edges by the given amount. This function can be used to either expand or contract a polyset.
- **polyset\_combination:**
  - Compute a combination of two or more polysets. This function can operate as a union, intersection, difference, or exclusive or (xor).
- **structure\_combination:**
  - Compute a combination of two or more structures. This function can operate as a union, intersection, difference, or exclusive or (xor).
- **structure\_2d\_expansion:**
  - Compute the 2D expansion of a structure. The 2D expansion of a structure is computed by independently expanding each slice of the structure within its 2D plane. This function can be used to either expand or contract a structure.
- **structure\_3d\_expansion:**
  - When computing the 3D expansion of a structure, the structure's slices are allowed to expand into other slices. This function can be used to either expand or contract a structure.

## Geometric Primitives

Below is a list of some common creation functions for geometric primitives and a brief explanation of their intended usage (Specific details of each function, argument parameters, and return values are provided at the [Dosimetry App Manifest Guide](#)).

- **make\_cube:**
  - Creates a triangle mesh representing a 3D box
- **make\_cylinder:**
  - Creates a triangle mesh representing an axis aligned, right 3D cylinder
- **make\_pyramid:**
  - Creates a triangle mesh representing a rectangular based, right 3D pyramid
- **make\_sphere:**
  - Creates a triangle mesh representing a 3D sphere
- **make\_sliced\_box:**
  - Creates a structure geometry representing a 3D box (using a sliced mesh)
- **make\_sliced\_cylinder:**
  - Creates a structure representing an axis aligned, right 3D cylinder (using a sliced mesh)
- **make\_sliced\_parallelepiped:**
  - Creates a structure representing a generalized 3D parallelepiped (using a sliced mesh)
- **make\_sliced\_pyramid:**
  - Creates a structure representing a rectangular based, right 3D pyramid (using a sliced mesh)
- **make\_sliced\_sphere:**
  - Creates a structure representing a 3D sphere (using a sliced mesh)

# Degrader Manipulation

Below is a list of some common degrader manipulation functions and a brief explanation of their intended usage (Specific details of each function, argument parameters, and return values are provided at the [Dosimetry App Manifest Guide](#)).

- **make\_block:**
  - Create a degrader representing a block. A block has a uniform thickness within its shape and 0 thickness outside. Note that the shape is specified at the downstream edge of the block.
- **make\_shifter:**
  - A block has a uniform thickness within its shape and 0 thickness outside. A range shifter is modelled as extending infinitely in the X and Y directions, so its thickness is uniform across the field.
- **make\_rc:**
  - Create a degrader representing a range compensator. A range compensator is a degrader whose thickness is specified as an image. The image is specified in the plane of the downstream edge of the RC.
- **make\_rc\_nurb:**
  - Create a degrader representing a nurbs range compensator. A nurbs range compensator is a degrader whose thickness is specified as a smooth surface. The surface is specified in the plane of the downstream edge of the RC.
- **truncate\_rc:**
  - Shifts a range compensator surface such that the minimum thickness is set to the specified value.

By changing the input (shape, image, etc) passed into the the degrader make functions, the resulting degrader can be manipulated as desired.

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