

X-ray and DRR Settings

Once the DRR images have been generated for a particular set of bone poses, the DRR images and the X-ray images are processed using the same method, then compared to each other using the selected image metric algorithm. The processing consists of the following steps:

1. perform a Sobel edge detection on the image
2. threshold the edge-detection image
3. multiply the edge-detection image by a weighting factor and add it to the original image
4. threshold the merged image
5. scale the result

The following X-ray and DRR parameters are used during processing:

X-ray

Edge/Intensity Merge

This is the value of the weighting factor in step 3. *Edge Capping (%)*

These two values govern the edge thresholding in step 2. Pixels in the edge image whose values are greater than the edge capping maximum are set to zero. Very bright pixels (sharp edges) are usually inorganic objects like EMG electrodes or metal plates or wires. They can be removed from the edge image by lowering the edge capping maximum from 100. Every pixel in the edge image whose value is above the edge capping minimum is set to the edge capping minimum. This effectively strengthens weaker edges (those below the edge capping minimum) because the entire image is scaled later. *Image Thresholds (%)*

These two values govern the thresholding in step 4. All pixels above the image threshold maximum are set to the maximum, and all pixels below the image threshold minimum are set to 0. Much of the time these thresholds should be left at 100 and 0. However, there are times when it is useful to raise the minimum above zero to mask soft tissue regions, and lower the maximum from 100 to remove artificial edges, such as the end of a CT bone that is within the X-ray image. *Image Scale*

This is the scale factor used in step 5. **DRR**

Edge/Intensity Merge

This is the value of the weighting factor in step 3. *Edge Capping (%)*

These two values govern the edge thresholding in step 2. Pixels in the edge image whose values are greater than the edge capping maximum are set to zero. Very bright pixels (sharp edges) are usually inorganic objects like EMG electrodes or metal plates or wires. They can be removed from the edge image by lowering the edge capping maximum from 100. Every pixel in the edge image whose value is above the edge capping minimum is set to the edge capping minimum. This effectively strengthens weaker edges (those below the edge capping minimum) because the entire image is scaled later. *Image Thresholds (%)*

These two values govern the thresholding in step 4. All pixels above the image threshold

maximum are set to the maximum, and all pixels below the image threshold minimum are set to 0. Much of the time these thresholds should be left at 100 and 0. However, there are times when it is useful to raise the minimum above zero to mask soft tissue regions, and lower the maximum from 100 to remove artificial edges, such as the end of a CT bone that is within the X-ray image. *Image Scale*

This is the scale factor used in step 5.

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