

## Exercise 25 : Image Algebra Formula for Image Manipulation

The Image Algebra module provides an algebraic formula parser, allowing both simple and complex algebraic operations (containing up to 1000 variables and 1000 constants) to be performed on image data. This exercise will demonstrate the use of common algebraic processing and other manipulations with the Image Algebra module.

1. Load the **Cubic\_CT\_Head.avw** data set from the **\$(\BIR\images\TutorialData)** directory.
2. Deselect the Cubic\_CT\_Head data set in the Analyze workspace, and then open the **Image Algebra** module (**Process > Image Algebra**).

### Thresholding Data

3. You may remember from previous exercises (Volume Render 12 and 13), that the Cubic\_CT\_Head data set can be thresholded to 145 to show bone.
4. **[A]** Enter the formula: **Output = (a > 145) \* a**. Press **<Enter>** (figure 1)
5. **[B]** Drag-and-drop the **Cubic\_CT\_Head** data set from the Analyze workspace into the Image Algebra module under variable 'a'.
6. Click the **Output** button **[C]**; in the **Parameters** window returned, set **Name** to **Bone**. Click **Done** to dismiss the window.
7. Click **Go** **[D]** in the main Image Algebra window to begin processing.
8. Once processing is complete, right-click on the **Output** icon and select **Display** to examine the data with all voxels less than 145 removed (figure 2). Close the Display tool once the data has been reviewed.

### Manipulating Data

9. In the Image Algebra module edit the formula: **Output = (a < 145) \* a**. Press **<Enter>**. All voxels greater than 145 will now be removed from the data set.

*note* | The Image Algebra module remembers parameters from previous Image Algebra sessions. If the module detects parameters from a past session, it will prompt the user to remember or forget these settings.

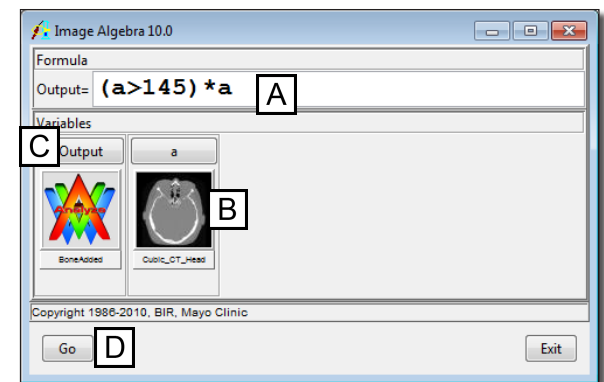


Figure 1

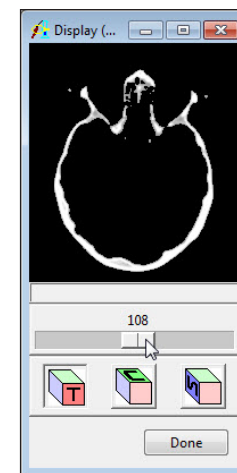


Figure 2

## Exercise 25 : Image Calculator Formula for Image Manipulation

- Click the 'a' button to view the parameters for variable 'a' (figure 3). Click **Done** to dismiss the Parameters window.
- Click the **Output** button and change **Name** to **NoBone**. Click **Done** to dismiss the window.
- Click **Go** in the main Image Algebra window to begin processing.
- Once processing is complete, right-click on the **Output** icon and select **Display** to examine the data with bone removed.
- Now, try adding the bone back in with the new formula: **Output = (b >= 1) \* b + (b < 1) \* a**. Press <Enter> (figure 4).
- Since we have reused the 'a' variable, the Image Algebra module will remember the data associated with it from the previous example. However, this is the first time the 'b' variable has been specified, so drag-and-drop **NoBone** (from Output or the Analyze workspace) to the area under variable 'b'.
- Click the **Output** button and change **Name** to **BoneAdded**. Click **Done** to dismiss the window.
- Click **Go** to process the new formula (figure 4).
- Once processing is complete, right-click on the **Output** icon and select **Display** to examine the data with the bone added back.
- Right-click in the formula field and explore some of the example formulas provided.
- Close the Image Algebra module before proceeding to the next exercise.

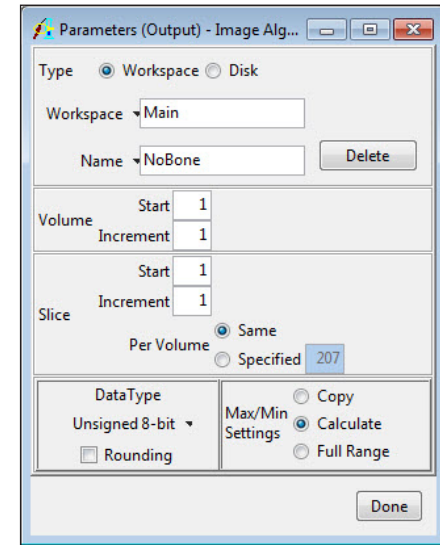


Figure 3

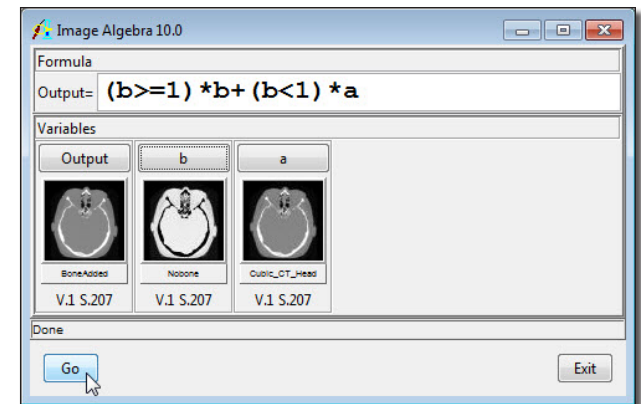


Figure 4