

Filter Designer

The Filter Designer module is a general-purpose 2D image processing tool which performs convolution and deconvolution in the frequency domain using the Fast Fourier Transform (FFT). This exercise will demonstrate how to use the Filter Designer process functions available when a data set and its associated Point Spread Function are loaded.

1. Load the **Chromosome_2D_512** and **Chromosome_2D_PSF** data sets from **C:\BIR\images\TutorialData\ImageProcessingTutorial**.
2. Select **Chromosome_2D_512** and open the **Filter Designer** module (figure 1) from the Process menu.
3. Drag and drop the PSF file from the workspace onto the **PSF input icon**.
4. Double-click on the Input icon to open the **Input Selector** window, and double-click on the **Output** icon to open the **Output Viewer**.
5. The **Convolver** function has automatically been applied to the data. The Fourier transform of the selected section (slice) of the input volume is multiplied by the Fourier transform of the selected section (slice) of the PSF volume. The output is the inverse Fourier transform of the resulting spectrum.
6. Compare the input (figure 2) and output (figure 3) images.
7. Right-click on the Output icon and select '**Store This Section**' option. The output data set will be saved to the Analyze workspace. If desired the Filter and Spectrum generated by the process can also be saved in this manner.
8. Change the function to **Generate > Process > Cross Correlator**.
9. A cross correlation function of the selected section of the input volume with the selected section of the PSF volume will be generated.
10. Compare the input and output images.
11. Review the other functions available from the **Generate > Process** menu. Adjust the associated parameters to see the effect on the filtered image data.

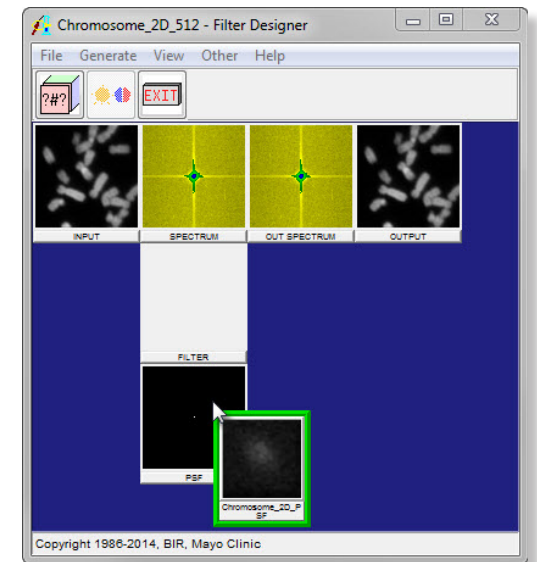


Figure 1

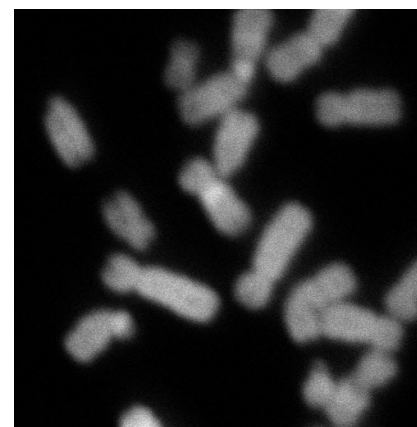


Figure 2: Convolver Input

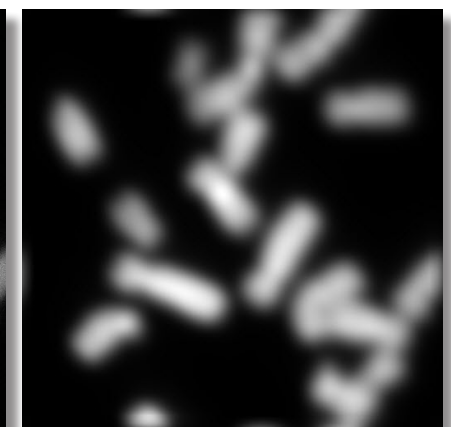


Figure 3: Convolver Output

Filter Designer: *Defining Filters*

Filter Designer is a general-purpose 2D image processing tool, the module allows users to interactively define a representation of a frequency filter. This exercise will show you how to manually define filters to filter your image data.

1. Select **MRI_3D_Head** and open the **Filter Designer** module (**Process > Filter Designer**).
2. Set the **Slice** to **100** (**Generate > Slice**) (figure 1).
3. In the **Filter Designer** window draw a **Low Pass** filter (figure 2).
4. After releasing the mouse the filter will be applied to the current slice.
5. Double click on the **Output** image to view the effect of the low pass filter (figure 3).
6. Now in the Filter Designer window, define a High Pass filter (figure 4).
7. Note the update to the Output image (figure 5).
8. To save the current filtered image right-click on the output image and select **Store This Selection**. Set **Change a Copy of Image Data** when prompted. Slice 100 in the data set will be filtered.
9. To review the filtered data, open it with the Multiplanar Sections module. The filter has been applied to slice 100.

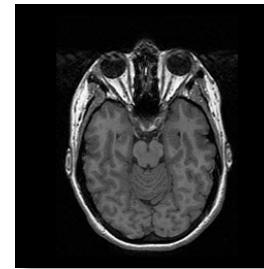


Figure 1

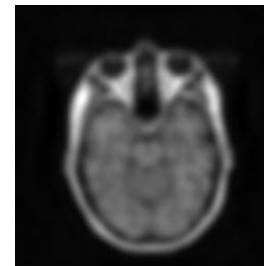


Figure 3

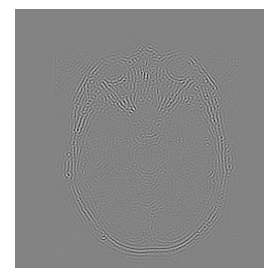


Figure 5

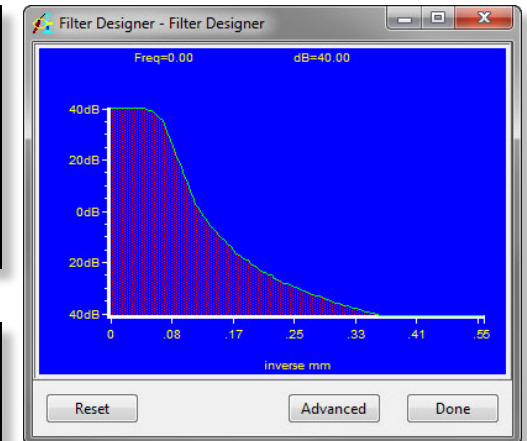


Figure 2

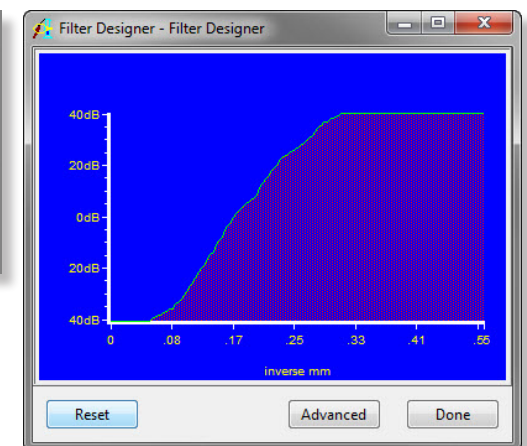


Figure 4