# GETTING STARTED

CREATNG A SIMULATED IMAGE

Click on the program *ComputeEdgeReadings.exe*. Allow your anti-virus software time to go through any checks. Use the File Open icon (which is on the left of the second line of the window) to open file *various18.xls* and you should get the screen shown below.
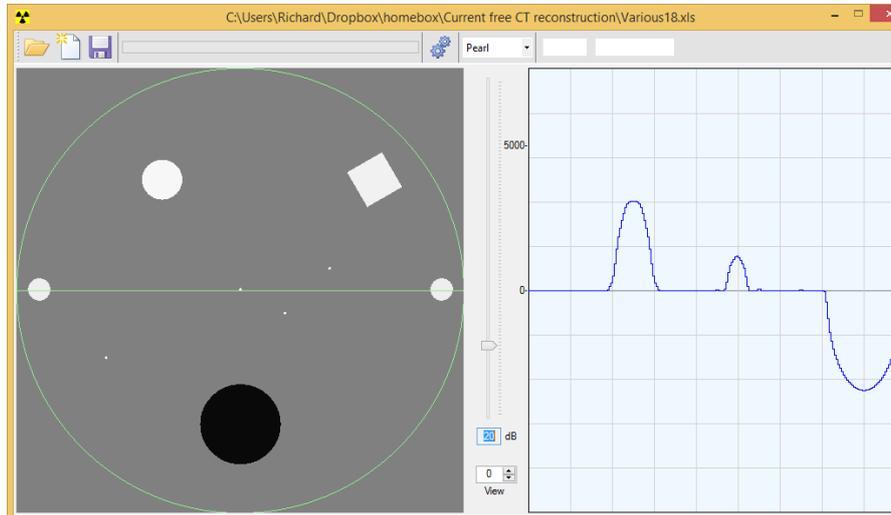
Use the File Save icon (which looks like a floppy disk) to save the results in file *SimEdgeReadings.csv*. It is OK to over-write the existing file.

You can change what is simulated by editing *various18.xls* using Excel or Open Office:

shape	density	x0	y0	s0	s1	theta	x1	y1	x2	y2
circle	600	-0.9	0.00625	0.05						
circle	1000	-0.6	-0.3	0.0065						
circle	1000	-0.35	0.5	0.09						
circle	-1000	0	-0.6	0.18						
circle	1000	0	0.00625	0.0065						
circle	1000	0.2	-0.1	0.0065						
circle	500	0.4	0.1	0.0065						
square	700	0.6	0.5	0.09		30				
circle	600	0.9	0.00625	0.05						

You can easily add extra squares or circles or ellipses, or move them, or change their size or density. Positions and sizes (x0, y0, s0 etc) are measured in fractions of the image radius. If you wish, you can save this with a new name and run *ComputeEdgeReadings.exe* again.

Your new file *SimEdgeReadings.csv* is now ready to be reconstructed as a CT image.

RECONSTRUCTING THE CT IMAGE

Click on the program *RECONSTRUCTfromSIMdata.exe* and you should get this screen:
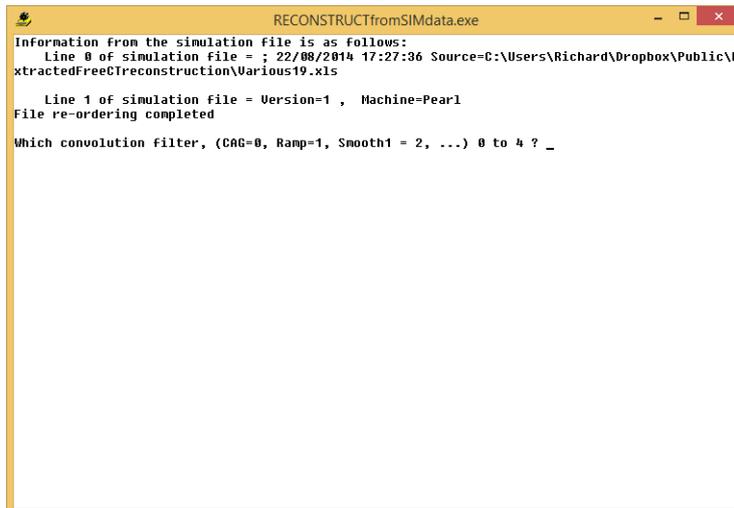
Hit 2 to select the smooth convolution filter. The program should now periodically tell you how far it has got in reconstructing the image. It ends by asking you to hit any key to exit.
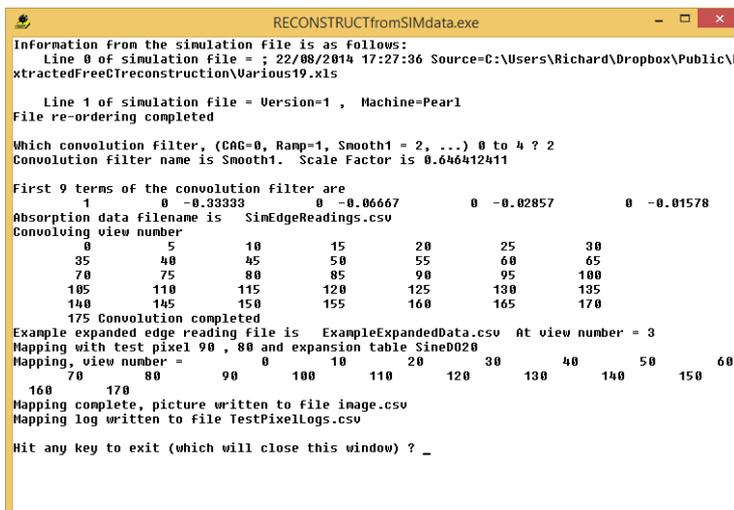

Your reconstructed image is now ready to be viewed.

VIEWING THE CT IMAGE

Click on the program *CT80ViewNET35.exe* and you should get the screen shown below.
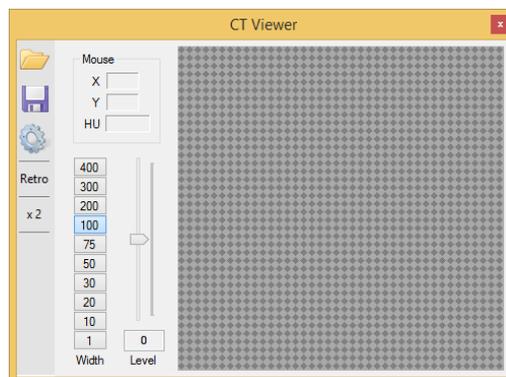
Use the File Open icon (which is near the top left of the window) to open file *image.csv* and you should get the screen shown below.
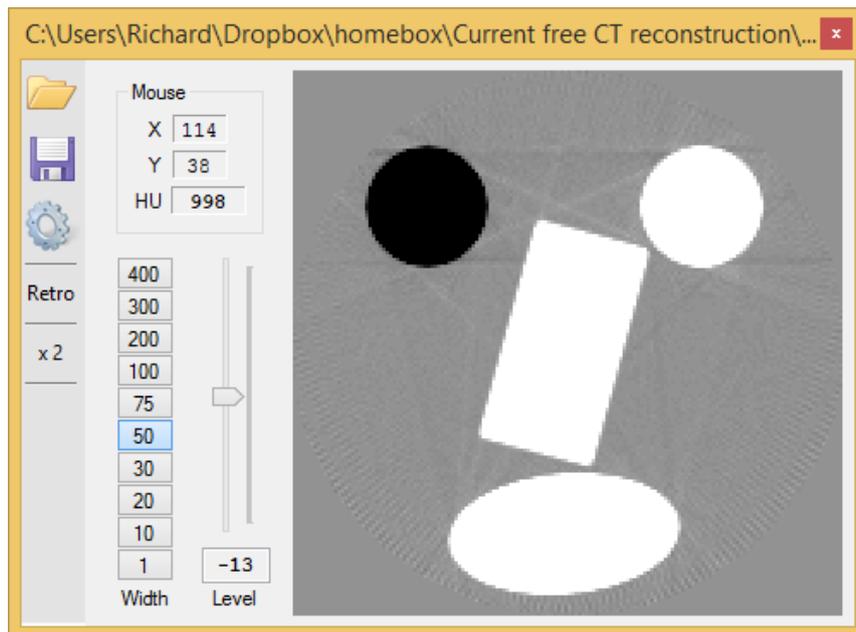
You can adjust the Widow Width and Window Level using the controls at the bottom left.

If you wish, you can save the image using the File Save icon. Otherwise, the next reconstruction will over-write the image.

RINGING THE CHANGES

In the simulator, you can select different "machines" using the box near the centre of the window. This allows you to select:

- Prototype: the 80x80 scanner which took the first ever CT scan of a living patient on 1 October 1971.
- Pearl: the 160x160 'Pearl' upgrade which was the first to use filtered-back projection.
- E320: The 320x320 Emerald body scanner operating with a 320mm field of view.
- Custom: the machine can be adjusted by using the Settings icon (two gear wheels).

In future, the ability to add realistic noise to the data will be added. Some more realistic X-ray data sets may also be included to supplement the simulated data.

The "compute" button on the viewer is above "Retro". It reconstructs an image with the minimum of mouse clicks. When it is given a file, it tries to delete *SimEdgeReadings.csv*, and will give a warning if the file cannot be deleted, for example if it is open in Excel. It then copies the submitted file onto *SimEdgeReadings.csv* and calls the reconstruction program. It works for any filename except *SimEdgeReadings.csv*.

The speed of reconstruction is substantially slower for the 320x320 images than for the smaller images.

The document "Description of the filtered back-projection algorithm" gives more information, and mentions how some of the reconstruction parameters can be changed by editing the file Parameters3.csv. It also describes how it can be interesting to look at intermediate files which are generated during reconstruction.