**[#784](http://trac.sasview.org/ticket/784)** new enhancement

**Add 3D integral to Correlation Function analysis**

*The new correlation function analysis implemented post-4.0 calculates the 1D integral. This is the most useful as it is that which should be used with anisotropic/oriented systems. However, for completeness, and to restore the full functionality offered by the old CCP13 CORFUNC program, we should also compute the 3D integral.*

What needs to happen?

The new correlation function analysis implemented by Lewis is calculating

as the Discrete (Fourier) Cosine Transform of { q2 x [ I(q) – background ] } (see /sasview/src/sas/sascalc/corfunc/transform\_thread.py : line 27), where *Q* is the ‘scattering invariant’

Γ1(*R*) is, formally, the 1D correlation function.

For completeness, the analysis should also compute the 3D correlation function, Γ3(*R*)

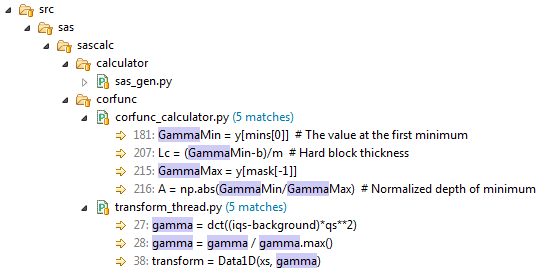
or, equivalently,

Reference

*Calculation of the correlation function.* Section 7.2.4. / Pages 247-251 in *X-ray scattering of synthetic polymers*. Volume 8 of Polymer Science Library. F. J. Baltá-Calleja and C. G. Vonk. Elsevier. 1989.

Implementation steps

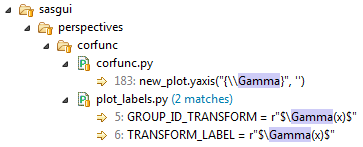
1. The correlation function analysis currently returns Γ1(*R*) in the variable *gamma* in /sasview/src/sas/sascalc/corfunc/corfunc\_calculator.py and /sasview/src/sas/sascalc/corfunc/transform\_thread.py



*gamma* should be changed to *gamma1.*

Q: What happens about GammaMin and GammaMax?

1. *gamma1* should then be sent to plotting in place of *gamma*.
2. The transform plot y-axis, set in /sasview/src/sas/sasgui/perspectives/corfunc/corfunc.py, can remain as just ‘Gamma’ since the same plot will be used to display both Γ1(*R*) and Γ3(*R*), but each transform will need its own TRANSFORM\_LABEL (ie, legend) defined in /sasview/src/sas/sasgui/perspectives/corfunc/plot\_labels.py.



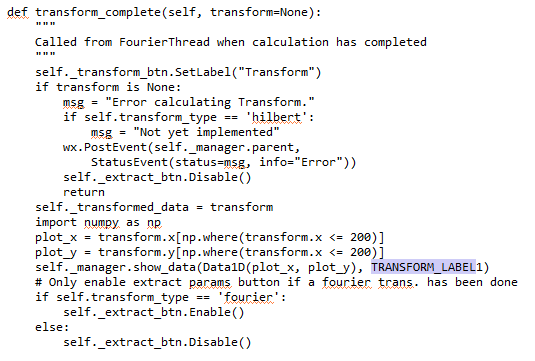
Accordingly, the following have been created:

TRANSFORM\_LABEL1 = r"$\Gamma1(x)$"

TRANSFORM\_LABEL3 = r"$\Gamma3(x)$"

1. *gamma3* should be computed (see above).
2. *gamma3* should be sent to plotting with the legend TRANSFORM\_LABEL3.

Q: Plotting is initiated in transform\_complete in /sasview/src/sas/sasgui/perspectives/corfunc/corfunc\_panel.py but operates on the Data1D object transform (see 1 above). If we also want it to plot *gamma3* how do we do that?



And further down the line we will want to plot the Hilbert transform instead of these two Fourier transforms…

**NB: No interpretation (ie, use of extract\_parameters) is required for *gamma3* (or for the Hilbert transform).**

1. For the Hilbert transform see Ticket #785.