

Estimating reconstruction resolution: Fourier Shell Correlation

Roberto Marabini

1 Theoretical Background

The Fourier Shell Correlation (FSC) estimates the quality (resolution) of a 3D reconstruction. More precisely the FSC measures the normalised cross-correlation coefficient between two volumes over corresponding shells in Fourier space[1]

2 Calculation

$$FSC(r) = \frac{\sum_{r_i \in r} F_1(r_i) \cdot F_2(r_i)^*}{\sqrt{2 \sum_{r_i \in r} |F_1(r_i)|^2 \cdot \sum_{r_i \in r} |F_2(r_i)|^2}}$$

where F_1 is Fourier transform for volume 1, F_2^* is the complex conjugate of the Fourier transform for volume 2, and r_i is the individual voxel element at radius r . In this form, the FSC takes two three-dimensional data sets and converts them into a one-dimensional array.

3 Objective

Using Matlab implemented the FSC

4 Bibliography

[1] Harauz G, van Heel M. Exact filters for general geometry 3-dimensional reconstruction. Optik. 1986;73