The set of stereological morphometric grids macros for ImageJ software

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The unbiased stereological procedures for morphometric quantifications became very popular in microscopy field and their usage is often the requirement in a number of scientific journals. A lot of brilliant theoretical works and similarly amazing practical applications were published during few last decades. The beauty of the majority of these methods lies in the simplicity of their application based on rigid mathematical framework once the major principles were followed in specimen preparation.

There are a number of ways to do stereology, but almost all modern techniques require the use of computer software to generate a grid. Many microscope control and scientific image analyzing programs have stereology modules, which can be used to display some type of stereological grid over live or recorded image from the microscope. The user will then have to count how many of grid points or grid lines intersect particular types of objects of interest. Most of stereological software is just a part of multifunctional software packages and, therefore, could incur very significant expenses that can interfere with the widespread use of computerized stereological tools.

One of the well-known exceptions is ImageJ software [1], which is a public domain Java image processing program that was designed with an open architecture that provides extensibility via plugins and macros. However, the currently implemented “Grid” and “Grid Cycloid Arc” plugins are rather limited in their functionality and applicability.

I have developed a number of macros that covers most of the well-known and widely used grid designs, which include: multipurpose grid with lines and points [2], Merz grid [3] and multi-circles grid that have built-in isotropy, grid with cycloids for vertical sections design [4] and unbiased counting frame grid [5] with the disector [6] volume feature. All of the grids have options for random offset, orientation and various densities and include help instructions. The macros display specific grid parameters (such as points/lines per area etc.) in separate window to facilitate further calculations. In combination with “Cell Counter” plugin these grids can be effectively used to count specimen features with stereological tools. Macro format allows to examine and to change the code without previous knowledge of programming language (such as Java). As an additional convenience, these macros are organized in “Tool sets” that can be added to the ImageJ toolbar as clickable icons.
References