Visualizing Three-Dimensional Maps in Correspondence Analysis

Oleg Nenadić, Daniel Adler and Walter Zucchini
University of Goettingen, Germany
onenadi@uni-goettingen, dadler@gwdg.de and wzucchi@uni-goettingen.de

Abstract
Maps in correspondence analysis are usually displayed in two dimensions. The lack of convenient software mitigates against the use of a full three-dimensional display in cases where a third dimension would substantially improve the quality. We illustrate how the package RGL can be used for creating three-dimensional displays that can be examined interactively.

Although modern computer hardware provides adequate processing power for real-time visualization in three dimensions, most statistical software packages do not support sophisticated graphics in three dimensions. RGL (see Nenadić, Adler & Zucchini (2003); Adler & Nenadić (2003) for a technical overview) is a library for the statistical computing environment ***R*** (Ihaka & Gentleman, 1996) that offers real-time three-dimensional visualization capabilities using OpenGL as the rendering backend. It has been ported to the major platforms Win32 and X11, and is released under the GPL (General Public License, "Copyleft"). The current release can be downloaded from http://134.76.173.220/~dadler/rgl/index.html

RGL has been designed as a general framework for three-dimensional visualization and as such does not offer special purpose functions for particular statistical analyses. It provides basic building blocks (such as points, lines, triangles, planes, surfaces and spheres in three dimensional space) and a number of appearance features (such as lighting properties, transparency effects and texture mapping). A convenient navigational interface for exploring the three-dimensional space using a mouse is supplied. The 21 functions offered by RGL are structured into six categories, with the shape and appearance functions comprising the core. RGL functions are semantically similar to the standard ***R***-commands such as "plot" and "persp" that are familiar to ***R*** users. These functions can be used in a very flexible manner to create complex three-dimensional graphics.

In most applications of correspondence analysis the first two dimensions explain a sufficiently high percentage of the total inertia, but in some cases the inclusion of the third dimension improves quality of the display substantially. In such cases it is usual to examine each two-dimensional projection of the three-dimensional map individually, i.e. 1&2, 1&3 and 2&3. In this presentation we will illustrate the visualization capabilities of RGL in the context of correspondence analysis using some examples of application. We show how RGL can be used for interactive exploration of the three-dimensional maps; e.g. to zoom into particular regions in order to examine details of interest. The familiar projections onto two-dimensional space can be viewed by simply moving the viewpoint using the mouse. We illustrate how appearance features offered by RGL (apart from colour) can be used to enhance correspondence analysis displays by incorporating attributes, such as mass and quality, in the display. This capability is especially useful for visualizing maps from stacked tables.

References

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