PySlice: an experiment written for Professor Frances Wang

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Abstract

PySlice was written in conjunction with Peter Brinkmann to be used as a psychological experiment by Professor Wang. It is the second in a series of three experiments that are aimed at determining if humans have the cognitive capacity to visualize four-dimensional objects in any manner. In the first experiment, four points on a circle were randomly chosen and connected to form a quadrilateral. Two occluders blocked the quadrilateral entirely from view leaving only a small slice visible between them. Subjects were allowed to move the gap and thus learn about the 2D quadrilateral by seeing only 1D slices of it. PySlice is implemented in the Cube - a full emersion 3D virtual environment - allow an extra dimension to be added to Professor Wang's original experiment. In PySlice, four points are randomly chosen on a sphere and are connected forming a tetrahedron. The tetrahedron is not displayed, but rather subjects are able to control a slicing plane that displays the intersection of the plane and the tetrahedron. As the plane is moved, the cross section changes giving information about the shape of the tetrahedron. Subjects will be tested to see if they can identify where the vertices of the tetrahedron were and if they can judge distances between vertices correctly. The third and final experiment will involve displaying 3D slices of a 4D object in order to see if subjects can learn anything about he structure of objects in higher dimensions.

1 Some Techinical Concerns

PySlice can be modified interactively in real-time by adding the flag '-i' when starting the progam. Interactive Startup Command: python slice.py -i

In interactive mode, many of the visualizations can be turned on or off independently. To do this, use the following commands substituting either 0(off) or 1(on) for 'x'.

tetra.viz(x): controls the tetrahedron

sliceviz(x): if off, disables all attributes associated with slicing (namely the square slicing plane and the small vertex spherers) - if on, displays the cross-sectional slice of the tetrahedron and enables the other slicing attributes

sqviz(x): controls the square slicing plane, but will only display it if sliceviz is on

vertsphviz(x): controls the small vertex spheres, but will only display them if sliceviz is on

ptsphviz(x): controls the large point sphere