**Abstract**

# JSXGraph and 3D graphics


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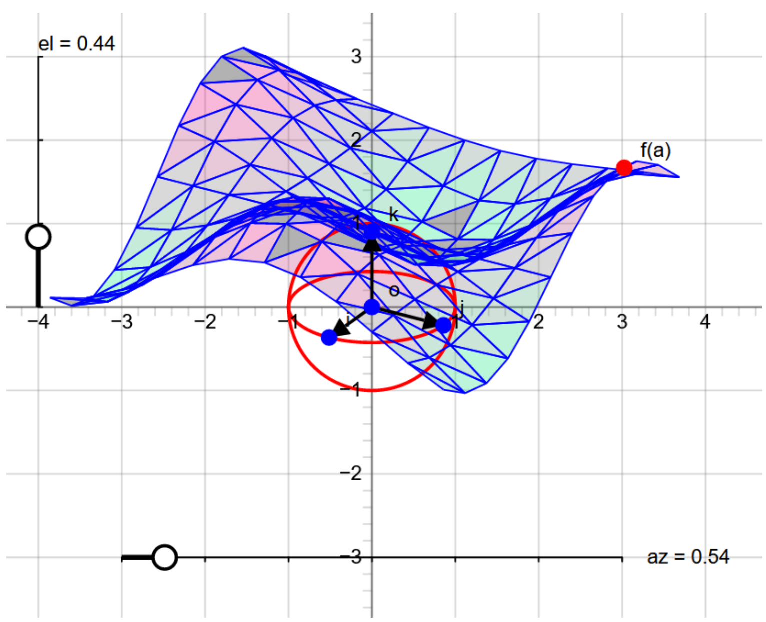
As the talk may be contain many technicalities, the intended audience are university teachers and developers.

In general, how can 3D graphics be added in a down-to-earth fashion? How to do it efficiently? Could JSXGraph some day handle 3D points natively?

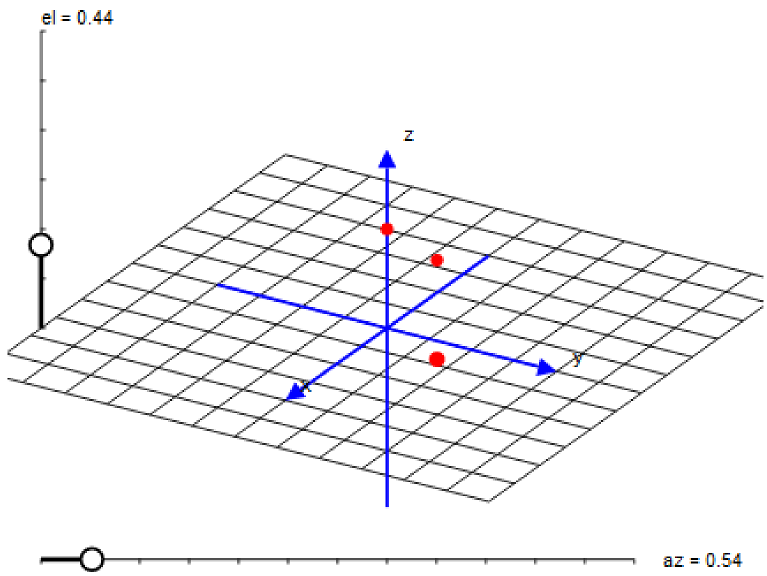
Let us use JSXGraph to visualize 3D objects: points, lines, planes, solids and surfaces. To rotate the object, we add sliders for the Azimuth (az) and Elevation (el).




First, let us consider the surface $z = f(x, y)$.

The user can give a formula of $f(x, y)$. We can then calculate $z_{jk} = f(x_j, y_k)$ for each rectangular lattice point $(x_j, y_k)$ in $[-L, L]^2$.

The points $p_{jk} = (x_j, y_k, z_{jk})$ can be projected to a plane and visualized in the computer. The triangles $p_{jk}, p_{j(k\pm1)}, p_{j(k\pm1)}$ can be drawn to produce a surface. For rotations of the surface, the example code uses rotation matrices.




Second, let us consider the geometric objects.

JSXGraph supports generic projective mappings which allow us to slant the $xy$ plane. When we add the $z$ axis, we obtain a visualization of $\mathbb{R}^3$.

A rectangular grid in the $xy$ plane becomes a slant grid. A magnetized point $p_{xy} = (x, y, 0)$ snaps to the slant grid and moves as the Azimuth is adjusted. A magnetized point $p_z = (0, 0, z)$ can be moved on the $z$ axis. The 3D point $p = p_{xy} + p_z$ can be adjusted easily with the mouse.

To handle the code by pressing buttons, a JSXGraph editor was coded in PHP.