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Centralaxonometric mapping in computer-graphics

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Abstract

The degenerated projective or central-axonometric mapping of the space to the plane can be given by the images of the origin, the unit-points and the infinite points of the axes of the Cartesian coordinate system $O(E_x, E_y, E_z)$. We will denote these points by the symbol $O^*(E_x^*, E_y^*, E_z^*, V_x^*, V_y^*, V_z^*)$.

In 1910 E. Kruppa proved that the projective mapping of a figure is projective to the central-projection of the figure. [KRU10] This affirmation can be refined, that is, it can be proved that the projective mapping of a figure is affine to the central-projection of this figure, if the direction points V_x^*, V_y^*, V_z^* are not collinear. It is a well known fact that this predicate is not any more refinable, that is, the projective mapping of a figure is not equivalent to the central-projection of the figure. First Kruppa [KRU23] gave a synthetic condition for when a central-axonometric mapping is a central projection. For the same afffirmation J. Szabó gave several criteria which are easy to put into practice. [SZA92],[SZA93],[SZA95].

In [SZA90] J. Szabó gave an analitic method to calculate the user-coordinates of a point $P(x, y, z)$ of the space, if the system

$$O^*(E_x^*, E_y^*, E_z^*, V_x^*, V_y^*, V_z^*)$$

is given. In this paper I will give an analytic method too, which is different from [SZA90], and maybe more applicable in computer graphics. Using homogeneous coordinates, I calculate a matrix from the given

$$O^*(E_x^*, E_y^*, E_z^*, V_x^*, V_y^*, V_z^*)$$

configuration, which maps a point of the world-system to the plane.

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