Perspective with Six Vanishing Points

Daniel Lőrincz, Brigitta Szilágyi, Ágnes Urbin
Department of Geometry
Budapest University of Technology and Economics
1111 Egry József street 1.
Budapest, Hungary
E-mail: szilagyi@math.bme.hu

Abstract

The purpose of this paper is to give a short introduction to our description of Perspective with Six Vanishing Points. Our description is essentially different from the already existing solutions for the question of representing the entire space around us. Considering the adequate periodicity of the trigonometric functions the mathematical formulas defined by us can give an exact mapping process which can be useful on several fields of sciences.

Historical premises

Representation, visualization, the problems of visual communication all belong to the basic questions of visual arts as well as of architecture and design. However the traditional (linear) perspective systems with one, two and three vanishing points correspond with our photographic way of seeing, they cover quite narrow part of the space effectively perceived by us. In view of the peripheral distortion of the linear perspective systems practically only one single point can be represented accurately. Installing new vanishing points helps to wide the field of view and avoid distortion. With three vanishing points an eighth part of space can be represented and each following vanishing point will duplicate the extent of the view. With the sixth vanishing point the whole space around the spectator can be shown on a single picture. [1],[2],[4]

Figure 1: *Picture on the plan and on the sphere,* Csaba Szegedi [5]

As long as we represent a part of the space, the traditional method as we look at the selected view outwardly is on good order. Since the Perspective with Six Vanishing Points includes the whole space, we have to change approach and observe the process from 'the middle of world' inside. [3],[6]

The sixth vanishing point

In our method we use both vanishing points of all three axes of a Cartesian coordinate system while we observe from the origin of the coordinate system and our direction of view is parallel to an axis. Consider

the sixth vanishing point as the point exactly behind us. Our description gives a solution for space representation which is fundamentally different from the already existing ones. Our method makes us able to represent the whole space without changing the view direction. With the exact mathematical formulas we defined any points of which we know the x, y and z coordinates can be represented as from the coordinates we can calculate α and β angles with trigonometric formulas. Considering the adequate periodicity of the trigonometric functions our formulas give a well defined mapping process. [7]
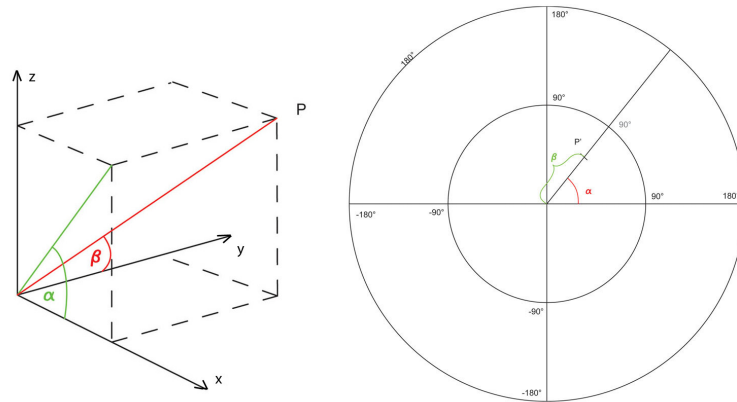

Figure 2: *Image of point **P** with Cartesian coordinates and in perspective with six vanishing points*

Perspective with six vanishing points is a spherical perspective so the image of only some special kind of lines will be line, arbitrary lines will be shown as curves or only two points. Since the image covers all directions around, the image is squarely defined by the point of the spectator. Changing the direction of view can be understood as a simple rotation at the image.

There can be several ways to set a system of vanishing points. Our method gives a practical and simple description. With trigonometric formulas and easily usable transformations one digitalized image of a place is enough to contemplate the whole perceivable space.

References

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