Cavalier perspective

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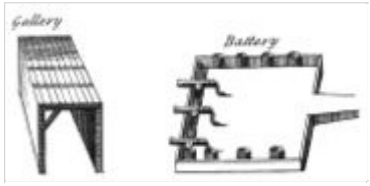
The **cavalier perspective**, also called **cavalier projection** or **high view point**, is a way to represent a three dimensional object on a flat drawing, and more specifically, a type of oblique projection.



Pieces of fortification in cavalier perspective (*Cyclopaedia* vol. 1, 1728)

A point of the object is represented by three coordinates, x, y and z. On the drawing, it is represented by only two coordinates, x'' and y''. On the flat drawing, two axes, x and z on the figure, are perpendicular and the length on these axes are drawn with a 1:1 scale; it is thus similar to the dimetric projections, although it is not an orthographic projection, as the third axis, here y, is drawn in diagonal, making an arbitrary angle with the x'' axis, usually 30 or 45°. The length of the third axis is not scaled[1][2].

This perspective does not try to give an illusion of what can be seen, but just tries to give an information about the depth.

It is very easy to draw, especially with pen and paper. It is thus often used when a figure must be drawn by hand, e.g. on a black board (lesson, oral examination).

The representation was initially used for military fortifications. In French, the « cavalier » (literally *rider, horseman*, see *Cavalry*) is an artificial hill behind the walls that allows to see the enemy above the walls [3]. The cavalier perspective was the way the things were seen from this high point. Some also explain the name by the fact that it was the way a rider could see a small object on the ground from his horseback [4].

Views

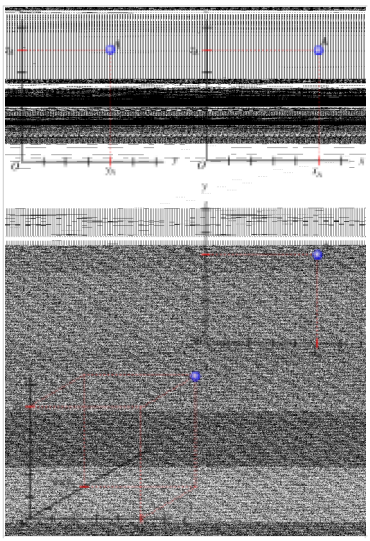
Graphical projections

- Perspective projection
- Parallel projection
  - Orthographic projection
    - Plan, or floor plan view
    - Section
    - Elevation
    - Axonometric projection
      - Isometric projection
      - Dimetric projection
      - Trimetric projection
  - Oblique projection
    - **Cavalier perspective**
    - Cabinet projection
- Anamorphic projection
- Auxiliary view

Other views

- Bird's-eye view/Aerial view
- Worm's-eye view
- Top-down perspective
- Map projection

Mathematical aspects



How the coordinates are used to place a point on a cavalier perspective

If the plane that faces the reader is *xz* and the "vanishing direction" is the *y* axis and its angle is •, then a point in the space with coordinates (*x*, *y*, *z*) is represented on the flat figure by a (*x″*, *y″*) point, with:

- $x'' = x + \cos \bullet\bullet y$;
- $y'' = z + \sin \bullet\bullet y$.

The transformation matrix is

$$P = \begin{pmatrix} 1 & \cos\alpha & 0 \\ 0 & \sin\alpha & 1 \end{pmatrix}$$

For example, for an angle 30° and a ratio 0.7:

- $x'' = x + 0.35 \bullet y$;
- $y'' = z + 0.61 \bullet y$;

and for an angle 45° and a ratio 0.5:

- $x'' = x + 0{,}35 \bullet y$;
- $y'' = z + 0{,}35 \bullet y$;

References

1. ^ Illustrator Draftsman 3 & 2 - Volume 2 Standard Practices and Theory, page 67 (http://www.tpub.com/content/draftsman/14276/css/14276_307.htm) from http://www.tpub.com
2. ^ Ingrid Carlbom, Joseph Paciorek, Planar Geometric Projections and Viewing Transformations, ACM Computing Surveys (CSUR), v.10 n.4, p.465-502, Dec. 1978
3. ^ Etymologie des maths, letter C (http://trucsmaths.free.fr/etymologie.htm#C) (French)
4. ^ DES QUESTIONS D'ORIGINES (http://mapage.noos.fr/r.ferreol/langage/notations/notations.htm) (French)

Further reading

- Foley, James (1997). *Computer Graphics*. Boston: Addison-Wesley. ISBN 0201848406.

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Categories: Descriptive geometry | Technical drawing | Perspective projection

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