Planar anamorphosis;
case study: fresco of St. Francis of Paola

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Definition of anamorphosis

In painting, anamorphosis (Gr. ana - back, morphe - form) means deformed representation of images at the surface, which from certain point of view turns out to be regular and made according to proper proportions. It is an extreme consequence of linear perspective, which involves the deformation of the image by placing the vanishing point of the pyramid of vision away from the main point and the observation point, and close to the plane of the work.

Construction of anamorphosis with deformation grids

In the R^3 space we have a plane α (called wall) and a vertical plane β, perpendicular to α. Let us assume that we are given an eye point O, and also a squares grid in a plane β. This grid will by projected from O upon a wall α. At the beginning we consider the images of the horizontal lines of the grid (Fig.1). The orthogonal projection of O upon the wall gives us the point O' which is the vanishing point of this set of parallel lines. Thus the images of the horizontal lines are lines radiating out from O'.
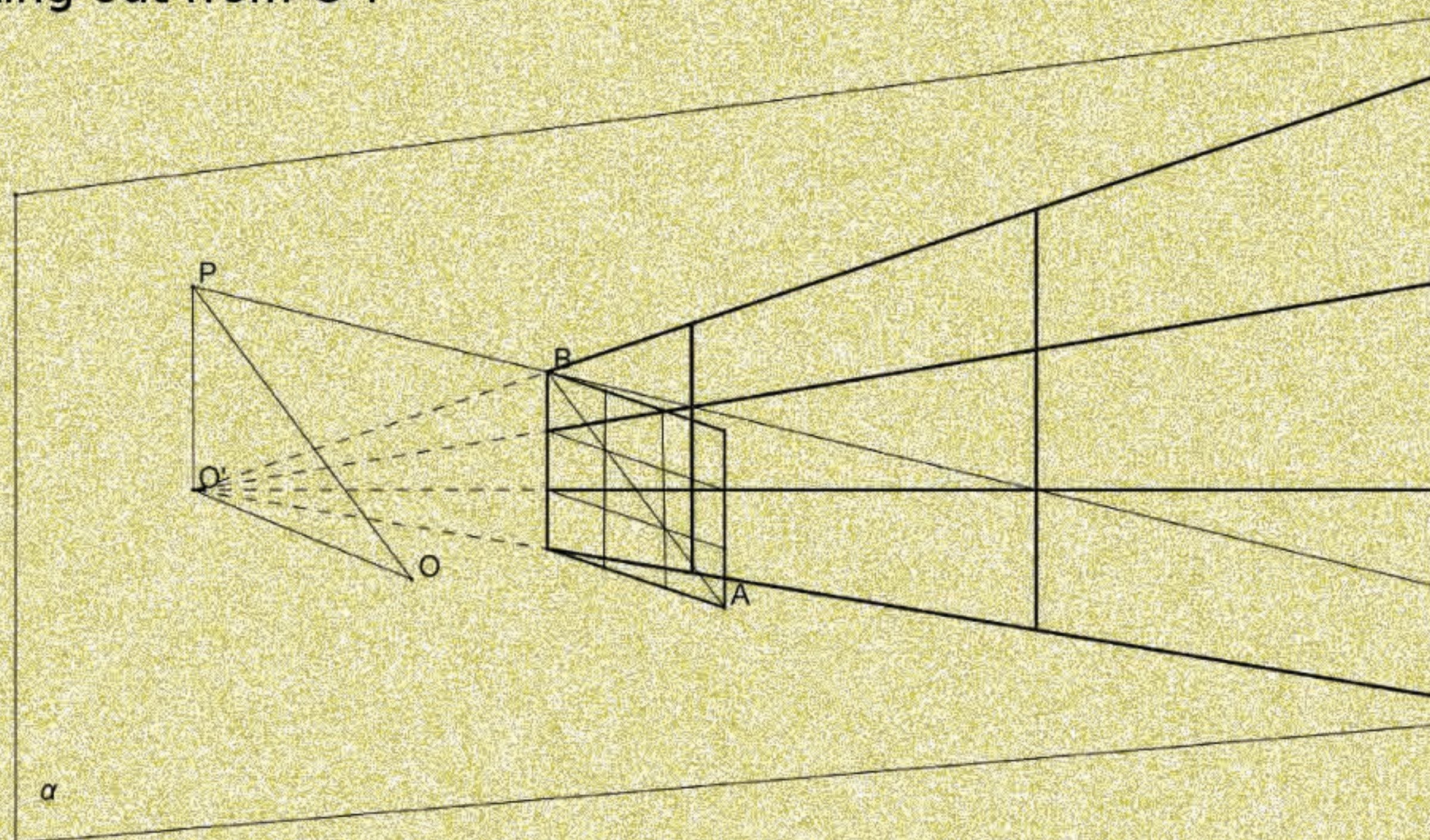

Fig.1. Projection grid on the wall α

To project the vertical lines upon the wall we use the diagonal method. So we intend to construct the images of the diagonal AB in the grid. This line on the wall intersects the deformation grids in the point B. Its vanishing point is point P which we obtain at the intersection of the line passing O and parallel to AB. The angle POO' = 45° so we construct the point P on the vertical line through O' in such a way that |PO'|=|O'O|. Due to one of the most fundamental theorems of the perspective theory PB is an image of AB. The images of vertical lines of the grid we obtain as vertical lines at the point of intersection horizontal lines with lines PB.

Fresco of St. Francis of Paola

There is currently probably only one anamorphic fresco in the world. It is the work of Emmanuel Maignana (1642) "Saint Francis of Paola", which is in the Convent of Trinita dei Monti in Rome. We can admire this monumental composition of length of 20m and height of 3.5m walking along the corridor (Fig. 2).

Then to our eyes appears the maritime landscape of the bay. However, when we stand at the end of the cloister, the figure of St. Francis of Paola, praying under the tree comes out from the landscape (Fig.3). This amazing effect was achieved using so called 'matializing fibers' technique.

Fig.3. Fresco of St. Francis of Paola, eye point located at the end of the cloister

Materializing fibers

The system is a mechanical device similar to the gallows, mounted perpendicularly to the wall, at some distance from the point of view. It is attached to the horizontal bar AB, by a noose, moveable string CD, held vertically by the weight. "Gemma" (a bead with a little hole you can look through), which can be adjusted the desired height is threaded to it (Fig.4). The wing EFGH, affixed on two hinges, on which the projected image is placed, is suspended on a vertical arm of "the gallows". Finally, a very long string, which can reach to both ends of the cloister, is attached at one of its ends to the front door, at the eye level.

Fig. 4. Instrument for creating anamorphosis

So, to project the image, the wing should be closed in a position in which it touches the string with gemma, which is placed at a fixed point in the figure. After opening the wing gemma remains in the place which is corresponding to the highlighted point on the image. It plays a role of a "fly" for the viewfinder. To plot a point on the wall corresponding to the highlighted point, the fiber of the optic beam should be stretched so that it can hit the gems and then the wall, marking the searched point on it. This operation should be repeated several times along the contours to get the desired anamorphic image.

Fig.2. Fresco of St. Francis of Paola, eye point located in front

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