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# Parallel vs Perspective Projection in Computer Graphics

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In computer graphics, projective transformation is one of the crucial aspects to understand the image transformation. This phase is part of the three-dimensional (3D) viewing pipeline after the object description has been transferred to the viewing-coordinates reference frame. The conversion of object description can be accomplished using translation and rotation between viewing and world coordinate. After that, the object description is projected to the view plane with parallel or perspective projection. In parallel projection, the coordinate positions are transferred to the view plane along with the parallel line. Meanwhile, in the perspective projection, the object projection is transformed to the view plane along the lines that converge to a point behind the view plane. Figures 1 show the parallel and perspective projection of a line segment onto the view plane.

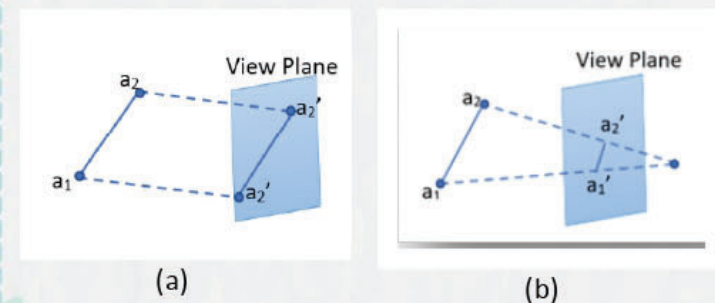
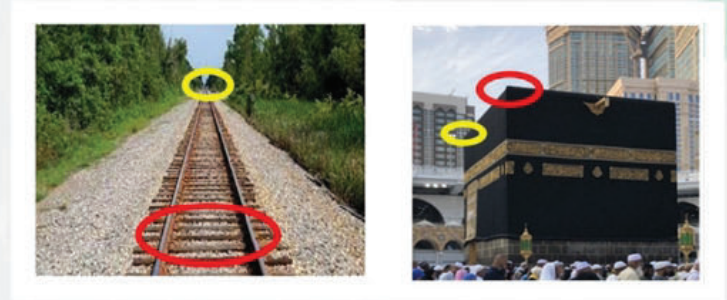


Figure 1. Parallel Projection (a) Perspective Projection (b)

Unlike perspective projection, parallel projection preserves relative proportions of the objects. Therefore, parallel projection can be used in computer aided design to produce the scale drawings of 3D objects. However, perspective projection is more realistic because the size of the object will reduce as the object distance is far from projected display.

This phenomenon can be seen in the image captured with the perspective projection effect. Based on Figure 2, the yellow labels indicate that the object was far and red labels indicate the object was near the projected display. Therefore, if the intention in 3D reconstruction is to achieve the actual dimension from the image, the perspective view needs to be corrected and rescale. Otherwise, the actual size of 3D reconstruction might be affected.



Source: <http://jwilson.coe.uga.edu/>

Figure 2. Perspective Projection Effect

As for the reflection from this knowledge in computer graphics, we can relate in our real life too. Everything that we saw in our life is our view plane. It depends on the types of glasses that we used to see that view. If we use the positive glasses, then the positive perspective will be projected in our view plane. Different people might have different perspective about something depending on the glasses they put on. Therefore, be open minded and always reflect on the glasses that we used to see the view.

## Reference:

1. Donald D. Hearn, M. Pauline Baker - Computer Graphics with OpenGL (3rd Edition) (2003, Prentice Hall)