3D viewing

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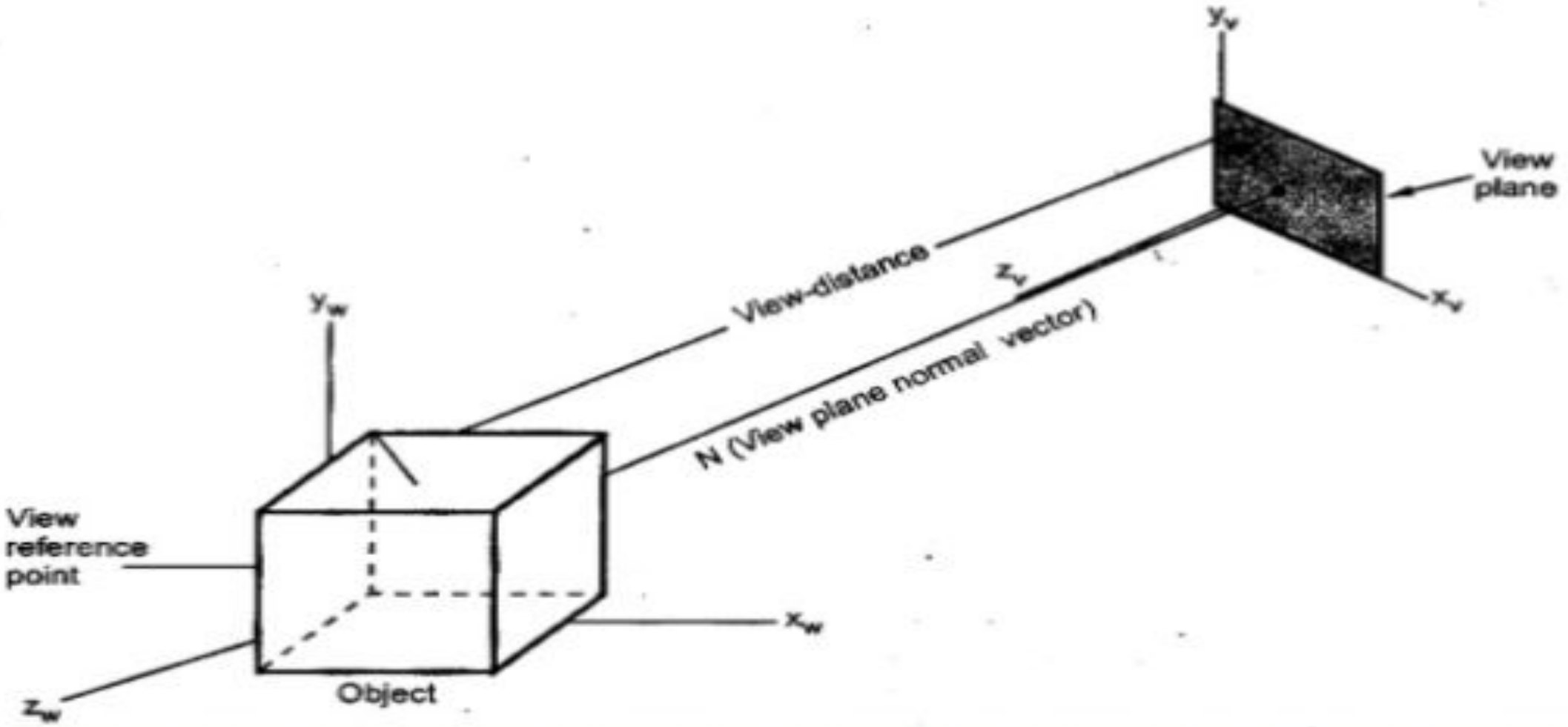
3 D viewing

- the 3D viewing process is inherently more complex than the 2 D viewing process
- In two dimensional viewing we have 3D window and 2D viewport and objects in the world coordinates are clipped against the window and are then transformed into the viewport for display.
- The complexity added in the three dimensional viewing is because of the added dimension and the fact that even though objects are three dimensional the display devices are only 2D.
- The mismatch between 3D objects and 2D displays is compensated by introducing projections. The projections transform 3D objects into a 2D projection plane.

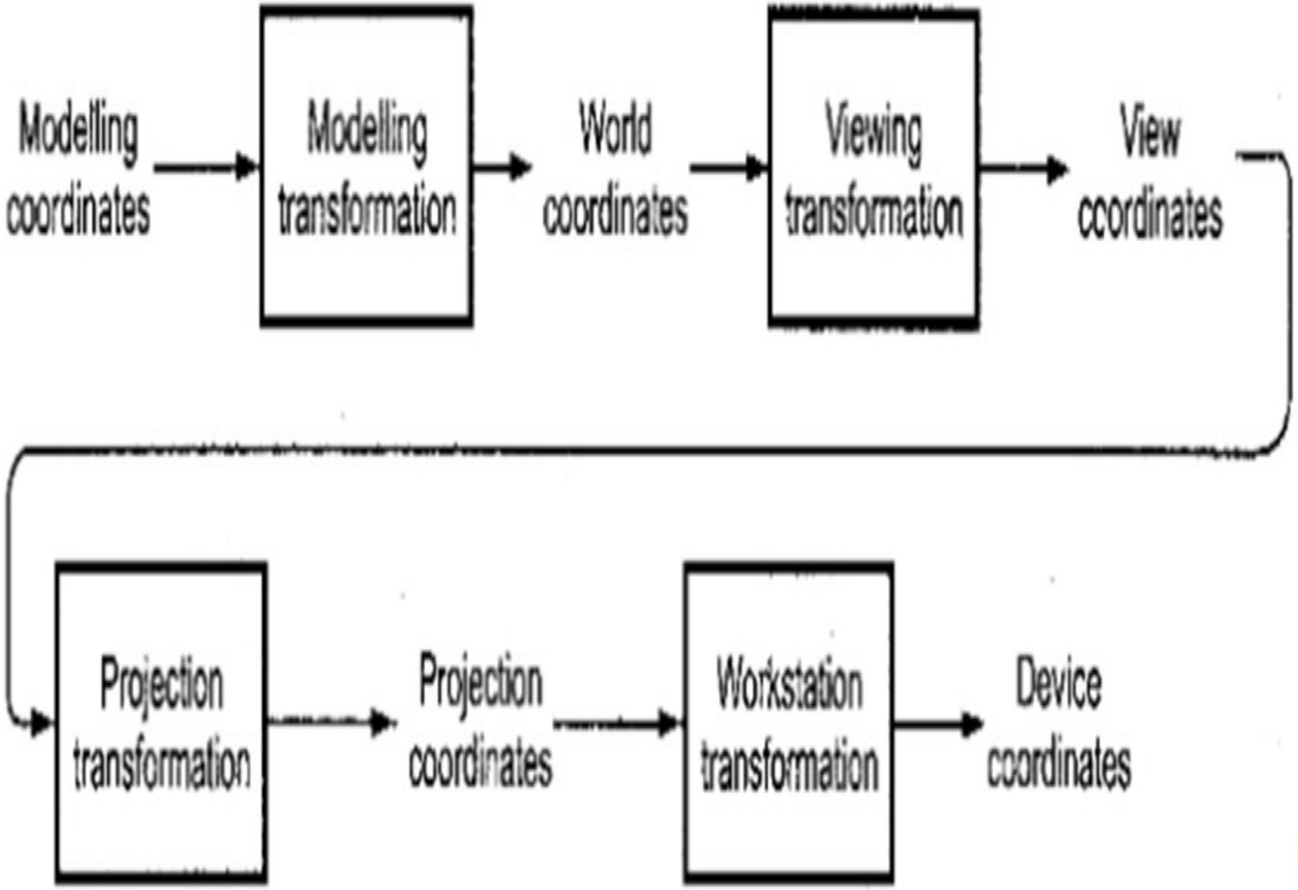
Few Important terms

- The first viewing parameter we must consider is the **view reference point.**
- This point is the center of our viewing coordinate system.
- The next viewing parameter is a **view-plane normal vector, N.**

- the view plane normal vector is a directed line segment from the view plane to the view reference point.
- The length of this directed line segment is referred to as **view-distance.**
- In other words we can say that a view plane is positioned view-distance away from the view reference point in the direction of the view plane normal


y_v
View plane
View-distance
z_v
y_w
N (View plane normal vector)
x_v
View reference point
x_w
Object
z_w

3 D viewing pipeline Explanation



- we can view the object from the side, or the top, or even from behind.
- Therefore, it is necessary to choose a particular view for a picture by first defining a view plane.
- A view plane is nothing but the film plane in a camera which is positioned and oriented for a particular shot of the scene.
- World coordinate positions in the scene are transformed to viewing coordinates, then viewing coordinates are projected onto the view plane

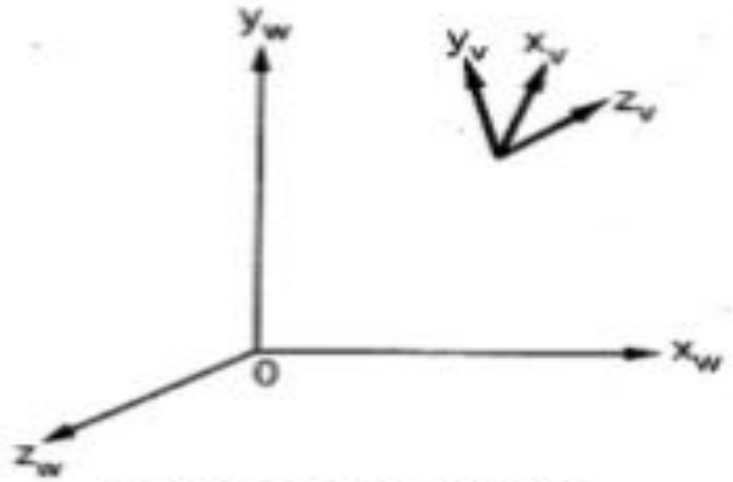
Transformation from World Coordinate to Viewing Coordinates

The conversion of object description from world coordinates to viewing coordinates is achieved by following transformation sequence.

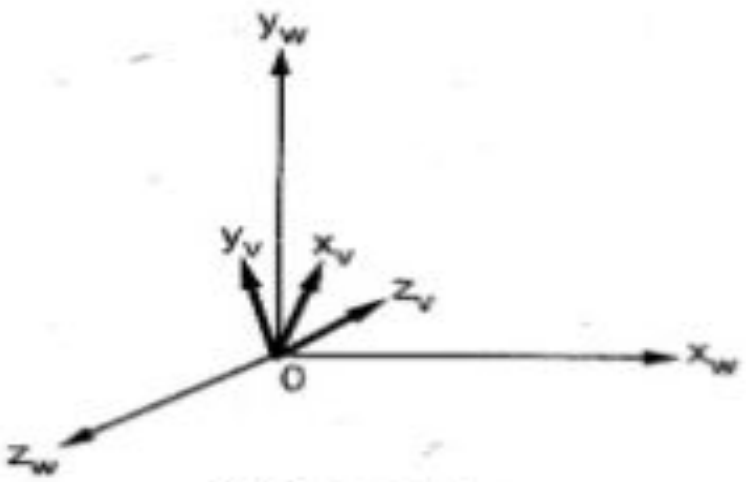
1. Translate the view reference point to the origin of the world coordinate system.
2. Apply rotations to align the x_v, y_v, and z_v axes with worked coordinate x_w, y_w, z_w axes, respectively.

composite transformation matrix is given as

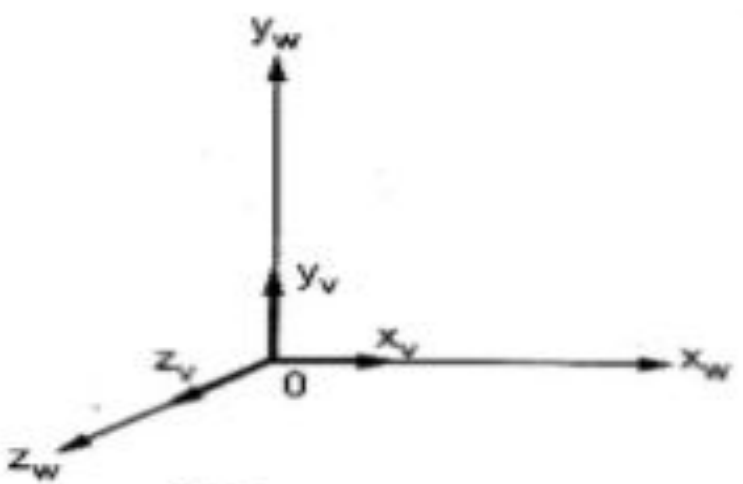
$$T_c = R_z R_y R_x \cdot T$$



(a) Original positions



(b) Translation



(c) 3 axes rotation

THANK YOU