

# Maharaja Agrasen Institute of Technology

## ETCS 211

### Computer Graphics & Multimedia

#### UNIT 2

#### PROJECTIONS: PERSPECTIVE AND PARALLEL PROJECTIONS

MAT/CSE/COM - UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

1

## What is projection?

Projections transform points in  $n$ -space to  $m$ -space, where  $m < n$ . In 3D, we map points from 3-space to the projection plane (PP) along projectors emanating from the center of projection (COP).

There are two basic types of projections:

Perspective - distance from COP to PP finite

Parallel - distance from COP to PP infinite

MAT/CSE/COM - UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

2

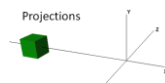
## Types of projections

Projections transform points in  $n$ -space to  $m$ -space, where  $m < n$ . In 3D, we map points from 3-space to the projection plane (PP) along projectors emanating from the center of projection (COP).

There are two basic types of projections:

Perspective - distance from COP to PP finite

Parallel - distance from COP to PP infinite



MAT/CSE/COM - UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

3

## Perspective Projection

Under perspective projections, any set of parallel lines that are not parallel to the PP will converge to a vanishing point.

Vanishing points of lines parallel to a principal axis  $x$ ,  $y$ , or  $z$  are called principal vanishing points.

#### Types of perspective drawing

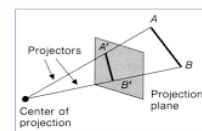
Perspective drawings are often classified by the number of principal vanishing points.

One-point perspective — simplest to draw

Two-point perspective — gives better impression of depth

Three-point perspective — most difficult to draw. All three types are equally simple with computer graphics.

#### Perspective Projection



4

MAT/CSE/COM - UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

4

## Perspective Projection

The perspective projection is an example of a projective transformation.

#### properties of projective transformations:

1. Lines map to lines
2. Parallel lines don't necessarily remain parallel
3. Ratios are not preserved

#### Advantage of perspective projection

Size varies inversely with distance and it looks realistic

#### Disadvantage of perspective projection

1. Distance and angles are not preserved
2. Parallel lines do not remain parallel

MAT/CSE/COM - UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

5

## Parallel Projection

For parallel projections, we specify a direction of projection (DOP) instead of a COP.

There are two types of parallel projections:

1. Orthographic projection — DOP perpendicular to PP
2. Oblique projection — DOP not perpendicular to PP

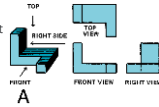
MAT/CSE/COM - UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

6

## Parallel Projection : Orthographic Projection

a method of projection in which an object is depicted using parallel lines to project its outline on to a plane.

projection of a single view of an object (such as a view of the front) onto a drawing surface in which the lines of projection are perpendicular to the drawing surface.



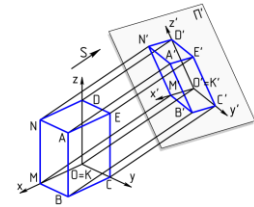
MAT.CDL.COM, UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

7

## Parallel Projection : Axonometric projection

**Axonometric projection** is a type of orthographic projection used for creating a pictorial drawing of an object, where the lines of sight are perpendicular to the plane of projection, and the object is rotated around one or more of its axes to reveal multiple sides.

Axonometric projections have the advantage that they give a pictorial view of the object, yet dimensions are measurable. Manually, axonometric views can be constructed from orthographic views.



MAT.CDL.COM, UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

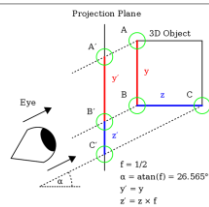
8

## Parallel Projection : Oblique Projection

**Oblique projection** used for producing two-dimensional images of three-dimensional objects.

Oblique projection is commonly used in technical drawing.

- it projects an image by intersecting parallel rays (projectors) from the three-dimensional source object with the drawing surface (projection plane).



MAT.CDL.COM, UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

9

## Parallel Projection : Oblique Projection

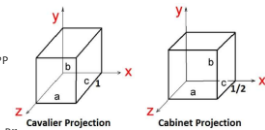
There are two types of oblique projections:

Cavalier projection

- DOP makes 45° angle with PP
- Does not foreshorten lines perpendicular to PP

Cabinet projection

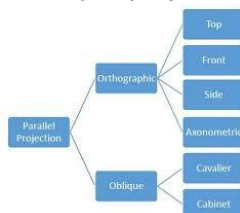
- DOP makes 63.4° angle with PP
- Foreshortens lines perpendicular to PP by one-half



MAT.CDL.COM, UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

10

## Taxonomy of projections



MAT.CDL.COM, UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

11

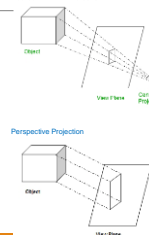
## Difference between perspective and parallel projections

Perspective projection is located at a finite point whereas Parallel projection is located at infinite points.

Perspective projection form a realistic picture of object whereas Parallel projection do not form realistic view of object.

Perspective projection can not preserve the relative proportion of an object whereas Parallel projection can preserve the relative proportion of an object.

Projector in perspective projection is not parallel whereas Projector in parallel projection is parallel.



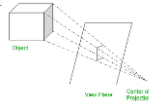
Parallel Projection

MAT.CDL.COM, UNIT 2 PROJECTIONS: PERSPECTIVE AND PARALLEL

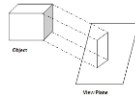
12

## Difference between perspective and parallel projections

- Perspective projection represents the object in three dimensional way whereas Parallel projection represents the object in a different way like telescope.
- The lines of perspective projection are not parallel whereas The lines of parallel projection are parallel.
- Perspective projection can not give the accurate view of object whereas Parallel projection can give the accurate view of object.



Perspective Projection



Parallel Projection

UNIT 2: ORTHOGRAPHIC, ISOMETRIC, PERSPECTIVE AND PARALLEL

13