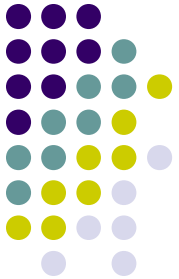


THREE DIMENSIONAL DISPLAY METHODS

DISPLAYING 3D OBJECT

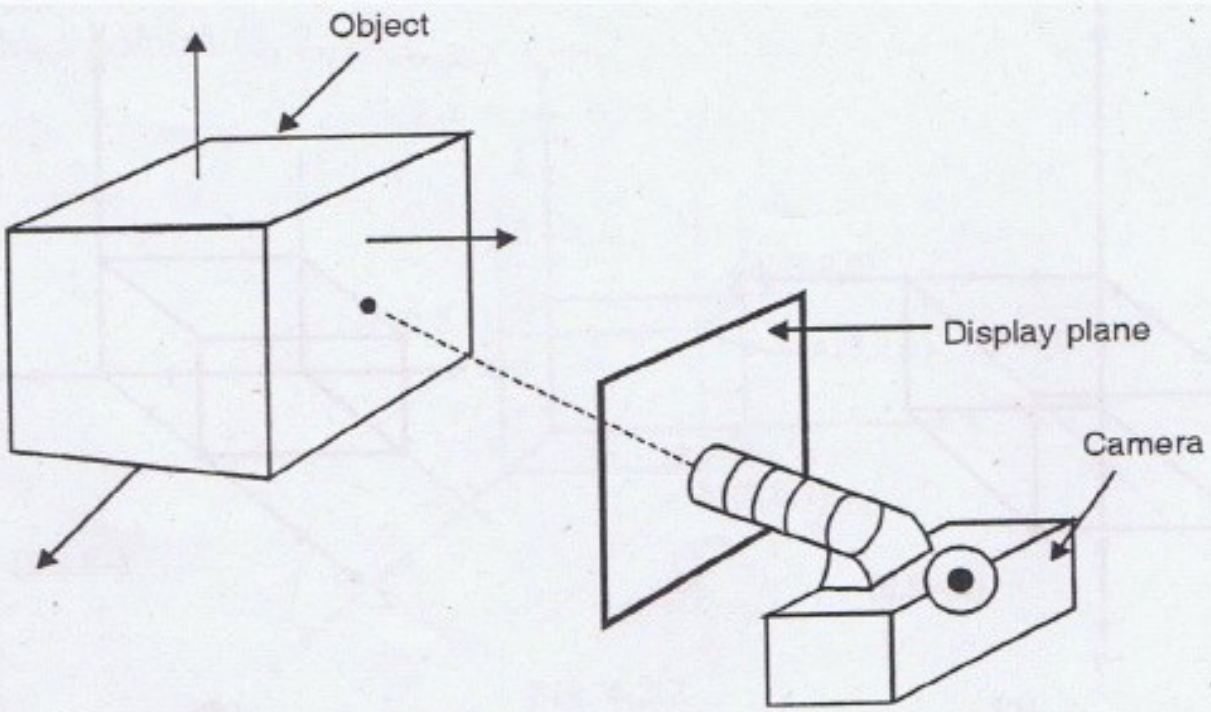
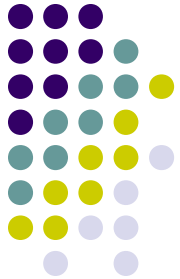


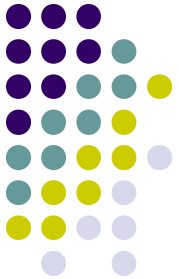
Fig. 4.3.1 : Setting a co-ordinate reference.

DISPLAYING 3D OBJECT



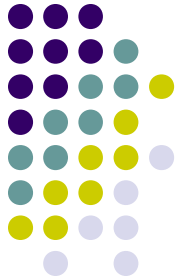
- **First setup a coordinate reference for camera.**
- This co-ordinate reference defines the position and orientation for the plane of the camera.
- **This plane must be used to display a view of the object; its description has to transferred to the camera reference co-ordinates and projected onto the selected display plane.**
- Then we can display object in wire frame form or we can apply lighting and surface rendering techniques to shade the visible surfaces.

THREE DIMENSIONAL DISPLAY METHODS



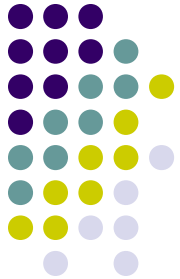
- Parallel Projection
- Perspective Projection
- Depth Cueing
- Visible line and Surface Identification
- Surface Rendering
- Exploded and Cutaway Views
- Stereoscopic View

PARALLEL PROJECTION

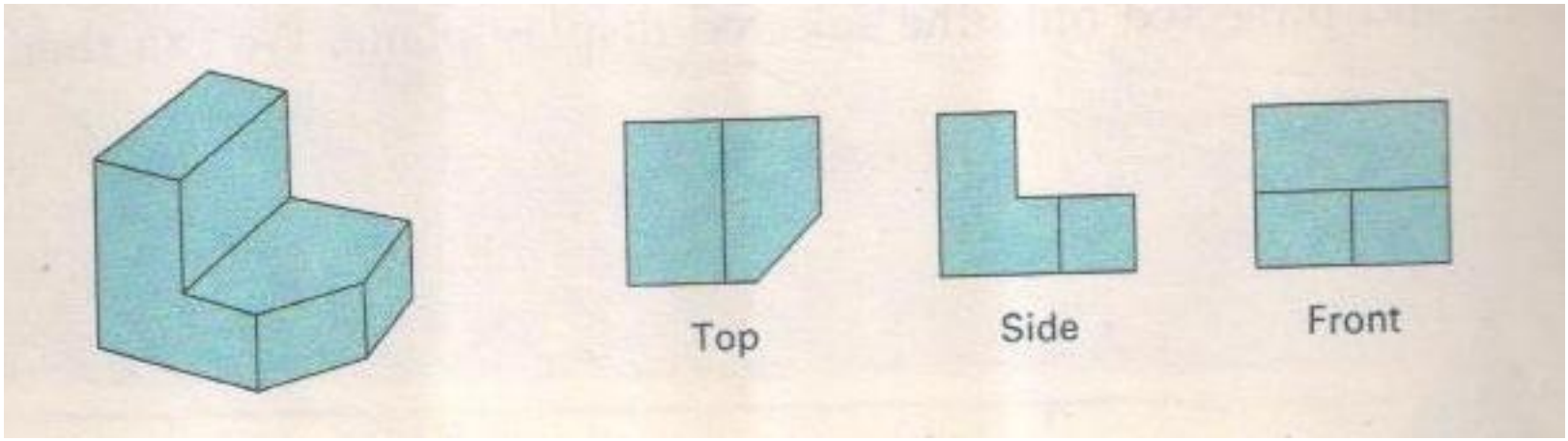


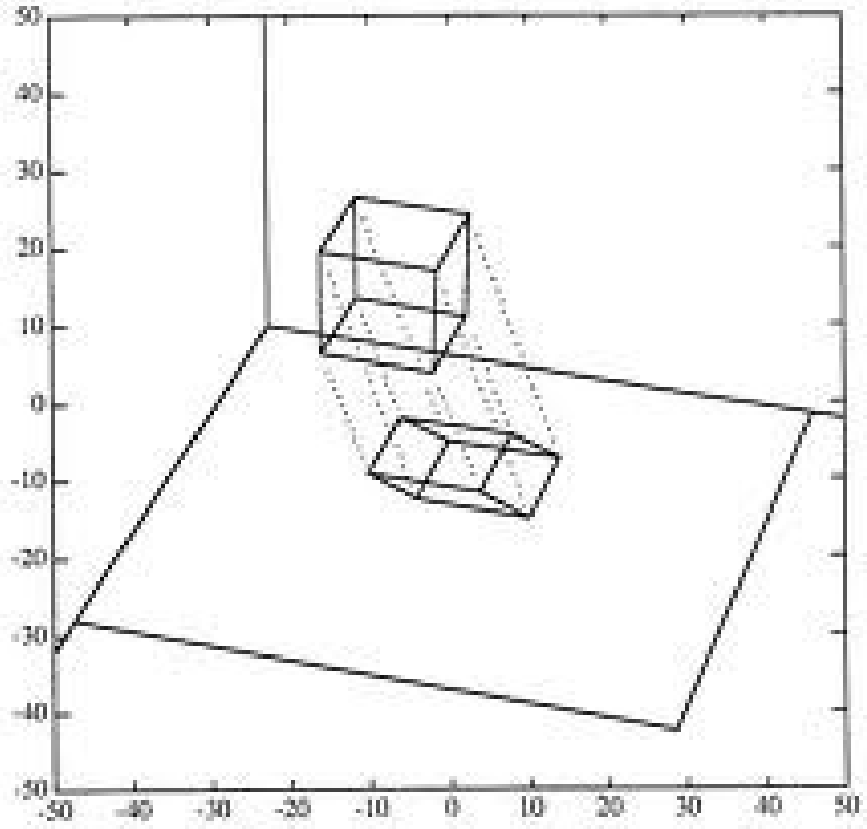
- In parallel projection, z co-ordinate is discarded and parallel ,lines from each vertex on the object are extended until they intersect the view plane.
- The point of intersection is the projection of the vertex.
- We connect the projected vertices by line segments which correspond to connections on the original object.

PARALLEL PROJECTION



- Method for generating view of a solid object is to project points on the object surface along parallel lines onto the display plane.
- By selecting different viewing positions we can project visible points on the object onto the display plane to obtain 2d views of the object.
- **Parallel projection preserves relative proportions of objects but does not produce the realistic views**
- Used in engineering and architectural drawings.


Top
Side
Front


50
40
30
20
10
0
-10
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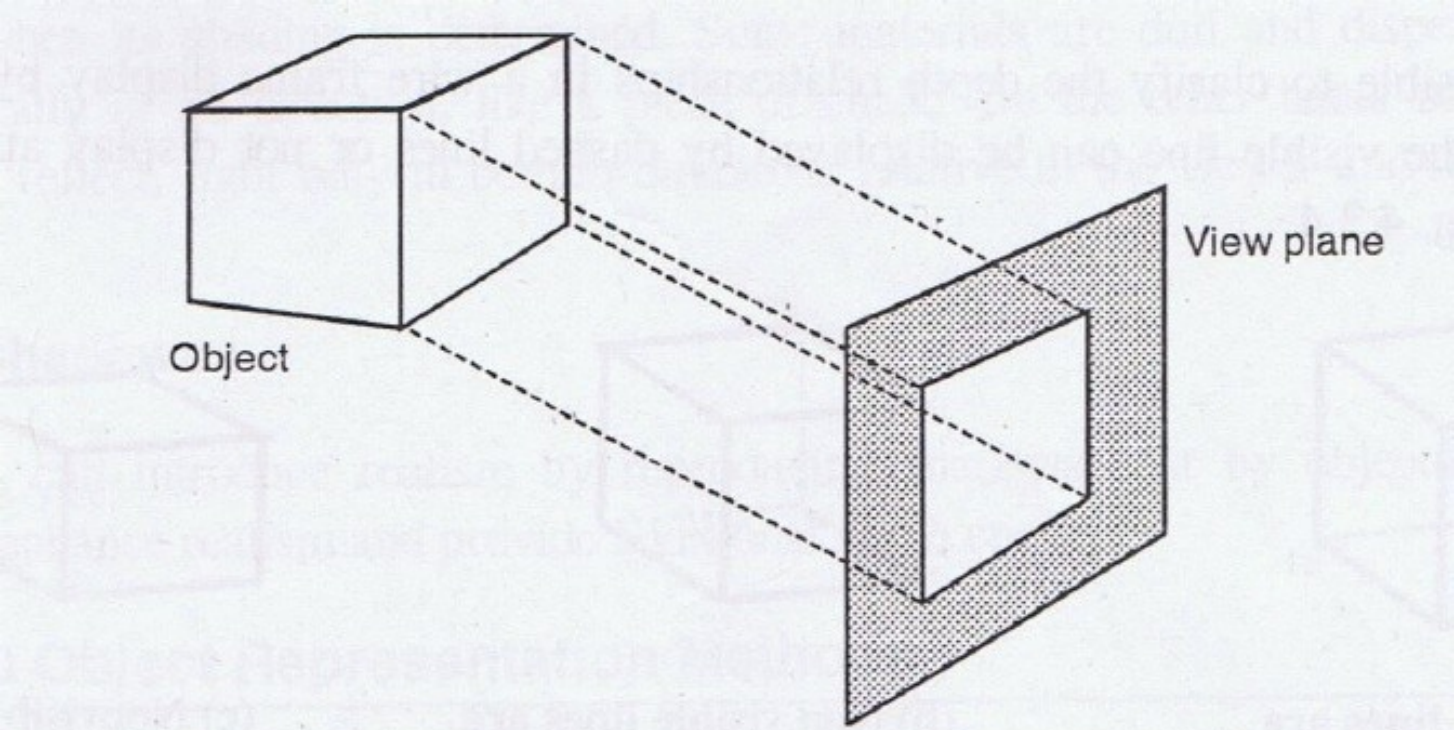
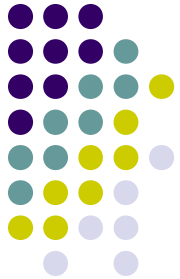


Fig. 4.3.2 : Parallel projection of an object to the view plane

PERSPECTIVE PROJECTION

- The perspective projection, on the other hand, **produces realistic views but does not preserve relative proportions.**
- The lines of projection are not parallel. Instead, they all converge at a single point called the `center of projection' or `projection reference point'.

PERSPECTIVE PROJECTION



- The object positions are transformed to the view plane along these converged projection lines and the projected view of an object is determined by calculating the interaction of the converged projection lines with the view plane.
- Project points to display plane along converging paths.
- This causes objects farther from the viewing position to be displayed smaller than objects of the same size that are nearer to the viewing position.

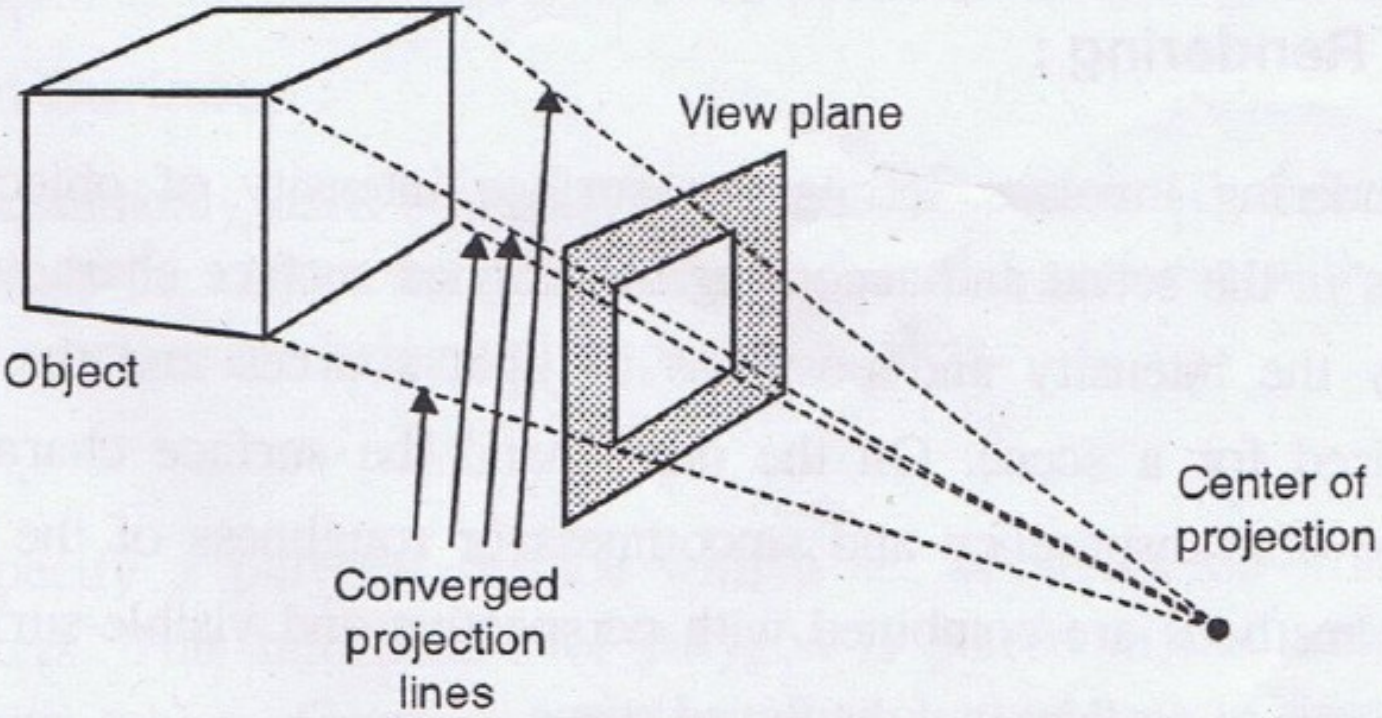
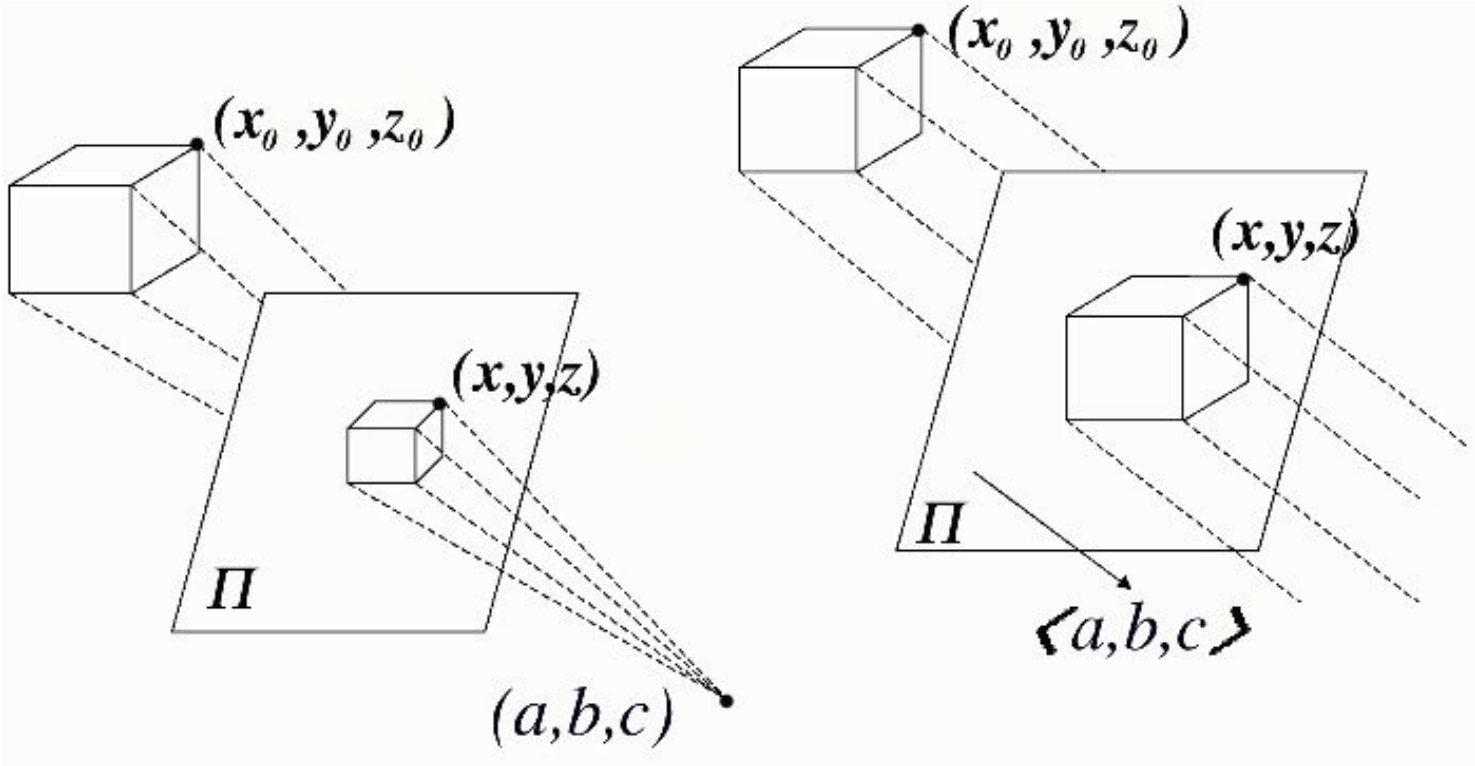
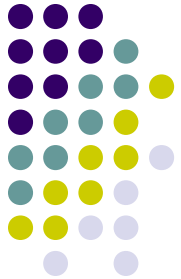


Fig. 4.3.3 : Perspective projection of an object to the view plane

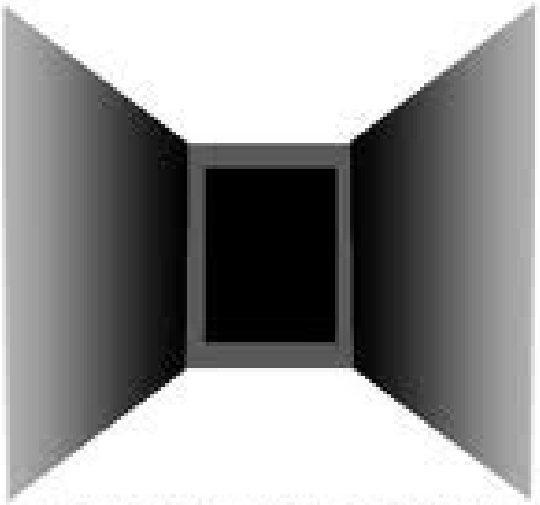


PERSPECTIVE **PARALLEL**

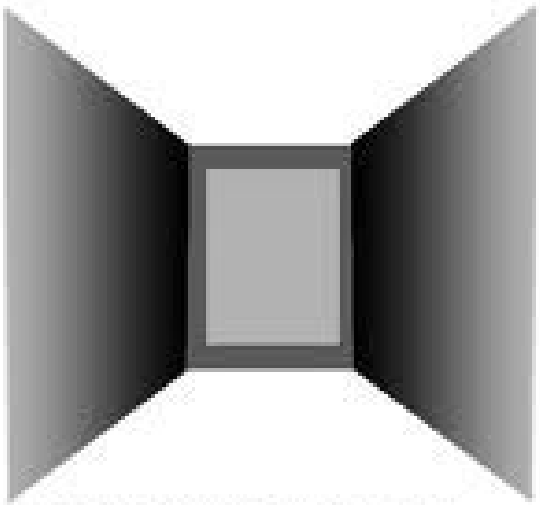
DEPTH CUEING



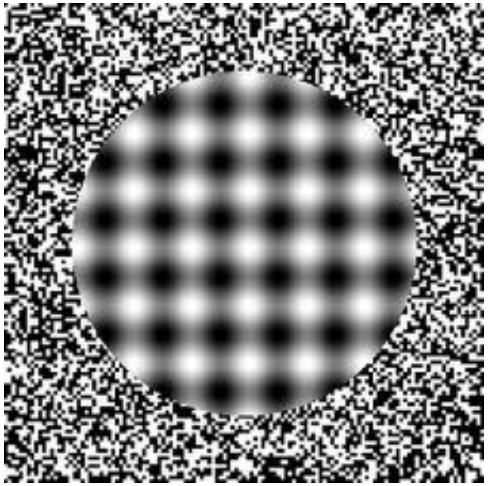
- Using depth information we can identify, for a particular viewing direction, which is the front and which is the back of displayed object.
- Simple method for indicating depth is to vary the intensity of objects according to the viewing position.
- **Depth Cueing :** The lines closest to the viewing position are displayed with high intensities and lines farther are displayed with decreasing intensities.



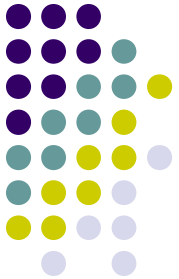
Darker colors recede into the background.



Lighter colors seem to protrude coming closer to the viewer.

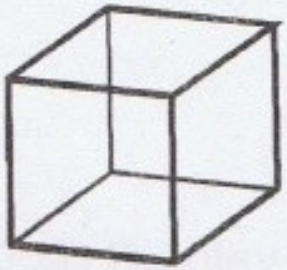


VISIBLE LINE IDENTIFICATION

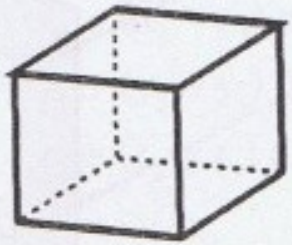


- Simple method to **highlight the visible lines** is to **display them in different color.**
- Another technique for engineering drawing is to **display the non-visible lines as dashed lines.**
- Another approach is to **remove the non-visible lines.**
  - **But removing the hidden line removes information about the shape of the back surfaces of an object.**
- When objects are to be displayed with color apply surface rendering to the visible surfaces.

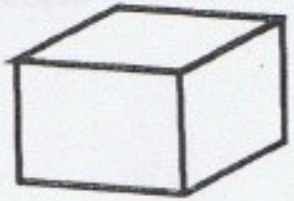
VISIBLE LINE



(a) visible lines are highlighted



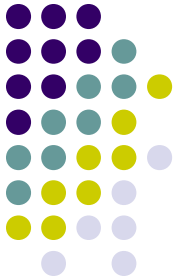
(b) Non visible lines are shown by dashed lines



(c) Nonvisible lines are not shown

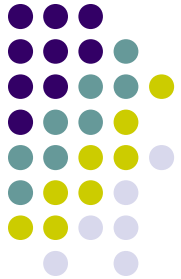
Fig. 4.3.4

VISIBLE SURFACE IDENTIFICATION

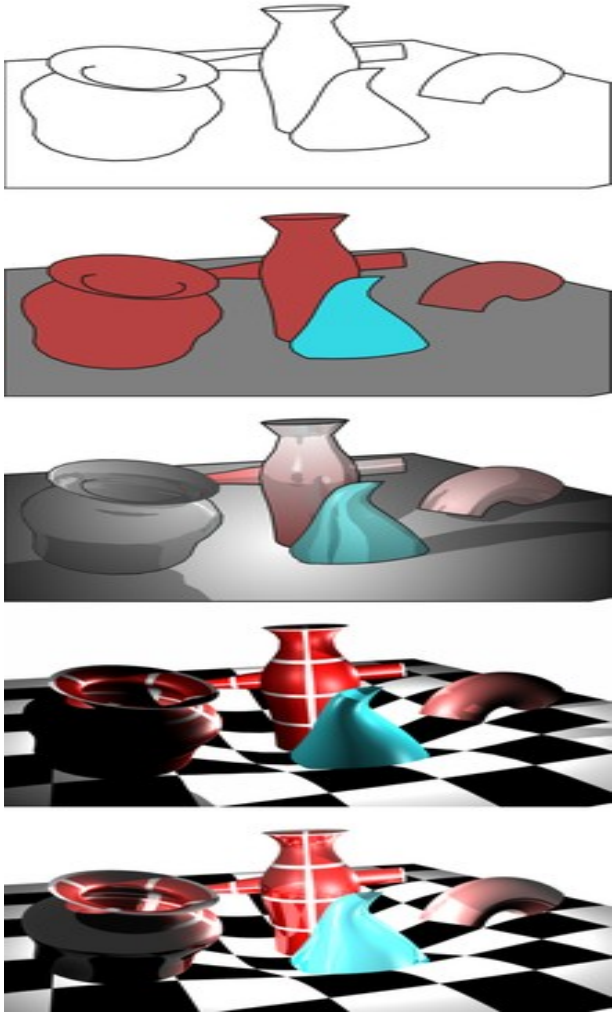


- The visible surface identification can be done with visible surface algorithms.
- **They establish visibility pixel by pixel across the viewing plane or determine surfaces for object as a whole.**
- Once the visible, surfaces are identified we can apply surface rendering techniques on them to obscure the hidden surfaces

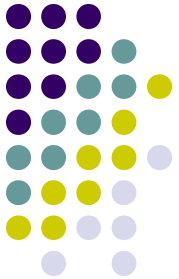
SURFACE RENDERING



- Added realism is attained in displays by setting the surface intensity of objects according to lighting conditions in the scene.
- **Lighting conditions** include intensity and positions of light sources and background illumination required for the scene.
- **Surface Properties** include degree of transparency and how rough or smooth the surfaces are to be.

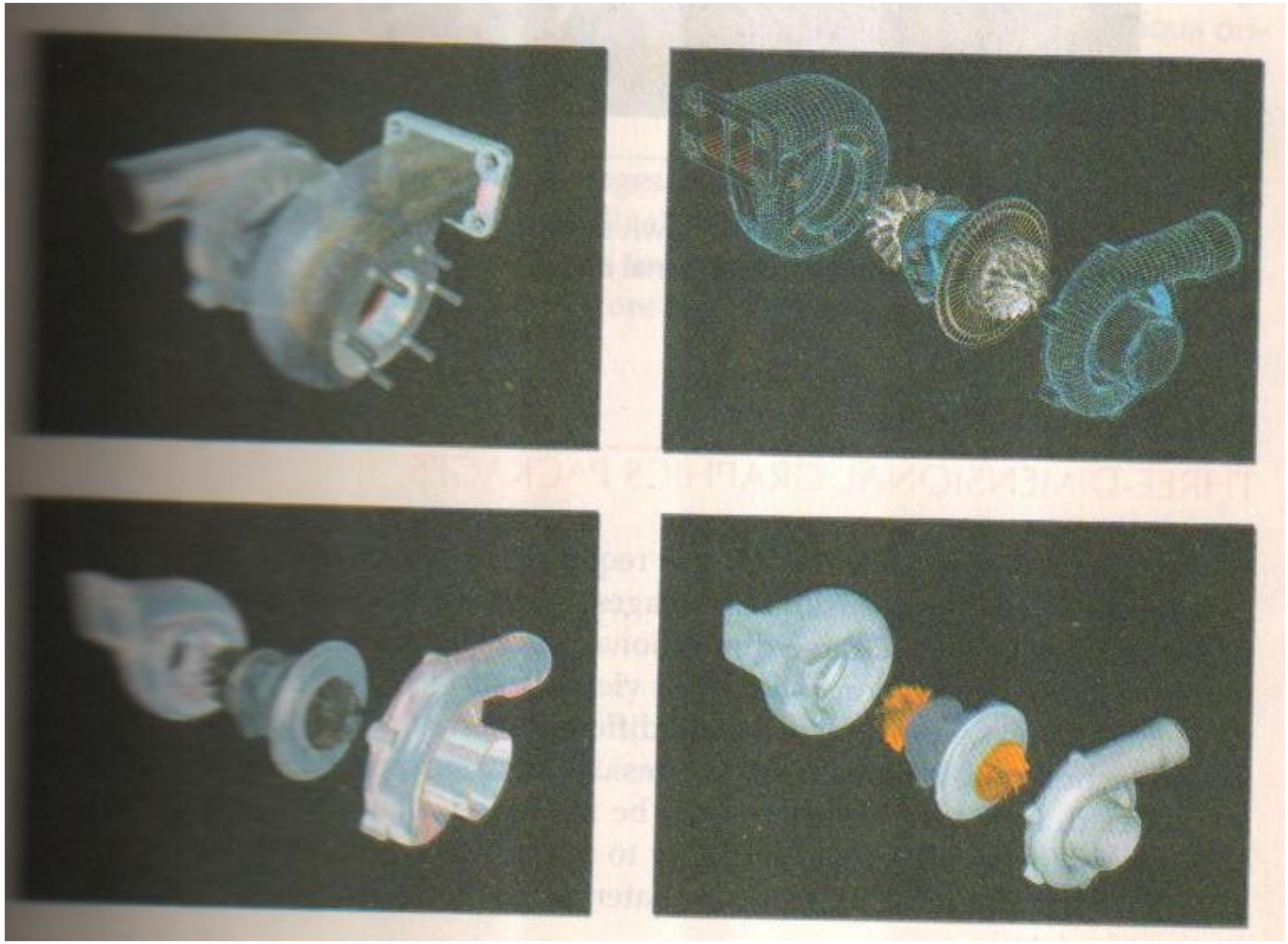


EXPLODED AND CUTAWAY VIEWS

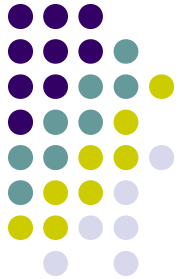


- Many graphics packages allow objects to be defines hierarchical structures so that internal details are stored.
- Exploded and cutaway vies of such objects are used to show the internal structure and relationship of the object parts.

CUTVIEW



STEREOSCOPIC VIEW



- Another method for adding a sense of realism is to display objects using stereoscopic views.
- **Stereoscopic devices present 2 views of scene:**
  - **One for left eye.**
  - **Other for right eye.**