3. Graphical methods: Stereographic projection

1) Types of projection

•Projection: Mapping 3D images into 2D ones on a planar surface

•Parallel projection: parallel rays are projected to a planar surface from an object. It is useful to convey measurements of distances or angles.
ex.) Orthographic projection (Fig.3.1, Fig 3.4), oblique projection (Fig.3.2)

• Perspective projection: nonparallel rays connecting one or more foci and a object are projected to a surface.
It is useful to convey perspective views of objects.
ex.) Equal area projection, equal angle (stereographic) projection

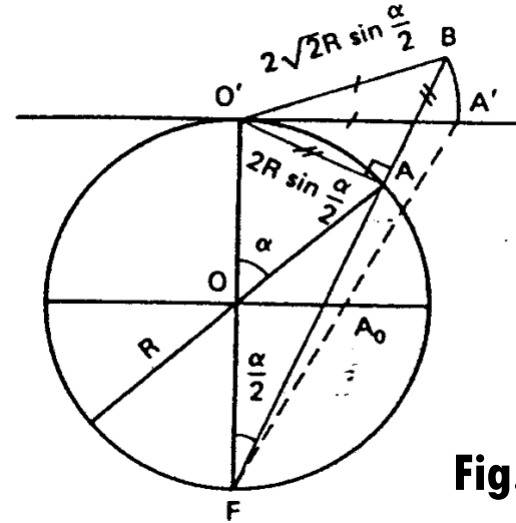# 1) Equal-Area projection ( )

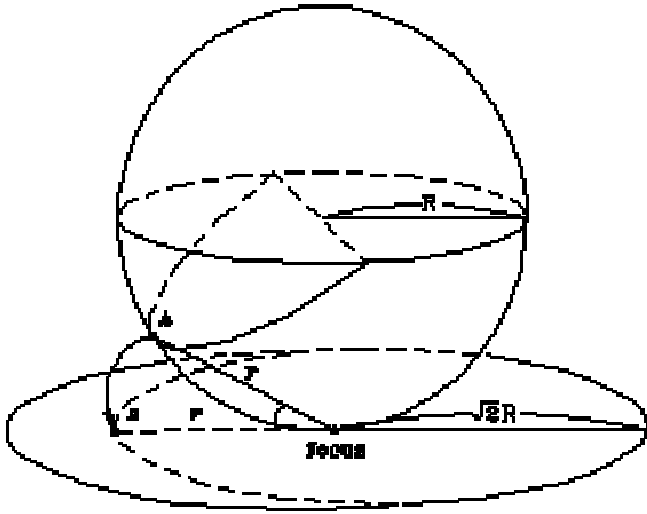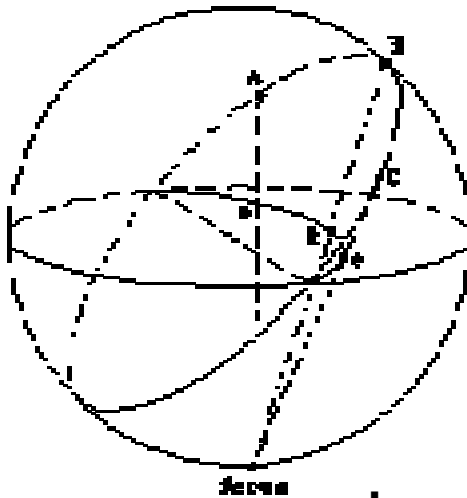

Fig. 3.5

Advantage: Area of a small circle is preserved.
Disadvantage: Shape of a small circle is distorted according to its location on the sphere.

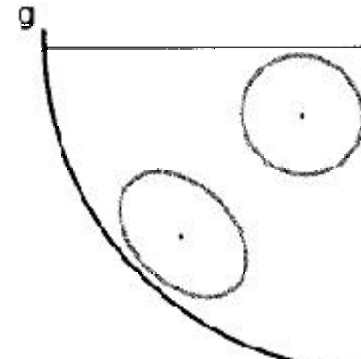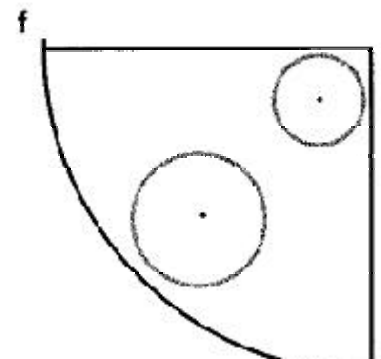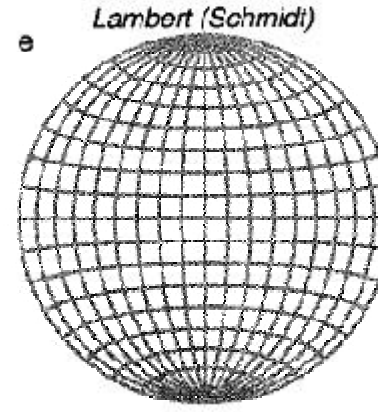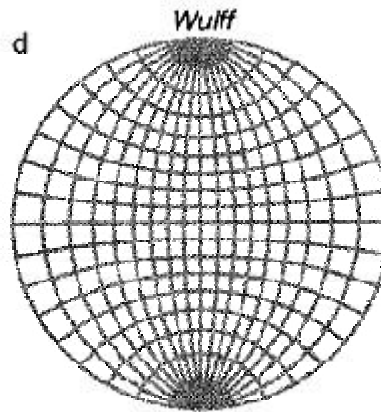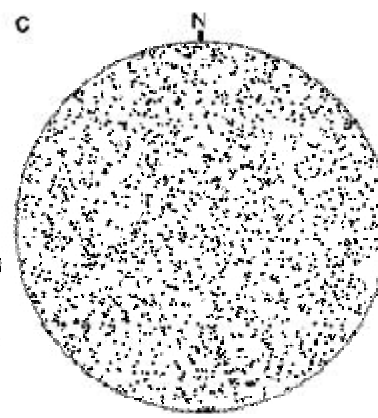# 2) Stereographic (equal-angle,   ) projection

Lower focal point (=upper hemisphere) projection

Advantage: Shape of a small circle (angle) is preserved (conformal).
Disadvantage: Area of a small circle changes according to its location on the sphere.

b

c

N=2000

Wulff

Lambert (Schmidt)

d

e

f

g
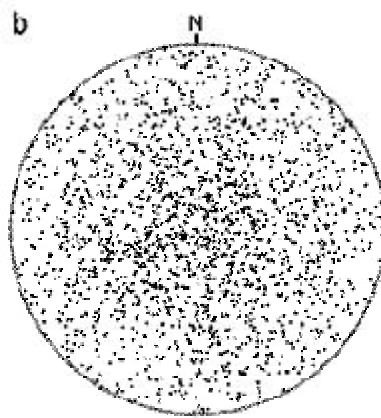
2) Stereographic projection of lines and planes

- Projection of a vector

- Projection of a great circle

- Projection of a small circle

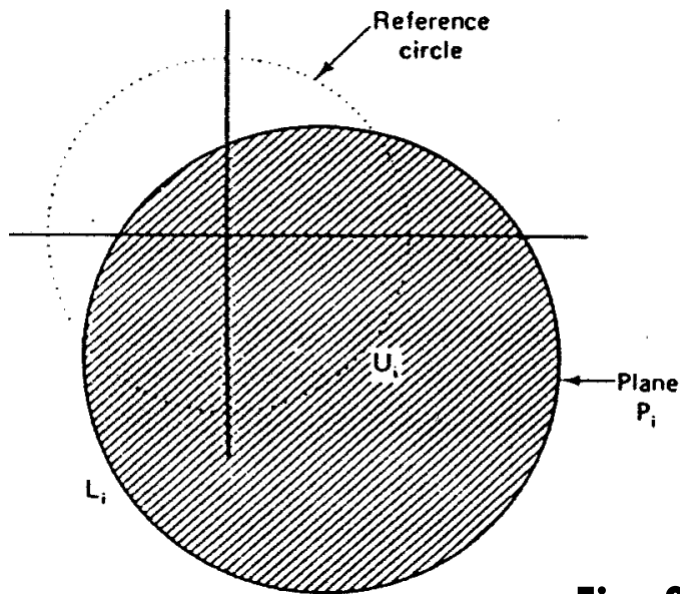# 3) Stereographic projection of a joint pyramid

- Projection of half spaces

Fig. 3.16

- Joint pyramid: an intersect of joint half spaces shifted to the center of a projection sphere
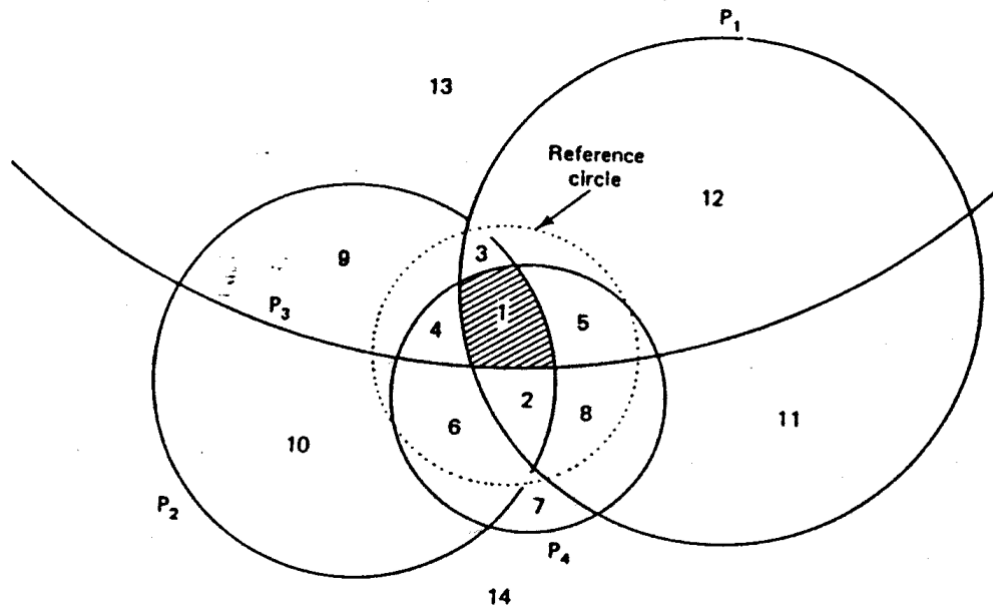

Fig. 3.17

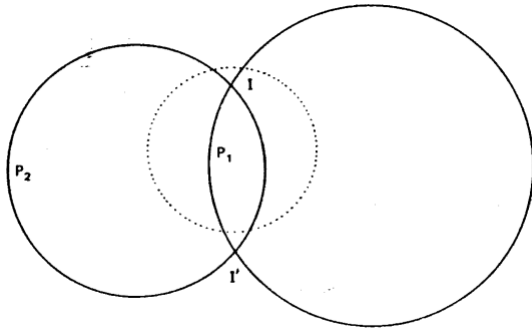- Intersection of two joints

Fig. 3.12

- Arc of joint pyramid

4) Additions

- Normal to a given plane

- Plane normal to a given vector (line)

- $(X_0, Y_0) \rightarrow (X, Y, Z)$

- • Center of a great circle passing two points
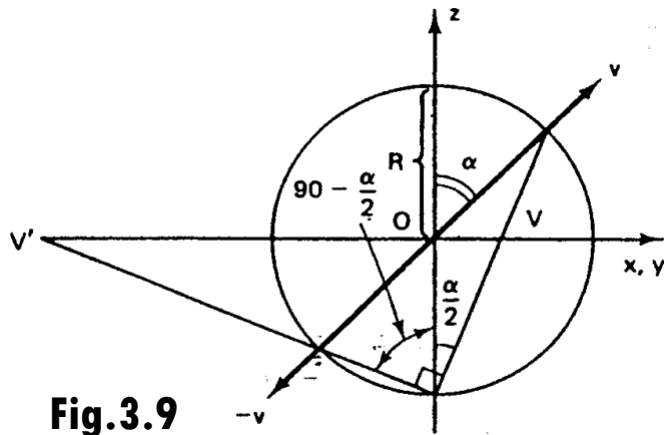 - - Vector analysis

  - - Graphical method

Fig.3.9

- Orthographic projection of a vector on a plane

- Vector analysis

- Graphical method