

2. Description of block geometry and stability using vector methods

1) Description of orientation

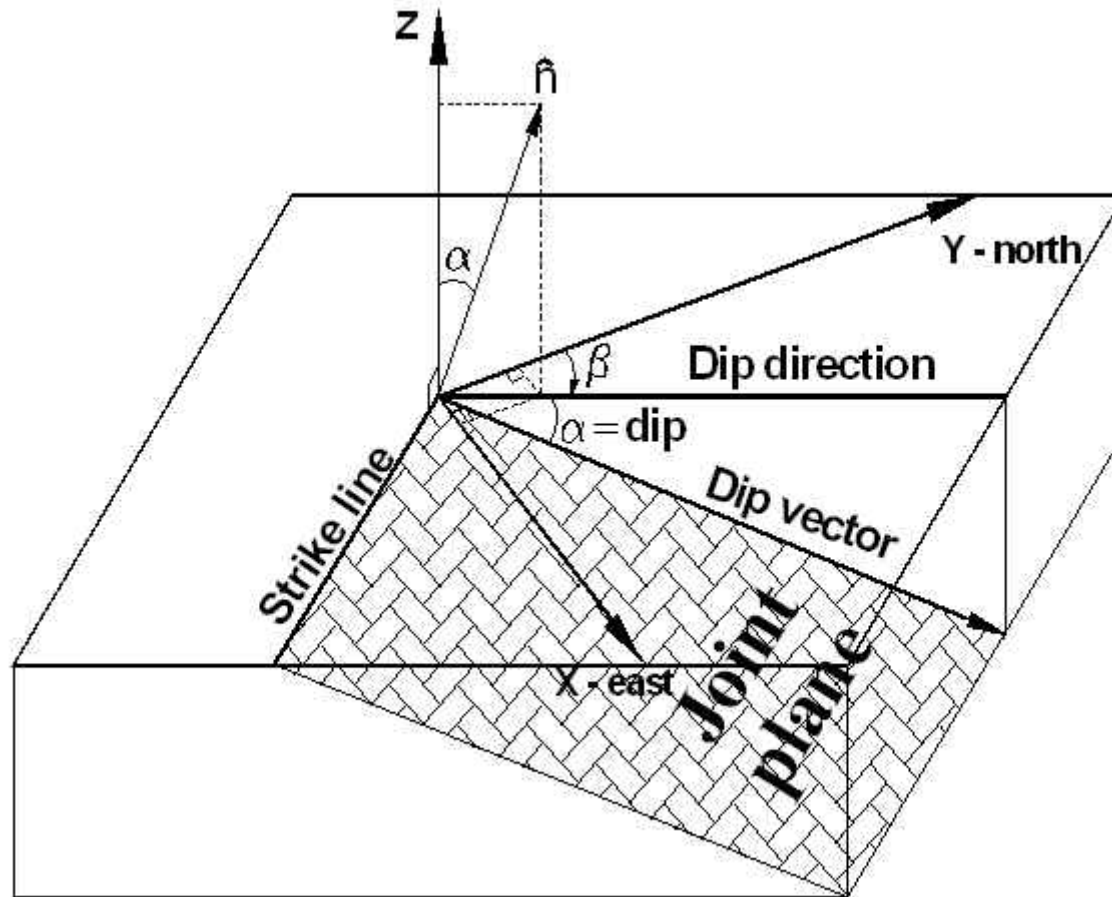


Fig. Dip direction, dip, strike and normal vector of a joint plane.

● Trend/Plunge (/)

- Trend: An angle in the horizontal plane measured in clockwise from the north to the vertical plane containing the given line
- Plunge: An acute angle measured in a vertical plane between the given line and the horizontal plane

Ex.) 320/23, 012/56

● Dip direction/Dip (/)

- Dip direction: Trend of the maximum dip line (dip vector) of the given plane
- Dip: Plunge of the maximum dip line of the given plane

Ex.) 320/23, 012/56

● Strike/Dip (/)

- Strike: An angle measured in the horizontal plane from the north to the given plane
- Dip: Plunge of the maximum dip line of the given plane

Ex.) N15 E/30 SE, N25 W/56 SW

● Conversion of Strike/Dip to Dip direction/Dip

- N60 E/30 SE:

- N60 E/30 NW:

- N60 W/30 NE:

- N60 W/30 SW:

- Normal vector of a plane

3D Cartesian coordinates of normal vector of a joint whose dip direction () and dip () are given (when +Z axis points vertical up).

$$N_x = \sin \mathbf{a} \sin \mathbf{b}$$

$$N_y = \sin \mathbf{a} \cos \mathbf{b}$$

$$N_z = \cos \mathbf{a}$$

● Normal vector of a plane

Ex.1) Calculate the normal vector of a joint whose dip direction () and dip () are 060° and 30° , respectively (when +Z axis points vertical up).

Ex.2) Obtain the normal vector components of a joint using dip direction and dip when X is north, Y is upward and Z is east.

2) Equations of lines and planes

- Line

2) Equations of lines and planes

- Plane

2) Equations of lines and planes

- Half-space

2) Equations of lines and planes

- Intersection of a plane and a line

2) Equations of lines and planes

- Intersection of two planes

2) Equations of lines and planes

- Intersection of three planes

2) Equations of lines and planes

- Angles between lines and planes
 - Angle between two lines
 - Angle between two planes
 - Angle between a line and a plane

3) Description of a block

- Calculation of volume

3) Description of a block

- Defining a block

Finding vertices

Defining faces with vertices

4) Block pyramid

- Equations
- Finding edges

5) Equations of forces (p.43)

6) Computation of sliding directions

Single face sliding

Sliding on two planes

H.W.1) Make a computer code with which you can do below work.

If you type in dip direction and dip of a plane it calculates the normal vector of the plane (z coordinate is always positive value).

If you give x, y and z coordinates of vertices of a hexahedron it calculates the volume of the hexahedron.

Show your code and its performance to others within 5 min. in next class.