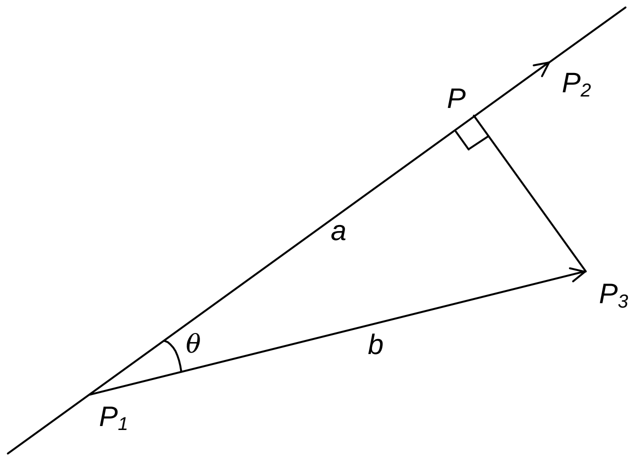

Suppose the coordinates of points P_1, P_2 and P_3 are being measured. When a line perpendicular to the straight line between P_1 and P_2 is drawn from point P_3, the range ($\overline{P_1 P}$) between P_1 and P can be measured.

The coordinates of P_1, P_2, P_3 and P are as follows:

$$\begin{cases} P_1\left(x_1, y_1, z_1\right) \\ P_2\left(x_2, y_2, z_2\right) \\ P_3\left(x_3, y_3, z_3\right) \\ P\left(x, y, z\right) \end{cases}$$

According to the above figure, vectors a and b will be as follows:

$$\begin{cases} a = \overrightarrow{P_1 P_2} = \begin{bmatrix} x_2 - x_1 \\ y_2 - y_1 \\ z_2 - z_1 \end{bmatrix} \\ b = \overrightarrow{P_1 P_3} = \begin{bmatrix} x_3 - x_1 \\ y_3 - y_1 \\ z_3 - z_1 \end{bmatrix} \end{cases}$$

Suppose the angle formed by straight lines P_1, P_2 and P_1, P_3 is theta. By orthogonalizing straight lines P_1, P_2 and P_1, P_3, the equation to calculate the measurement of range ($\overline{P_1 P}$) between P_1 and P will be as follows:

$$\overline{P_1 P} = |b|\cos(theta) = \frac{|a||b|\cos(theta)}{|a|} = \frac{a \cdot b}{|a|}$$

$$= \frac{(x_2 - x_1)(x_3 - x_1) + (y_2 - y_1)(y_3 - y_1) + (z_2 - z_1)(z_3 - z_1)}{\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}}$$