$$\underline{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \quad \underline{y} = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} \quad \underline{z} = \begin{bmatrix} z_1 \\ z_2 \\ z_3 \end{bmatrix} \quad \underline{w} = \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix}$$

$$\underline{w} = a\,\underline{x} + b\,\underline{y} + c\,\underline{z}$$

$$\begin{bmatrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix}$$

But if $\underline{x}$, $\underline{y}$, and $\underline{z}$ are orthogonal

$$\underline{x}^T\underline{w} = a\,\underline{x}^T\underline{x} + b\,\underbrace{\underline{x}^T\underline{y}}_{0} + c\,\underbrace{\underline{x}^T\underline{z}}_{0}$$

$$a = \frac{\underline{x}^T\underline{w}}{\underline{x}^T\underline{x}}$$

and if $\underline{x}^T\underline{x} = 1$, $\underline{y}^T\underline{y} = 1$ and $\underline{z}^T\underline{z} = 1$ $\Rightarrow$ $a = \underline{x}^T\underline{w}$

Likewise: $b = \underline{y}^T\underline{w}$ $\quad c = \underline{z}^T\underline{w}$

a, b, c are like the Fourier Series coefficients

$\underline{x}, \underline{y}, \underline{z}$ are like the sinewaves at different frequencies

$$\underline{x}^T\underline{w} = \sum_{k=1}^{3} w_k x_k \qquad \underline{y}^T\underline{w} = \sum_{k=1}^{3} w_k y_k \qquad \underline{z}^T\underline{w} = \sum_{k=1}^{3} w_k z_k$$

$$a_k = \frac{1}{T}\int_{-T/2}^{T/2} x(t)\,\underbrace{e^{-j2\pi\frac{k}{T}t}}_{s_k^*(t)}\,dt$$

where: $T = \int_{-T/2}^{T/2} |s_k(t)|^2\,dt$ $\quad s_k(t)s_k^*(t)$

$s_k(t) = e^{j2\pi\frac{k}{T}t}$