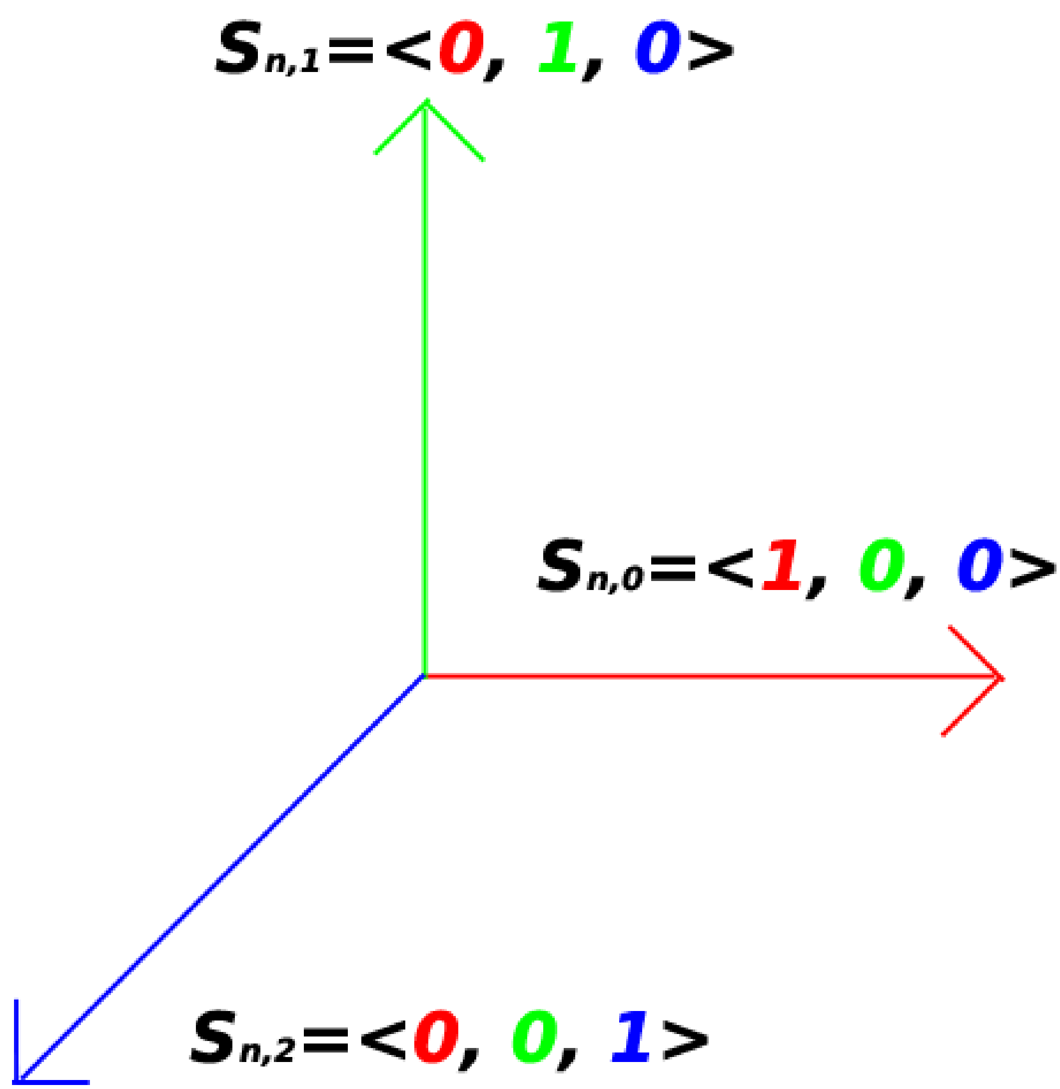
MODEL TRANSFORMATIONS MATRICES FROM A LINEAR ALGEBRA STAND POINT

Vector spaces are represented with a **set of basis vectors** and **matrices** are **vector sets**, so, we can use **matrices** for represent **vector spaces**. This way we can represent the following vector space using the matrix $\boldsymbol{S}$



Where $n = 0, 1, 2$

And $\boldsymbol{S} = [\boldsymbol{S_{n,0}} \quad \boldsymbol{S_{n,1}} \quad \boldsymbol{S_{n,2}}] = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

And in homogenous coordinates we have that $\boldsymbol{S} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Thus we can say that matrix $\boldsymbol{S}$ represent the standard basis in homogenous coordinates, and if we want represent column vector $\boldsymbol{x} = [1 \quad 0 \quad 0 \quad 0]^{\boldsymbol{T}}$ into the standard vector space we could simply say that $\boldsymbol{S}$ is a transformation matrix

$$\boldsymbol{Sx} = \boldsymbol{c} \; where \; \boldsymbol{x} = \boldsymbol{c} \; in \; this \; particular \; case \; (no \; transformation \; occurs \; in \; vector \; \boldsymbol{x})$$

If we want transform our vector $\boldsymbol{x}$, let's say rotate it θ radians anti-clockwise along z axis we must define a new $\boldsymbol{A}$ matrix that defines a new vector basis that is relative to the standard basis.

POSSIBLE INTERPRETATIONS

In the vector transformation $\boldsymbol{Ax} = \boldsymbol{c}$

We can say that **c** is a vector identical to **x** but represented in a different vector basis (which is represented in the columns of matrix **A)**

We can say that **c** represents a vector rotated by θ radians anti-clockwise along z axis