**Relationship between homogenous coordinate systems and coordinate systems**

* Homogeneous coordinates and projective geometry bear exactly the same relationship. Homogeneous coordinates provide a method for doing calculations and proving theorems in projective geometry, especially when it is used in practical applications. Projective geometry can be applied in real world applications through use of computer graphics.
* Homogeneous coordinates have a natural application to Computer Graphics; they form a basis for the projective geometry used extensively to project a three-dimensional scene onto a two- dimensional image plane. They also unify the treatment of common graphical transformations and operations. Homogeneous coordinates are ubiquitous in computer graphics because they allow common vector operations such as translation, rotation, scaling and perspective projection to be represented as a matrix by which the vector is multiplied.
* They involve use of certain matrices for each transformation and it allows 3 primitive transforms. One should add a fourth coordinate w to each point and a column and row to each affine transform matrix. This is to enable transformation from .After this you divide each coordinate by the w coordinate and discard the 3D coordinate.
* W=0 represents points at infinity
* PH = (Px, Py, Pz, Pw)
* P3d = (Px/Pw, Py/Pw, Pz/Pw)
* Some examples of the transformations represented by matrices can be seen below



