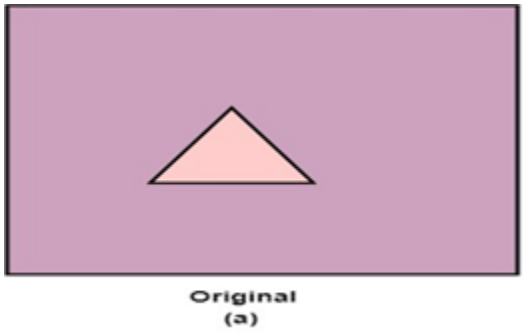
Scaling

Scaling is used to change the size of an object. The size can be increased or decreased. The scaling three factors are required S_x S_y and S_z.

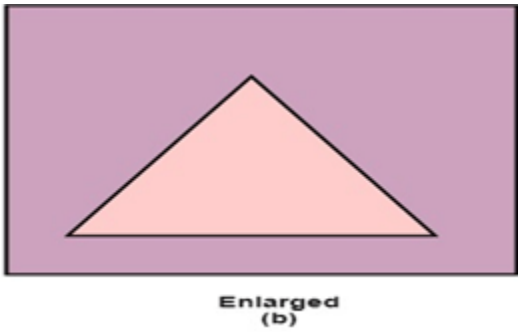
S_x=Scaling factor in x- direction

S_y=Scaling factor in y-direction

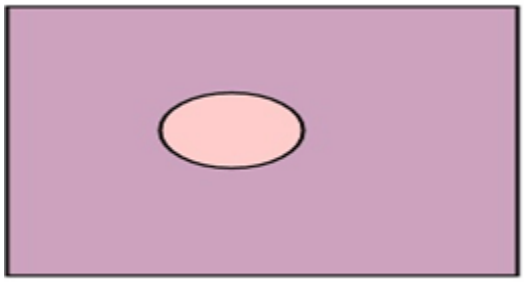
S_z=Scaling factor in z-direction



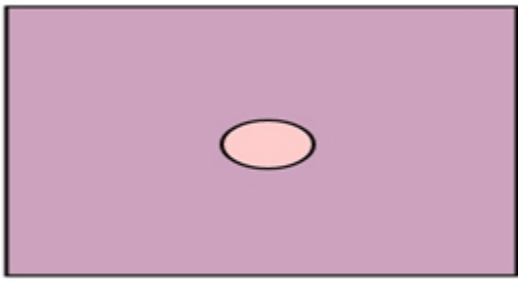
Original
(a)



Enlarged
(b)



Original
(a)



Reduced
(b)

Matrix for Scaling

$$\begin{Bmatrix} S_x & 0 & 0 & 0 \\ 0 & S_y & 0 & 0 \\ 0 & 0 & S_z & 0 \\ 0 & 0 & 0 & 1 \end{Bmatrix}$$

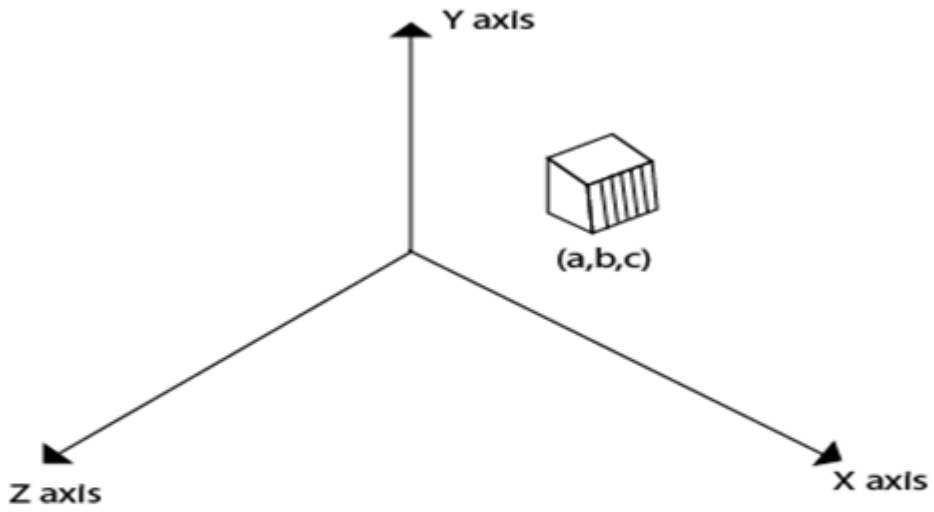
Scaling of the object relative to a fixed point

Following are steps performed when scaling of objects with fixed point (a, b, c). It can be represented as below:

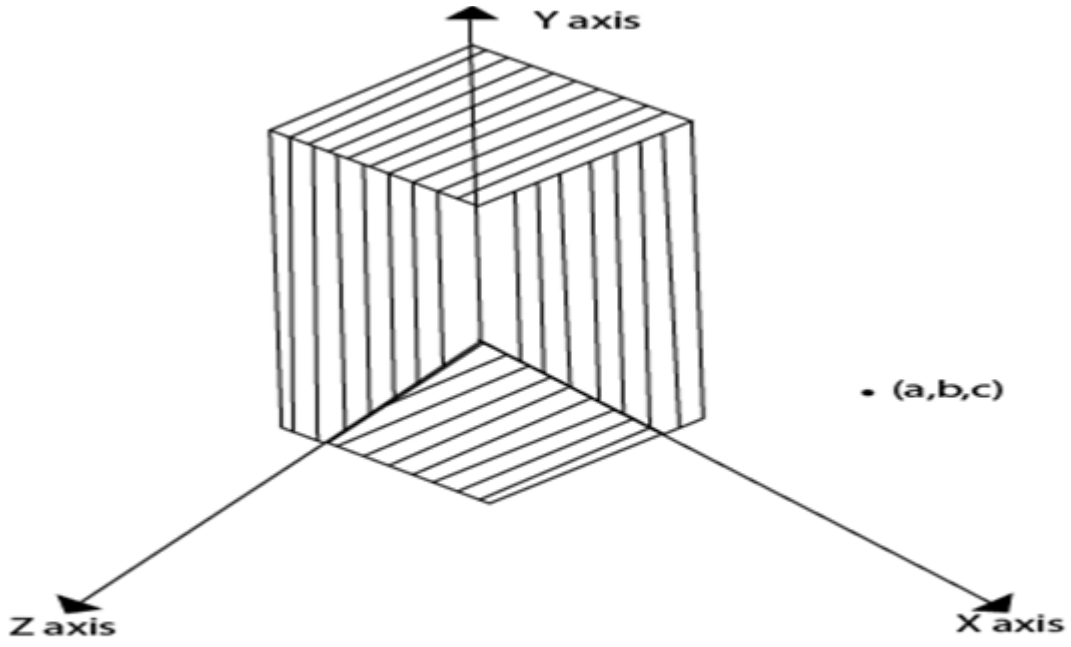
1. Translate fixed point to the origin
2. Scale the object relative to the origin
3. Translate object back to its original position.

Note: If all scaling factors $S_x=S_y=S_z$.Then scaling is called as uniform. If scaling is done with different scaling vectors, it is called a differential scaling.

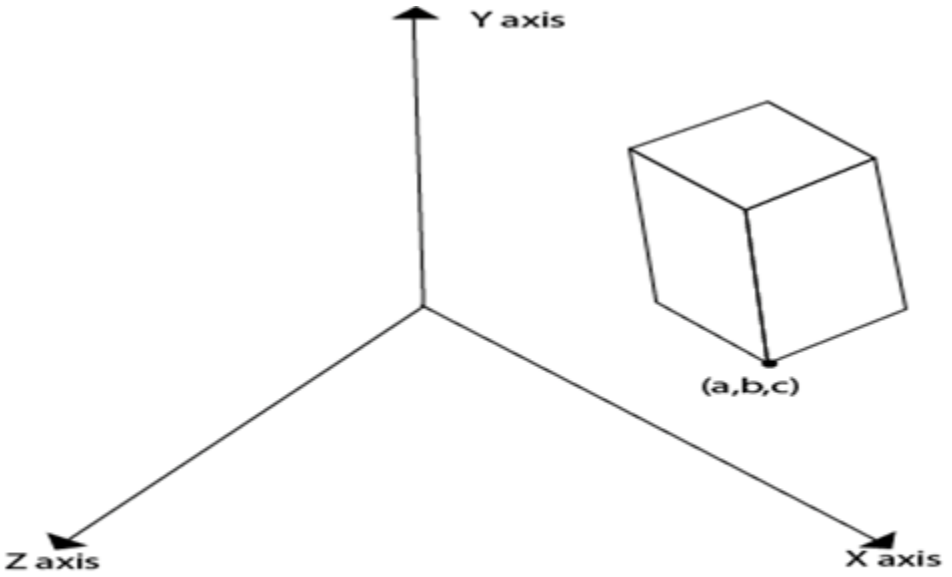
In figure (a) point (a, b, c) is shown, and object whose scaling is to done also shown in steps in fig (b), fig (c) and fig (d).



Object & point for scaling
(a)



Scaling of object
(c)



Object shifted to original position after scaling
(d)