Unit-3

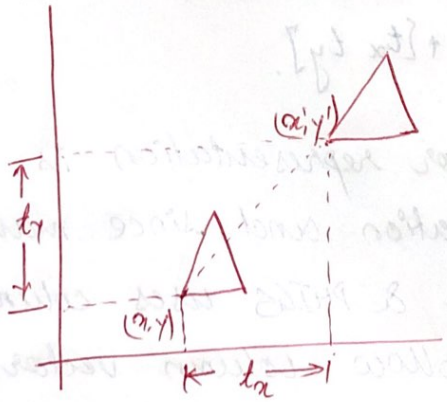
Transformation :-

changing position, shape, size or orientation of an object on display is known as transformation.

Basic Transformation

- The basic transformation includes three transformations. Translation, Rotation & Scaling.
- These three transformations are known as basic transformation because with combination of these three transformations we can obtain any transformation.

Translation



- It is a transformation that used to reposition the object along the straight line path from one co-ordinate location to another.
- It is rigid bood transformation so we need to translate whole object.

- We translate two dimensional point by adding translation distance t_x and t_y to the original co-ordinate position (x, y) to move at new position (x', y') as:

$$x' = x + t_x \quad \& \quad y' = y + t_y$$

- Translation distance pair (t_x, t_y) is called Translation vector or shift vector.
- We can represent it in ~~row vector~~ single matrix equation in column vector as

$$P' = P + T$$

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} t_x \\ t_y \end{bmatrix}$$

- We can also represent it in row vector form as:

$$[x' \; y'] = [x \; y] + [t_x \; t_y].$$

- Since column vector representation is standard mathematical notation and since many graphics package like GKS & PHIGS uses column vector we will also follow column vector representation

Example:-

1) Translate the traingle A(10,10) B(15,15) C(20,10) 2 unit in x direction and 1 unit in y direction.

we know that

$$P' = P + T$$

i.e $\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} t_x \\ t_y \end{bmatrix}$

For point (10,10)

$$A' = \begin{bmatrix} 10 \\ 10 \end{bmatrix} + \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 12 \\ 11 \end{bmatrix}$$

For point (15,15)

$$B' = \begin{bmatrix} 15 \\ 15 \end{bmatrix} + \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 17 \\ 16 \end{bmatrix}$$

For point (20,10)

$$C' = \begin{bmatrix} 20 \\ 10 \end{bmatrix} + \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 22 \\ 11 \end{bmatrix}$$

Final co-ordinate after tran