Assignment - 6

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Title :- Basic Transformation.

Problem statement :-

Write a c++ program to draw 2D objects & perform basic transformations

objective :-

i) To understand the concept of scaling, translation & rotation.

ii) To know the different matrices which are used to perform 2D transformation such as scaling, rotation & translation.

Outcome :-

The students will be able to

i) To implement the transformation on various object. ii) To draw 2D object & perform transformation iii) To perform scaling, rotation & translation on 2D object.

S/H Requirements :-

Qt Creator, Linux 64 bit OS.

Theory :-

2D objects are list 2D transformation means changing by applying rules.

When a transformation takes on 2D plane, it is called 2D transformation.

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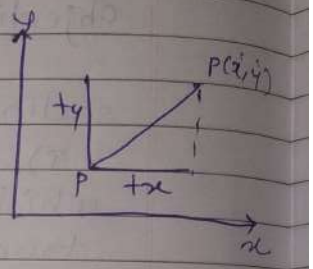
Translation :-

i) A translation moves a object to different position on screen.

ii) You can translate a point in 2D by adding translation co-ordinates (t_x, t_y) to the original co-ordinate x, y to get the new co-ordinate x', y'.

$$P' = [x, y, 1] \cdot \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ t_x & t_y & 1 \end{bmatrix}$$



$$x' = x + t_x.$$
$$y' = y + t_y.$$

Rotation :-

i) In rotation we rotate the object at particular angle from its origin

ii) From following figure we can see that point x, y is located at angle from horizontal, x co-ordinate with distance x from origin.

matrix representation,

$$R = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Scaling :-

i) To change the size of the object scaling is used.

ii) In scaling process, you either expand as compress the dimension of object.

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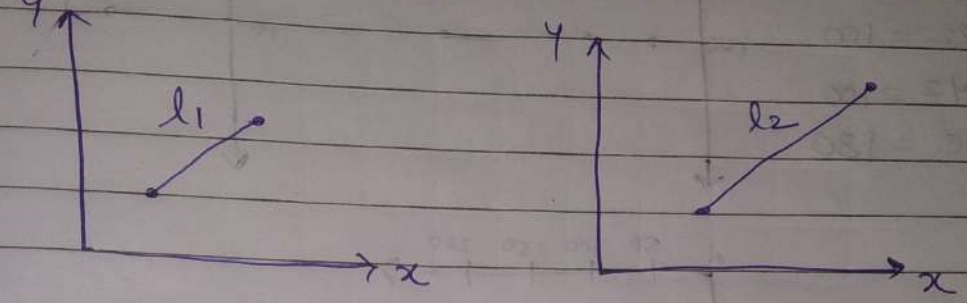
iii) Scaling can be achieved by multiplying original coordinate with scaling factor to get desired result.

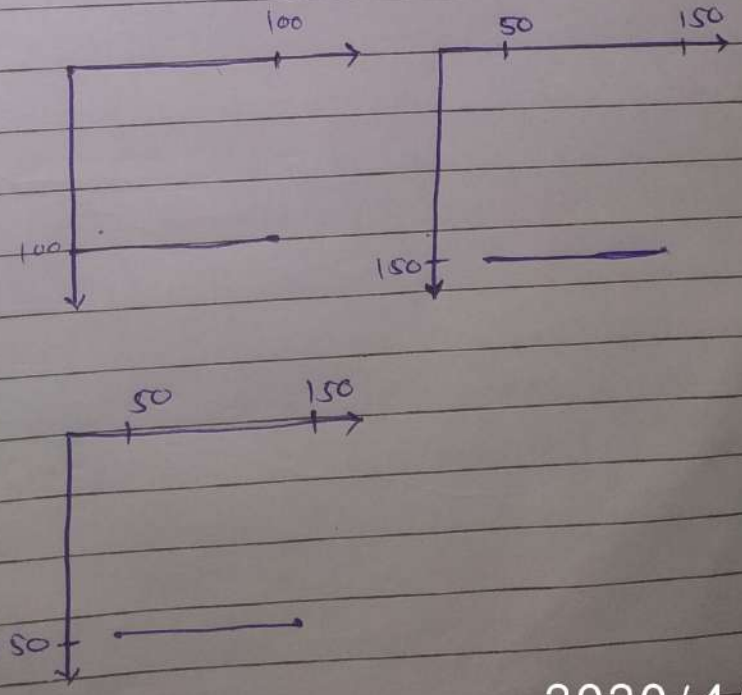


Matrix representation.

$$S = \begin{bmatrix} Sx & 0 & 0 \\ 0 & Sy & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Application of 2D transformation.
i) Circle ii) Triangle iii) Rectangle

Test cases :-

Input	Expected o/p	Actual o/p	Result
1) $x_1 = 0$ $y_1 = 100$ $y_2 = 100$ $x_2 = 100$ $tx = 50$ $ty = 50$			Success.

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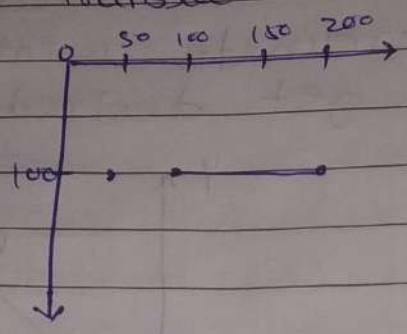
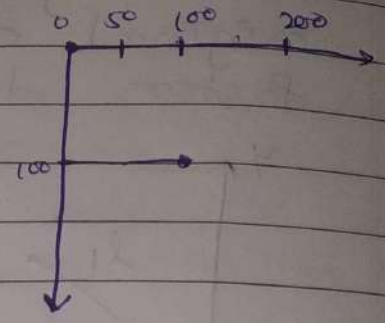
I/P | Expected O/P | Actual O/P | Result

translation

2] $x_1 = 200$
$y_1 = 100$
$x_2 = 100$
$y_2 = 100$
$e = 180$





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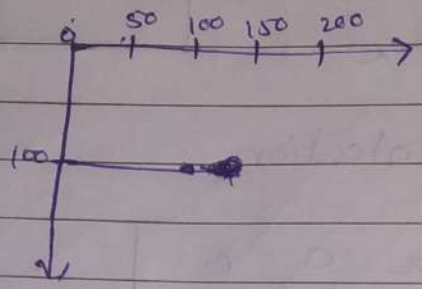

Conclusion :-

We have successfully implemented basic transformations.

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