Subject: Computer graphics

Topic : Rotation example problems

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Rotation

EXAMPLE PROBLEMS

PROBLEM

Given a triangle with corner coordinates (0, 0), (1, 0) and (1, 1). Rotate the triangle by 90 degree anticlockwise direction and find out the new coordinates?

SOLUTION

- We rotate a polygon by rotating each vertex of it with the same rotation angle.

Given-

- Old corner coordinates of the triangle = A (0, 0), B(1, 0), C(1, 1)
- Rotation angle = θ = 90º

For Coordinates A(0, 0)

Let the new coordinates of corner A after rotation = (X_{new}, Y_{new}).

Applying the rotation equations, we have-

X_{new}
$= X_{old} \times \cos\theta - Y_{old} \times \sin\theta$
$= 0 \times \cos 90º - 0 \times \sin 90º$
$= 0$

Y_{new}
$= X_{old} \times \sin\theta + Y_{old} \times \cos\theta$
$= 0 \times \sin 90º + 0 \times \cos 90º$
$= 0$

Thus, New coordinates of corner A after rotation = (0, 0).

For Coordinates B(1, 0)

Let the new coordinates of corner B after rotation = (X_{new}, Y_{new}).

X_{new}
$= X_{old} \times \cos\theta - Y_{old} \times \sin\theta$
$= 1 \times \cos 90º - 0 \times \sin 90º$
$= 0$

Y_{new}
$= X_{old} \times \sin\theta + Y_{old} \times \cos\theta$
$= 1 \times \sin 90º + 0 \times \cos 90º$
$= 1 + 0$
$= 1$

Thus, New coordinates of corner B after rotation = (0, 1).

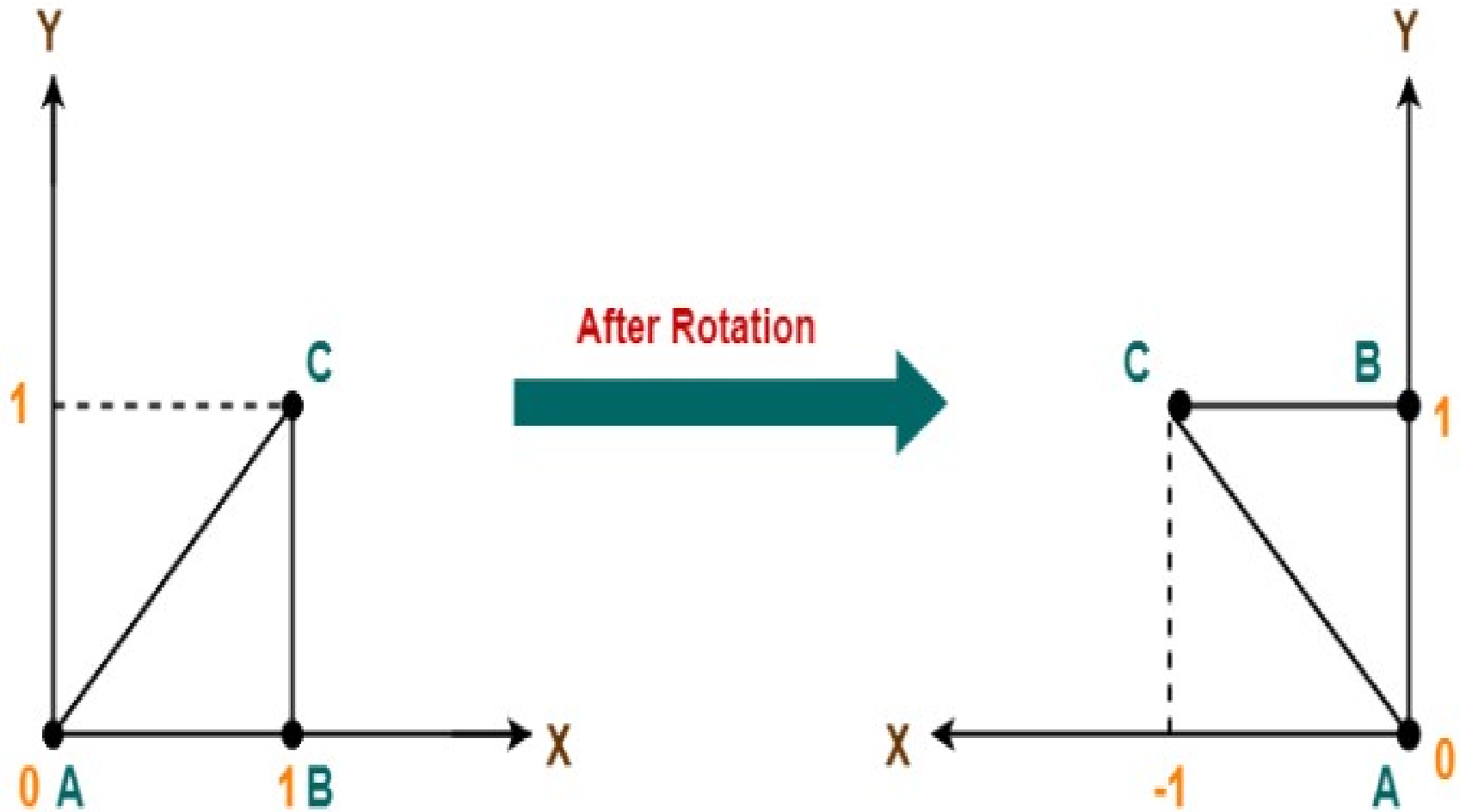
For Coordinates C(1, 1)

Let the new coordinates of corner C after rotation = (X_{new}, Y_{new}).

X_{new}
$= X_{old} \times \cos\theta - Y_{old} \times \sin\theta$
$= 1 \times \cos 90º - 1 \times \sin 90º$
$= 0 - 1$
$= -1$

Y_{new}
$= X_{old} \times \sin\theta + Y_{old} \times \cos\theta$
$= 1 \times \sin 90º + 1 \times \cos 90º$
$= 1 + 0$
$= 1$

Thus, New coordinates of corner C after rotation = (-1, 1).


Y
C
1
0 A
1 B
X
After Rotation
Y
C
B
1
X
-1
A
0