The Algorithm

1. Initial values:- point$(0,r)$

   $x_0 = 0$

   $y_0 = r$

   move circle origin at $(0,0)$ by $x = x - x_c$ and $y = y - y_c$

2. Initial decision parameter

   $$p_0 = f_{circle}\left(1, r - \tfrac{1}{2}\right) = 1 + \left(r - \tfrac{1}{2}\right)^2 - r^2 = \tfrac{5}{4} - r$$

3. At each x_i position, starting at $i = 0$, perform the following test: if $p_i < 0$, the next point is $(x_i + 1, y_i)$ and

   $p_{i+1} = p_i + 2x_{i+1} + 1$

   If $p_i \geq 0$, the next point is (x_i+1, y_i-1) and

   $p_{i+1} = p_i + 2x_{i+1} + 1 - 2y_{i+1}$

   where $2x_{i+1} = 2x_i + 2$ and $2y_{i+1} = 2y_i - 2$

4. Determine symmetry points in the other octants

5. Move pixel positions (x,y) onto the circular path centered on (x_c, y_c) and plot the coordinates: $x = x + x_c$, $y = y + y_c$
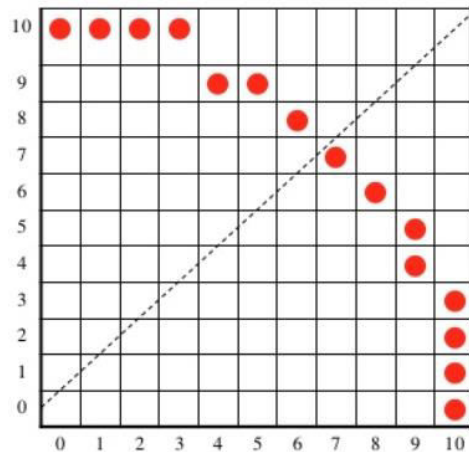
6. Repeat 3 – 5 until $x \geq y$

Example

$r = 10$

$p_0 = 1 - r = -9$ (if r is integer round $p_0 = 5/4 - r$ to integer)

Initial point $(x_0, y_0) = (0, 10)$

i	p_i	x_{i+1}, y_{i+1}	$2x_{i+1}$	$2y_{i+1}$
0	-9	(1, 10)	2	20
1	-6	(2, 10)	4	20
2	-1	(3, 10)	6	20
3	6	(4, 9)	8	18
4	-3	(5, 9)	10	18
5	8	(6, 8)	12	16
6	5	(7, 7)		

Lecture No 20 Topic: Transformation

Translation
- Rotation
- Scaling
- Shear
- Reflection

Matrix Representation

Homogeneous Coordinates

Matrix Composition

Composite Transformations

2D Transformation
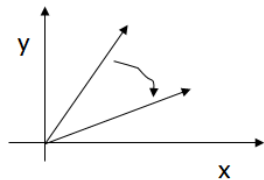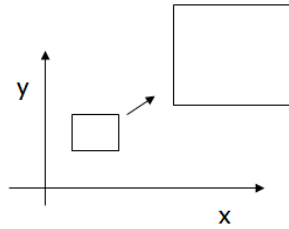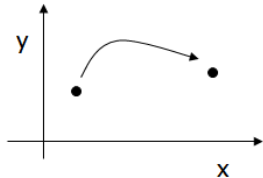
Geometric Transformation

What is geometric transformation?

Operations that are applied to the geometric description of an object to change its

position, orientation, or size are called geometric transformations

2D Transformations

Applications:

- Animation

- Image/object manipulation

- Viewing transformation

- etc.