# Computação Gráfica
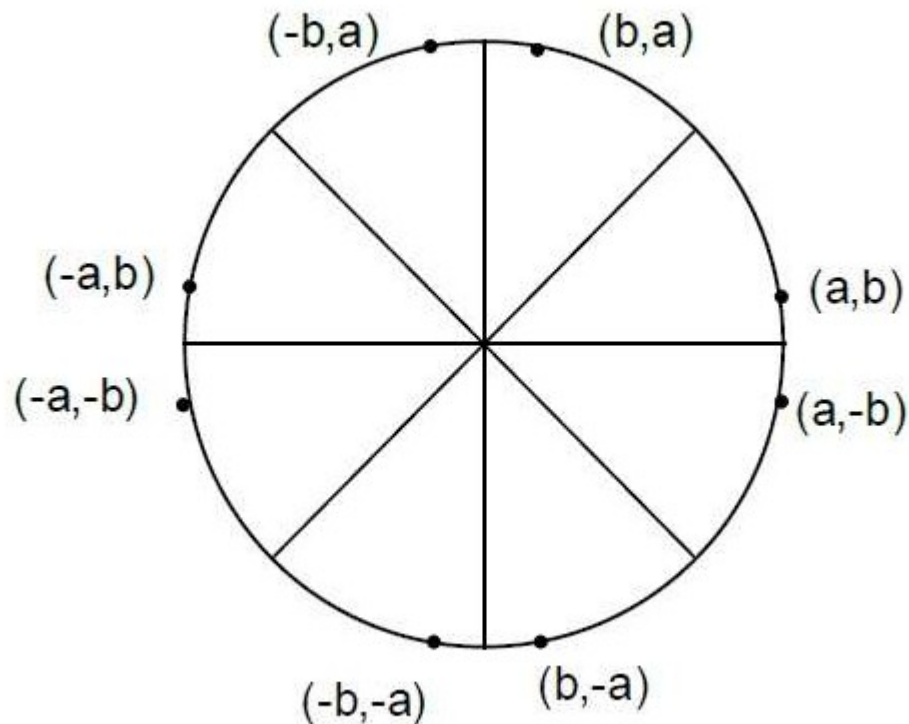
## Hitalo Nascimento

## Primitivas Gráficas

# Aula 04

Os principais algoritmos para desenho de círculos são:

- Midpoint Circle Algorithm;

- Bresenham's Algorithm.

# INTRODUÇÃO

The equation of circle is $X^2 + Y^2 = r^2$, where r is radius.

## Midpoint Circle Algorithm

1. Input radius $r$ and circle center $(x_c, y_c)$, and obtain the first point on the circumference of a circle centered on the origin as

$$(x_0, y_0) = (0, r)$$

2. Calculate the initial value of the decision parameter as

$$p_0 = \frac{5}{4} - r$$

3. At each $x_k$ position, starting at $k = 0$, perform the following test: If $p_k < 0$, the next point along the circle centered on $(0, 0)$ is $(x_{k+1}, y_k)$ and

$$p_{k+1} = p_k + 2x_{k+1} + 1$$

Otherwise, the next point along the circle is $(x_k + 1, y_k - 1)$ and

$$p_{k+1} = p_k + 2x_{k+1} + 1 - 2y_{k+1}$$

where $2x_{k+1} = 2x_k + 2$ and $2y_{k+1} = 2y_k - 2$.

4. Determine symmetry points in the other seven octants.
5. Move each calculated pixel position $(x, y)$ onto the circular path centered on $(x_c, y_c)$ and plot the coordinate values:

$$x = x + x_c, \qquad y = y + y_c$$

6. Repeat steps 3 through 5 until $x \geq y$.

# BRESENHAM'S ALGORITHM

**Step 1** – Get the coordinates of the center of the circle and radius, and store them in x, y, and R respectively. Set P=0 and Q=R.

**Step 2** – Set decision parameter D = 3 – 2R.

**Step 3** – Repeat through step-8 while P ≤ Q.

**Step 4** – Call Draw Circle (X, Y, P, Q).

**Step 5** – Increment the value of P.

**Step 6** – If D < 0 then D = D + 4P + 6.

**Step 7** – Else Set R = R - 1, D = D + 4(P-Q) + 10.

**Step 8** – Call Draw Circle (X, Y, P, Q).

# Bibliografia

- https://www.tutorialspoint.com/computer_graphics/computer_graphics_quick_guide.htm
- Donald Hearn and M. Pauline Baker. Computer Graphics C version. Second Ed.