**Assignment No. 03**

3. Implement Bresenham circle drawing algorithm to draw any object. The object should be

displayed in all the quadrants with respect to center and radius

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| **Aim** |
| Understand DDA, Midpoint and Bresenham’s Circle drawing.  Further using these algorithms to draw real time pictures |

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| **Objective(s)** | |
| **1** | To Learn Circle drawing slgorithm |

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| **Theory** |
| **Bresenham’s Circle Drawing:**  A circle is a symmetrical figure. It has eight - way symmetry. If we know any single point of circle we can plot all remaining seven pixels using 8- way symmetry.  This algorithm considers 8 –way symmetry of circle and generates the whole circle.  1/8th part of circle i.e. from 90° to 45° is drawn, during this x increments in positive direction and y increments in negative direction. In this algorithm we have to select proper pixel which is either on the circle or closed to the circle port.  +x  x  y  -y  90°  45°  0  Decision Variable is given as d = 3 -2r  **Algorithm:**   1. Read radius (r) of the circle. 2. Initialize Decision variable   d = 3 – 2r.   1. Initialize Starting point   x = 0, y = r   1. do   {  Plot (x, y)  Plot (y, x)  Plot (y, - x)  Plot (x, - y)  Plot (- x, - y)  Plot (- y, - x)  Plot (- y, x)  Plot (- x, y)    if ( d < 0)  {  d = d + 4x + 6  }  else  {  d = d + 4(x – y) + 10  y = y – 1  }  x = x + 1  }while ( x < y)     1. Stop.   **Mid Point circle**  **Define a circle function:**  **Fcircle(x,y) = x2 + y2 – r2**  **1.**Any point (x,y) on the boundary of the circle with radius satisfies the equation fcircle(x,y) = 0.  **2.** If the point is in the interior of the circle ,the circle function is negative.  **3.** And if the point is outside the circle ,the circle function is positive.  **4.** Mid point of the circle is at (xk +1,yk).  **5.** We have to determine the next pixel position which is nearer to the circle either  (xk + 1,yk) or (xk +1,yk -1).  **6.** Decision Parameter at the mid point between the two pixels :  **Pk = fcircle( xk +1,yk – ½)**  **= (xk +1)2 + (yk -1/2)2 – r2**  **7.**With the help of this we can calculate pk+1.  **8.** The initial decision parameter is obtained by evaluating the circle function at the start position (x0,y0)= (0,r)  **9.** **p0 = 1-r**.  **Algorithm :**   1. Input radius r and circle center (xc,yc) , and obtain the first point on the circumference of the circle centered on the origin as   ( x0,y0) = (0,r)   1. Calculate the initial value of the decision parameter as   P0 = 5/4 – r   1. At each xk position , startin at k =0,perform the following test : If pk < 0 , the next point along the circle centered on (0,0) is (xk + 1,yk) and      1. Pk+1 = pk + 2xk+1 + 1 2. Otherwise , the next point along the circle is (xk +1,yk-1) and   Pk+1 = pk + 2xk+1 +1 – 2yk+1  Where 2xk+1 = 2xk +2 and 2yk+1 = 2yk -2.  6. Determine symmetry points in the other seven octants. Move each calculated pixel position (x,y) onto the circular path centered on (xc,yc) and plot the coordinate values :  x= x + xc  y = y + yc  7. Repeat syeps 3 through 5 until x>=y. |

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| **Input** |
| 1. Enter two points. 2. Enter radius and centre of circle 3. Draw inscribed and Circumscribed circles in the triangle |

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| **Output** |
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| **Lab. Based FAQ** |
| 1. What is ant aliasing? 2. Discuss DDA advantages and disadvantages? |

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| **Lab. Based FAQ** |
| 1. Draw a moving Car using the Bresenham’s algorithm 2. Draw a raining scene using DDA algorithm. 3. Draw a raining scene using Bresenham’s algorithm. 4. Draw a dancing doll using Bresenham’s Circle drawing algorithm. |