CSE-301 Computer Graphics

Final Exam

ID : 14294

DATE : 23/06/2020

SUBJECT : COMPUTER GRAPHICS

DEPARTMENT : BS(CS) (5TH SEMESTER)

Question #1 (15 Marks)

a. **What is 'Eight Way Symmetry' of a circle?**

ANS:- The most important thing in drawing a circle is learning how the circle is drawn using 8-way symmetry. It is based on Mirror reflection. If we see Right hand in the mirror we will see Left hand, Similarly if we see pixel (x,y) in mirror we will see (y,x). So point P1(x,y) will become P2(y,x) after reflection .

b. **Write the 8 coordinates for representing 8-way symmetry in terms of (x, y).**

ANS:- Any circle follows 8-way symmetry. This means that for every point (x,y) 8 points can be plotted. These (x,y), (y,x), (-y,x), (-x,y), (-x,-y), (-y,-x), (y,-x), (x,-y).
For any point (x+a, y+b), points (x ± a, y ± b) and (y ± a, x ± b) also lie on the same circle. So it is sufficient to compute only 1/8 of a circle, and all the other points can be computed from it.

c. **How does it help minimize the calculations?**

Ans:-

X1 = 1 | X2 = 5
Y1 = 1 | Y2 = 3

$\triangle X = 4$

$\triangle Y = 2$

The initial decision parameter and the minimize calculation has the value;

$$P = 2\triangle y - \triangle x$$

$$= 4 - 4 = 0$$

Question #2 (10 Marks)

a. **What happens if Refresh Rate of a display is too slow? Explain.**

ANS:- Typically a refresh rate of less than 60 Hz will produce noticeable flicker, meaning you can tell the screen is being redrawn instead of seeing a constant image. If the refresh rate is too slow, this flicker can be hard on your eyes and may cause them to tire quickly.

b. What happens if Refresh Rate of a display is too fast? Explain.

ANS:- If you specify a refresh rate that is too high for your monitor, your screen may become unusable and your hardware may be damaged. Also note, Some monitors shiver at higher rates and some of the higher resolutions and color depths may be unavailable at the higher frequencies. In my older monitor, it displayed resolutions from 60Hz to 200Hz.

Question #3 (10 Marks)

For plotting a line between two points, we can use algorithms such as

- Incremental Line Algorithm
- DDA Algorithm
- Midpoint Algorithm
- Bresenham's Algorithm

a. Explain the method used in and TWO of the above algorithms in your own words.

ANS:-

DDA ALGORITHM:-

In any 2-Dimensional plane in case we partner two centers (x0, y0) and (x1, y1), we get a line section. Notwithstanding, by virtue of PC representations we can not clearly join any two encourage centers, for that we should figure widely appealing point's sort out and put a pixel for each midpoint, of the perfect concealing with help of limits like putpixel(x, y, K) in C, where (x,y) is our co-ordinate and K implies some concealing.

BRESENHAM'S ALGORITHM:-

A productive calculation to render a line with pixels. The long measurement is augmented for every pixel, and the fragmentary incline is collected.

It denotes all the squares a line goes through, not simply the least blunder squares. It might help with vacillated lines or checking for snags.

Given facilitate of two focuses A(x1, y1) and B(x2, y2). The errand to discover all the middle of the road focuses required for drawing line AB on the PC screen of pixels.

b. Explain the drawbacks of these algorithms.

ANS:- DDA ALGORITHM:

- Floating point arithmetic in DDA algorithm is still time consuming.

- The algorithms is orientation dependent. Hence end point accuracy is poor.
- Although DDA is fast, the accumulation of round-off error in successive additions of floating point increment, however can cause the calculation pixel position to drift away from the true line path for long line segment.
- Rounding-off in DDA is time consuming.

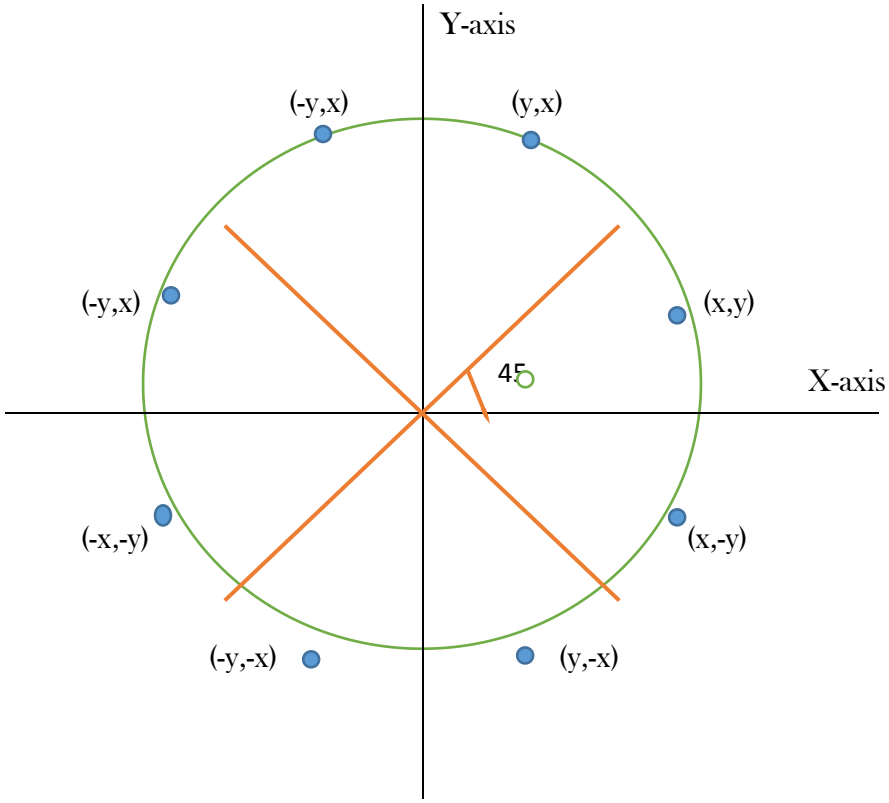
BRESENHAM'S ALGORITHM:

- Floating point number juggling in DDA calculation is still tedious.
- The calculation is direction subordinate. Consequently end point exactness is poor.
- Although DDA is quick, the gathering of adjust mistake in progressive augmentations of coasting point increase, anyway can cause the count pixel position to float away from the genuine line way for long queue fragment.
- Rounding-off in DDA is tedious.

Question #4 (15 Marks)

When plotting a circle, the convention is to draw the arc of first quadrant and then impose the same values in all the other 7 quadrants. To plot the arc in first quadrant, we just need the radius of the circle.

a. **Draw the first arc of the circle centered at (0, 0) and radius r = 13.** (10 Marks)



For each pixel (x,y) all possible pixels in 8 octants

B. **Convert the (x, y) values determined in part 'a' to the second quadrant.** (5 Marks)

ANS:-

Given
r=13 (x,y)=(0,0)

If d>0 then (x+1, y-1)
Else (x+1, y)
Initially (x,y)=(0,13)
Where d=3-(2*r) and x=0, y=r=13
d=3-(2(13)
d=3-26
d=-26<0
So (x+1,y)= (1,13)
Now x<y 1<13 so repeat above step

d=-23<0 so
d=d+(4*x)+6
=-23+(4*1)+6
d=-23+(4*1)+6
d=-13<0

So (x+1,y)=(2,13) Here x<y
d= -13+(4*2)+6
d= -13+8+6
d= 1>0

(x+1,y)=(3,13)
X<y and d>0 so

d= d+4 * (x-y)+10
d= 1+4*(3-13)+10
d= -29<0

And (x,y-1) - (3,12)
X<y and d<0 Therefore

d= -29+(4*3)+6 = -11<0
(x+1,y) = (4,12)

X<y and d<0 Therefore

d= -11 + (4*4)+6= 11
(x+y, y-1) = (5, 11)

X<y and d>0 Therefore

d=11+4(5-11)+10
d=19

So (x+1, y-1)+ (6,10)

X<y and d>0 Therefore

d= 10+4*(6-10)+10
d=4>0

So

(x+1. y-1) - (7,9)
X<y and d>0 Therefore
D= 4+4*(7-9)+10
d=6>0

S0 (x+1, y-1) = (8,8)

Here x=y so exit the program