RAMA UNIVERSITY

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FACULTY OF ENGINEERING & TECHNOLOGY

BCS -504 Computer Graphics & Multimedia

Lecture-08

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OUTLINE

- SCAN CONVERSION DEFINITION
- ADVANTAGE OF DEVELOPING ALGORITHMS FOR SCAN CONVERSION
- SCAN CONVERTING A POINT
- SCAN CONVERTING A STRAIGHT LINE
- DDA ALGORITHM
- BRESENHAM'S LINE ALGORITHM

Scan Conversion Definition

It is a process of representing graphics objects a collection of pixels. The graphics objects are continuous. The pixels used are discrete. Each pixel can have either on or off state.

The circuitry of the video display device of the computer is capable of converting binary values (0, 1) into a pixel on and pixel off information. 0 is represented by pixel off. 1 is represented using pixel on. Using this ability graphics computer represent picture having discrete dots.

Any model of graphics can be reproduced with a dense matrix of dots or points. Most human beings think graphics objects as points, lines, circles, ellipses. For generating graphical object, many algorithms have been developed.

Advantage of developing algorithms for scan conversion

1. Algorithms can generate graphics objects at a faster rate.
2. Using algorithms memory can be used efficiently.
3. Algorithms can develop a higher level of graphical objects.

Examples of objects which can be scan converted

Point

Line

Sector

Arc

Ellipse

Rectangle

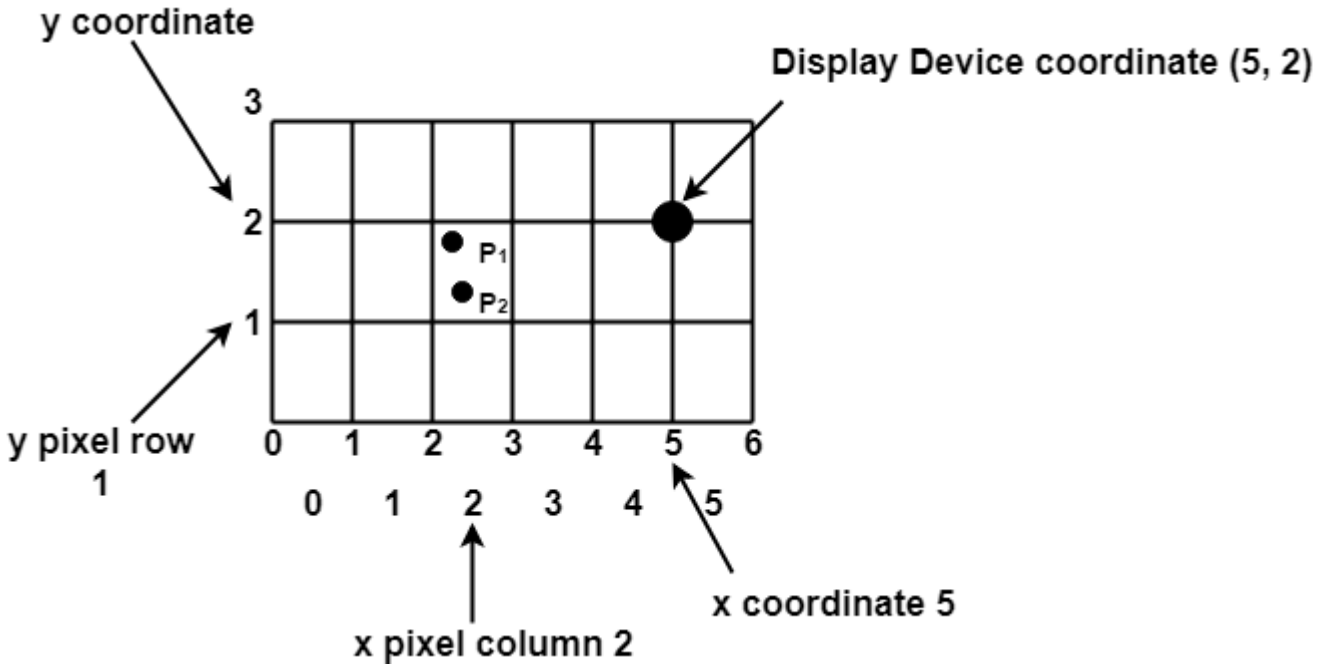
Polygon

Characters

Filled Regions

Scan Converting a Point

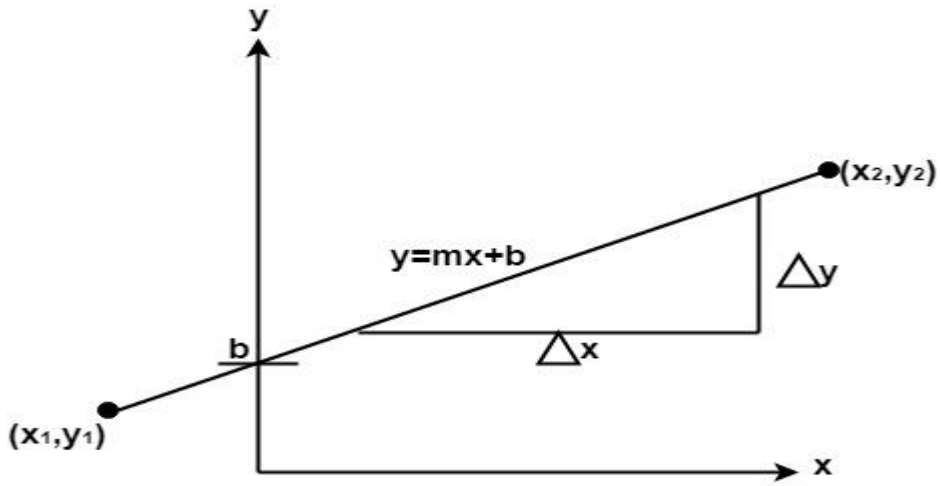
Each pixel on the graphics display does not represent a mathematical point. Instead, it means a region which theoretically can contain an infinite number of points. Scan-Converting a point involves illuminating the pixel that contains the point.
Example: Display coordinates points as shown in fig would both be represented by pixel (2, 1). In general, a point p (x, y) is represented by the integer part of x & the integer part of y that is pixels [(INT (x), INT (y).



Scan Converting a Straight

A straight line may be defined by two endpoints & an equation. In fig the two endpoints are described by (x_1,y_1) and (x_2,y_2). The equation of the line is used to determine the x, y coordinates of all the points that lie between these two endpoints.

Using the equation of a straight line, y = mx + b where m = & b = the y interrupt, we can find values of y by incrementing x from x =x_1, to x = x_2. By scan-converting these calculated x, y values, we represent the line as a sequence of pixels.



DDA Algorithm

Step1: Start Algorithm

Step2: Declare x_1,y_1,x_2,y_2,dx,dy,x,y as integer variables.

Step3: Enter value of x_1,y_1,x_2,y_2.

Step4: Calculate dx = x_2-x_1

Step5: Calculate dy = y_2-y_1

Step6: If ABS (dx) > ABS (dy)

Then step = abs (dx)

Else

Step7: x_{inc}=dx/step

y_{inc}=dy/step

assign x = x_1

assign y = y_1

Step8: Set pixel (x, y)

Step9: x = x + x_{inc}

y = y + y_{inc}

Set pixels (Round (x), Round (y))

Step10: Repeat step 9 until x = x_2

Step11: End Algorithm

Bresenham's Line Algorithm

Step1: Start Algorithm

Step2: Declare variable x_1,x_2,y_1,y_2,d,i_1,i_2,dx,dy

Step3: Enter value of x_1,y_1,x_2,y_2

Where x_1,$y_1$are coordinates of starting point

And x_2,y_2 are coordinates of Ending point

Step4: Calculate dx = x_2-x_1

Calculate dy = y_2-y_1

Calculate i_1=2*dy

Calculate i_2=2*(dy-dx)

Calculate d=i_1-dx

Step5: Consider (x, y) as starting point and x_{end}as maximum possible value of x.

If dx < 0

Then x = x_2

y = y_2

x_{end}=x_1

If dx > 0

Then x = x_1

y = y_1

x_{end}=x_2

Bresenham's Line Algorithm

Step6: Generate point at (x,y)coordinates.

Step7: Check if whole line is generated.

If $x >= x_{end}$

Stop.

Step8: Calculate co-ordinates of the next pixel

If $d < 0$

Then $d = d + i_1$

If $d \geq 0$

Then $d = d + i_2$

Increment $y = y + 1$

Step9: Increment $x = x + 1$

Step10: Draw a point of latest (x, y) coordinates

Step11: Go to step 7

Step12: End of Algorithm

Multiple Choice Question

MUTIPLE CHOICE QUESTIONS:

Sr no	Question	Option A	Option B	OptionC	OptionD
1	The electron beam is swept across the screen, one row at a time, from top to bottom.	Random Scan System	Raster Scan System	both	none
2	Its resolution is good because this system produces smooth lines drawings because CRT beam directly follows the line path.	Random Scan System	Raster Scan System	Rapid Scan System	all of these
3	The electron beam is directed only to the parts of screen where a picture is to be drawn.	Raster Scan System	Rapid Scan System	Random Scan System	none
4	In technique of CRT coated with two phosphor layers usually red and green. That shows the ……..	outer layer of green	outer layer of red	inner layer of green	b & c
5	Its resolution is poor because raster system in contrast produces zigzag lines that are plotted as discrete point sets.	Raster Scan System	Random Scan System	no scan system	all of these

REFERENCES

- http://www.engppt.com/search/label/Computer%20Graphics