

## ADVANCE JAVA

Database: It is a collection of interrelated data.

DBMS: Database Mngt. System. it is a s/w that provides you with mechanism to :

- retrieve
- modify etc.

RDBMS: Relational DBMS. It is based on relational theory.

JDBC: JAVA DATABASE CONNECTIVITY (written in java)

a set of Java classes & methods to interface with database.

SQL: Structured Query lang

- retrieve
- modify
- store data.

\* Info. req. for communica<sup>n</sup> in DB connectivity:

- name of DB
- location of DB
- RDBMS / DBMS product used.

We use JDBC calls to - retrieve  
- update

info. from DBMS using JDBC.

PROCESS:

establish DB connection

↓  
send SQL stmt.

↓  
process & return → close connection.  
result

ODBC (written in C)

open DB connectivity.



It is an interface used for accessing RDBMS.

It is based on (Open SQL cmd level interface)

ANSI SQL → DB. related

JDBC API:

JDBC drivers are used as java Prog. Cannot

directly communicate with ODBC driver.

They are :

① JDBC- ODBC driver + ODBC driver (TYPE 1)

They rely on intermediary such as ODBC to transfer SQL calls to DB.

② Native API partly JAVA driver (TYPE 2)

They use native C lang lib calls to translate JDBC to native client lib.

③ JDBC- NET pure java Driver. (TYPE 3)

Most flexible. It consists of < JDBC DBMS independent protocols drivers.

calls are translated → middle tier server through SOCKET

④ Native Protocol pure Java driver. (TYPE 4)

contain JDBC calls that are converted directly to network protocol.

JDBC API has 2 layers:

- Driver
- Application

components of JDBC API:

- Driver manager
- Driver for driver layer
- connection
- Prepared statement.

Driver manager → responsible for loading & unloading drivers & making connection to DB.

JDBC [JAVA.sql] Driver class → forwards JDBC req. to real dB.

JDBC driver class is loaded with a call to

implementation → Class.forName(driver name)!

\* connection :

<protocol> : < subprotocols> : < subname>

↓  
JDBC.

↓  
type of  
driver

↓  
identify  
DB.

✓ 8

Statement obj:

Created by calling [createStatement()]

3 methods :

- executeQuery() : execute simple query.
- executeUpdate() : execute - insert  
  update  
  Delete.
- execute() : execute SQL stmt. that may return multiple values.

Result set:

It provides access to table data.

We use next() to move ptr. to next row.

We can access data from Result set rows by calling getXXX()

Result Set Metadata interface:

Provides constants & methods that are used to obtain info abt. result set obj.

getcolumnCount() - no. of columns.

getColumnName() - name

Path set:

properties  
↓  
Advanced.  
↓  
Env. Variables.

~~J~~  
Create table in ms access:

Blank → table → 1<sup>o</sup> key.

Table in  
design view.

Make Notepad file & write code.

Run file:

cmd.  
↓  
cd.. ] cd\  
cd.. ] cd\  
cd foldername  
javac file.java  
java file.

control panel  
+  
Adm. tools  
+  
ODBC  
+  
Drive D:  
D:  
partition

setSize (500, 300);

setVisible (true);

8

→ public void actionPerformed (ActionEvent ae)

{ if (ae.getSource) == process)  
{ try

Statement st = c.createStatement ();  
String sqlcmd = cmd.getText ();  
boolean select cmd = st.execute (sqlcmd);  
if (select cmd)  
{

ResultSet r = st.getResultSet ();

ResultSetMetaData rsmd = r.getMetaData ();  
int nfcoll = rsmd.getColumnCount ();

String result = "Reg-No \t Name \t Class \n";

resultarea.setText (result);

while (r.next ())

{ for (int i = 1; i < nfcoll; i++)

result = result + r.getString (i) + "\t";

result = result + "\n";

resultarea.setText (result);

{ else

resultarea.setText (" ");

} catch (Exception e)

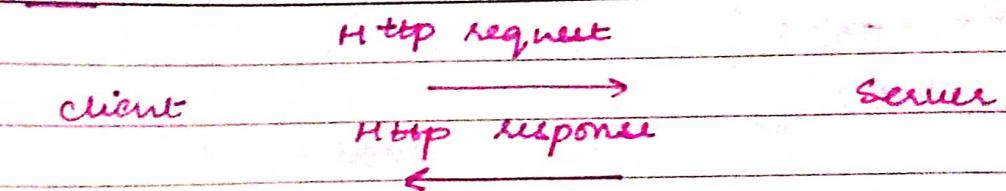
{ resultarea.setText ("error " + e);

Public static void main (String args[]) throws Exception.

{ bubbles = new bubbles ();

{

Servlet:



To generate HTTP response we use Servlet.

JSP → java embedded in HTML.

client side scripting:

Javascript VBScript etc.

server side:

CGI script

Servlets etc. → a better solution than CGI

→ disadvantage of CGI is each time req. is received by web

browser server, an entire new process is created.

To overcome this we use Servlets.

ASP: disadvantage → can only run on Internet Info server

Servlets: → crash proof, run on any web server

secure

portable

written in Java

```
setSize(500, 300);
```

```
setVisible(true);
```

```
{  
    public void actionPerformed(ActionEvent ac)  
    {  
        if (ac.getSource() == process)
```

```
        {  
            try
```

```
                Statement st = c.createStatement();
```

```
                String sqlcmd = scmd.getText();
```

```
                boolean select cmd = st.execute(sqlcmd);
```

```
        if (select cmd)
```

```
        {  
            ResultSet r = st.getResultSet();
```

```
            ResultSetMetaData rsmd = r.getMetaData();
```

```
            int ncol = rsmd.getColumnCount();
```

```
            String result = "Reg-No \t Name \t Class \n";
```

```
            resultarea.setText(result);
```

```
        while (r.next())
```

```
        {  
            for (int i = 1; i < ncol; i++)
```

```
                result = result + r.getString(i) + "\t";
```

```
            result = result + "\n";
```

```
            resultarea.setText(result);
```

```
        }  
        else
```

```
            resultarea.setText(" ");
```

```
        catch (Exception e)
```

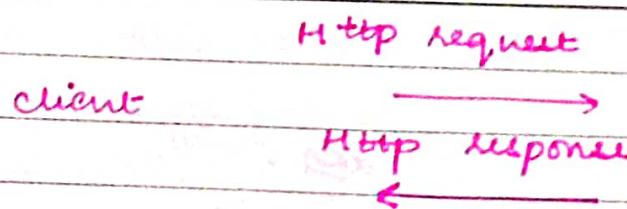
```
            resultarea.setText("error " + e);
```

```
    }
```

Public static void main (String args[]) throws Exception

```
    bubbles = new bubbles();
```

Servlet:



To generate HTTP response we use Servlet.

[JSP] → java embedded in HTML.

client side scripting:

JavaScript VBScript etc. (Client side)

Server side:

CGI script

Servlets etc.

disadv: each time req. is received by web browser, a new process is created.

To overcome this we use Servlets.

ASP: disadvantage → can only run on Internet Info server

\* servlets: → crash proof  
run on any web server

→ secure  
portable  
written in Java

Servlet Engine: SW that executes servlets on web server.

They are server side applets.

The server loads & executes them.

Servlet Container: Responsible for handling client request, passing req. to servlet & returning req. to client.

JWS: Java Web Server.

### LIFE CYCLE:

Instantiation

defined by:  
`java.util.HttpServlet`

Initialization.

service

destroy.

No-existent.

Q&A  
[  
- servlet req.  
- servlet response

GET

- Form value goes as  
URL to servlet

- length short

- less secure

POST

- URL +  
msg.

- ⚡ length

- more secure.

Servlet code:

```

import java.io.*;
import javax.servlet.http.*;
import javax.servlet.*;

public class Param extends HttpServlet
{
    public void doGet (HttpServletRequest req, HttpServletResponse res)
        throws ServletException, IOException
    {
        PrintWriter out = res.getWriter();
        String name = req.getParameter ("username");
        String password = req.getParameter ("password");
        out.println ("Name : " + name + "<br>");
        out.println ("Password : " + password + "<br>");
    }

    public void doPost (HttpServletRequest req, HttpServletResponse res)
        throws IOException, ServletException
    {
        doGet (req, res);
    }
}

```

HTML :

```

<html>
<body>
<center>
<h1> Password finder </h1> <center>
<form name="my form" method="POST"
action="http://localhost:8084/Param">
<br>
<h3> Enter name <input type="text" name="username" size=25> </h3>
<br>
<h3> Enter password <input type="password" name="password" size=10> </h3>
<input type="submit" value="Submit">
</body>
</html>

```

```

import javax.servlet.*;
import javax.servlet.http.*;
import java.io.*;

```

```
public class Counter extends HttpServlet
```

```
{ public int count;
```

```
public void init (ServletConfig sc) throws ServletException
```

```
{ super.init (sc);
```

```
Count = 0;
```

```
public void doGet (HttpServletRequest req, HttpServletResponse res)
```

```
throws IOException, ServletException
```

```
{ handle (req, res);
```

```
}
```

```
public void doPost (————— req, ————— res) throws
```

```
—————, —————
```

```
{
```

```
handle (req, res);
```

```
{
```

```
public void handle (————— req, ————— res) throws —, —
```

```
{ res.setStatus (res.SC_OK);
```

```
res.setContentType ("text/html");
```

```
PrintWriter out = res.getWriter();
```

```
out.println ("Servlet is used: " + count + " times");
```

```
count ++;
```

```
out.close();
```

```
{
```

```
{
```

## JAVA BEAN :

reusable SW component model.

Write once, use anywhere.

reuse of code

code compartmentalization

BDK :> Bean Dev Kit

(Helps developers to create reusable components).

JAR :>

Java Archive file.

It allows efficient deployment of set of classes &  
their associated resources.

Manifest file :> It indicates which of components in  
a Jar file are Java Beans.

c new archive

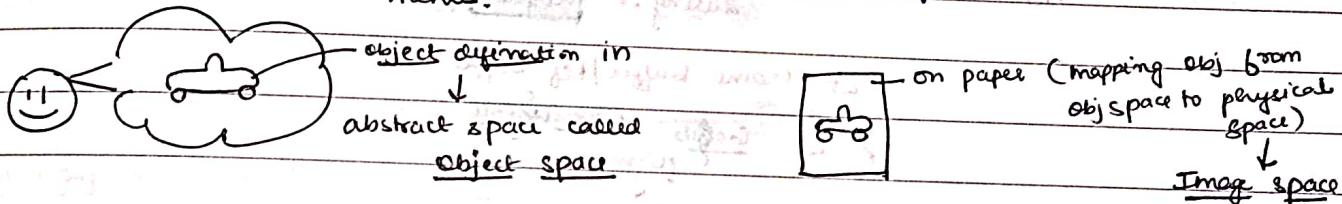
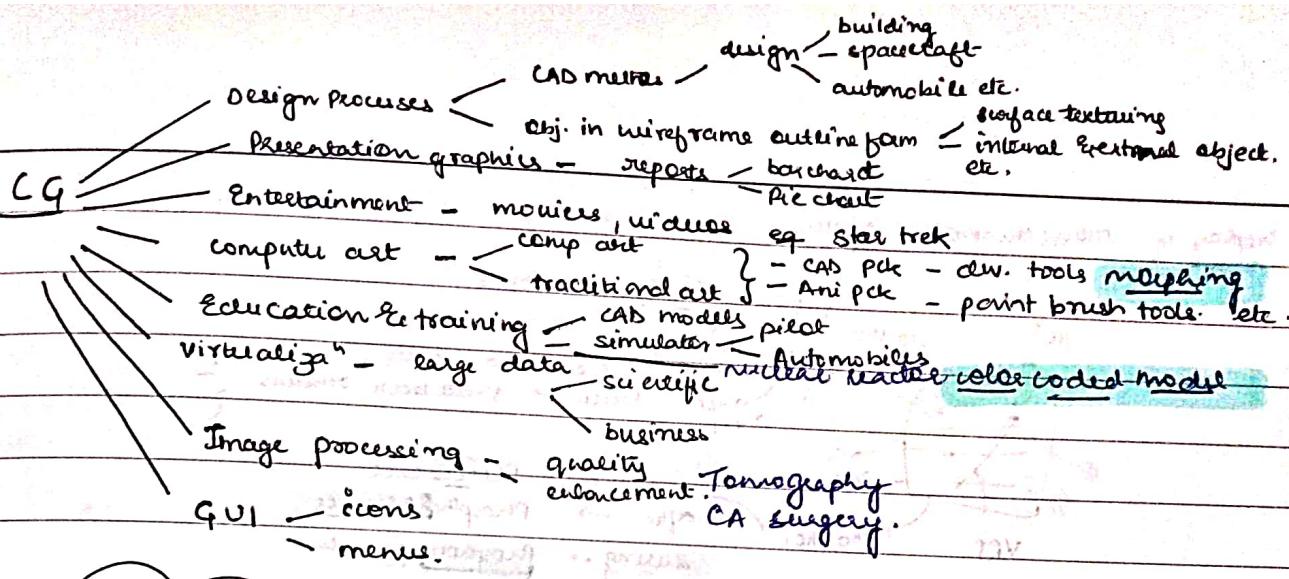
C change

f first element

i index info.

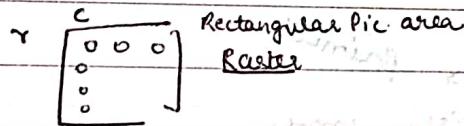
u update.

x extract.



Scan conversion : systematic approach to convert obj in conti. space into discrete approximation

Image : pixel 0



$$\text{total no. pixels} = \text{size} \times \text{no. of pixels per unit length.}$$

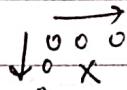
↓ Resolution

without overlap  
1280 x 1024  
α Increase of display resolution  
following type of phosphor

size 3 x 2 inch

R 300 pix/length

Eq. Image size :



$$\text{Total no. of pixels in V} \times \text{no. of pixels in H}$$

no. of pix 900 x 600 = 540000.

Aspect ratio = image width / height

Direct coding:



→ pixel code.

allocation/m to every pixel to code its color

3 bit 1 bit / 1° color.

$$8 \times 8 \times 8 \rightarrow$$

24 bit 8 bit / 1° color.

$$256 \times 256 \times 256 \rightarrow$$

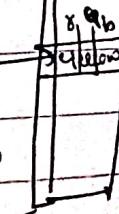
↓ true color

Look-up table

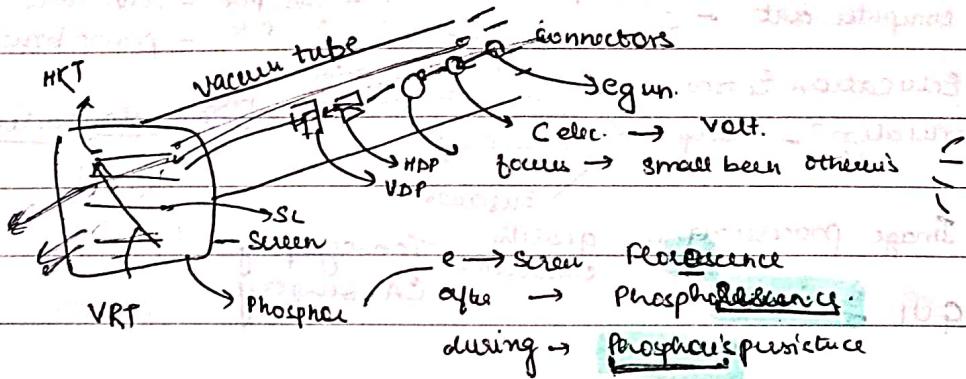
0

index/  
address to  
table

256



## Display of Monochromatic system



frame buffer / Ref. buffer.

60Hz Repetition  
flicker.

Interlacing =

Raster scan: 2b, 8 sweeps acc. scan =

=

refresh frame buffer.

locking

set of intensities → painted

Capability → realistic images

shading.

60-60 frames/sec.

↑

Random scan: / vector display. line at a time

set of line drawing cmd → Display list

smooth lines.

↑ resolution

Referring can occur randomly.

30-60 times/sec.

line algo:

cartesian slope of line

$$y = mx + b \quad \text{--- (1)}$$

$$x = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{--- (2)}$$

$$b = y - mx \quad \text{--- (3)}$$

$\Delta x$  interval

$$\Delta x = \frac{\Delta y}{m} \quad \text{--- (4)}$$

&  $\Delta y$

$$\Delta y = x \Delta m \quad \text{--- (5)}$$

DDA (Digital Differential Analyzer)

Scan line conversion algo based on calculating  $\Delta x$  &  $\Delta y$  values  
ie  $\Delta y = m \Delta x$

$$\Delta x = \frac{\Delta y}{m}$$

consider, positive slope.

for  $m \leq 1$

we sample along  $x$  axis taking  $\Delta x = 1$

$$\therefore y_{k+1} = y_k + m$$

$k$  value starts from 1 to increment by 1 till end.

for

$m > 1$

$$\Delta y = 1$$

$$\therefore x'_{k+1} = x_k + \frac{1}{m}$$

we scan from L  $\rightarrow$  R

but if R  $\rightarrow$  L

then

for  $m \leq 1$

$$\Delta y = -1$$

$$y_{k+1} = y_k - m$$

for  $m > 1$

$$\Delta y = -1$$

$$\therefore x'_{k+1} = x_k - \frac{1}{m}$$

Adv.

- fast algo

disadv.

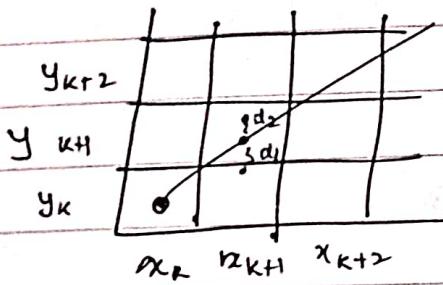
- floating calculations

- approximation

- time consuming.

## Screenline drawing algo

Scan line conversion algo for lines with slope  $< 1$



$$\frac{y_{k+2} - y_k}{d_2}$$

we sample along  $x$  & move to successive column to plot the pixel.

$$y = mx + b$$

$$d_1 = y - y_k \quad \text{--- (1)}$$

$$d_2 = y_{k+1} - y \quad \text{--- (2)}$$

$$y = (\Delta x_{k+1})m + b$$

$$x_{k+1}$$

$$d_1 = (x_{k+1})m + b - y_k \quad \text{--- (3)}$$

∴ Substituting

$$d_2 = y_{k+1} - (x_{k+1})m - b \quad \text{--- (4)}$$

$$\textcircled{1} - \textcircled{3} - \textcircled{4}$$

$$d_1 - d_2 = (x_{k+1})m + b - y_k - y_{k+1} + (x_{k+1})m + b$$

$$= 2m(x_{k+1}) + 2b - [y_k - y_{k+1}]$$

$$= 2m(x_{k+1}) + 2b - 2y_k \pm 1$$

$$m = \frac{\Delta y}{\Delta x}$$

$$x_{k+1}$$

$$\Delta x(d_1 - d_2) = 2\Delta y(x_{k+1}) + 2b\Delta x - 2\Delta x y_k - \Delta x$$

$P_K$

$$P_K = 2\Delta y(x_{k+1}) - 2\Delta x y_k + 2b\Delta x - \Delta x$$

$$= 2\Delta y x_k + 2\Delta y - 2\Delta x y_k + 2b\Delta x - \Delta x$$

$$P_K < 0$$

$$\therefore d_1 - d_2 < 0$$

$$d_1 < d_2$$

∴ plot lower pixel

else

upper

$$P_{k+1} = 2\Delta y x_{k+1} + \cancel{2\Delta y} - 2\Delta x y_{k+1} + 2b\Delta x - \Delta x$$

$$P_{k+1} - P_k = 2\Delta - - - (-) 2\Delta - - - -$$

$$x_{k+1} = x_k$$

$$\begin{aligned} P_{k+1} - P_k &= 2\Delta x_k + 2\Delta y + 2\Delta y - 2\Delta x y_{k+1} + 2b\Delta x - \Delta x \\ &- (2\Delta x_k + 2\Delta y + 2\Delta y - 2\Delta x y_k + 2b\Delta x - \Delta x) \end{aligned}$$

$$2\Delta y (x_{k+1} - x_k) - 2\Delta x (y_{k+1} - y_k)$$

$$2\Delta y - 2\Delta x (y_{k+1} - y_k)$$

if

$$P_k < 0$$

$$y_{k+1} = y_k$$

∴

$$\cancel{P_k} = 2\Delta y$$

$$P_{k+1} = P_k + 2\Delta y$$

$$P_k > 0$$

$$y_{k+1} = y_k + 1$$

∴

$$\cancel{P_k} = 2\Delta y - 2\Delta x$$

$$P_{k+1} = P_k + (2\Delta y - 2\Delta x)$$

$$P_0 = ?$$

$$P_k = 2\Delta y (x_k) + 2\Delta y - 2\Delta x y_k + 2b\Delta x - \Delta x$$

$$x_k = 0$$

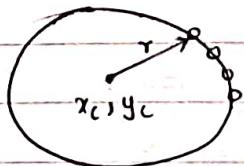
$$y_k = 0$$

$$b = 0$$

$$= 2\Delta y - \Delta x$$

## Circle Drawing + Bresenham

circle: set of points at a dist  $r$  from center  $(x_c, y_c)$



$$x^2 + y^2 = r^2 \quad (x_c, y_c) = (0, 0)$$

now, when  $x_c = y_c = 0$  center

$$(x - x_c)^2 + (y - y_c)^2 = r^2$$

$$\therefore y = y_c \pm \sqrt{r^2 - (x - x_c)^2} \quad \text{--- (1)}$$

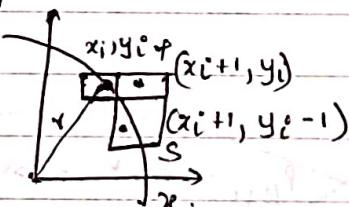
the points are at a varied distance from each other.

we cal.  $x$  &  $y$  using polar word.

$$x = x_c + r \cos \theta \quad \text{--- (2)}$$

$$y = y_c + r \sin \theta \quad \text{--- (3)}$$

consider,



now, let  $D(T)$  be dist of  $T$  from origin

$$\therefore D(T) = (x_i^2 + y_i^2) - r^2$$

$$D(S) = -s - - - - -$$

$$D(S) = (x_{i+1}^2 + y_{i-1}^2) - r^2$$

$$D_i^2 = D(T) + D(S)$$

$$= (x_i^2 + y_i^2) - r^2 + (x_{i+1}^2 + y_{i-1}^2) - r^2$$

$$= 2(x_i^2 + y_i^2 + y_{i-1}^2) - 2r^2$$

$$D_i^2 < 0$$

$$\therefore D(T) + D(S) < 0$$

$$|D(T)| < |D(S)|$$

$\therefore T$  chosen

else

S.

$$d_{i+1}^o = 2(x_{i+1}^o + 1)^2 + (y_{i+1}^o)^2 + (y_{i+1} - 1)^2 - 2r^2$$

$$d_{i+1}^o - d_i^o = 2(x_{i+1}^o + 1)^2 - 2(x_i^o + 1)^2 + (y_{i+1}^o)^2 - (y_i^o)^2 + (y_{i+1} - 1)^2 - (y_i - 1)^2$$

$$x_{i+1}^o = x_i^o + 1$$

$$= 2(x_i^o + 1 + 1)^2 - 2(x_i^o + 1)^2 +$$

$$= 4x_i^o + 6 + (y_{i+1}^o)^2 - (y_i^o)^2 + (y_{i+1} - 1)^2 - (y_i - 1)^2$$

$$d_{i+1}^o - d_i^o = 4x_i^o + 6 + 2(y_{i+1}^o)^2 - 2(y_i^o)^2 - 2(y_{i+1} - y_i)^2 + 6$$

$$d_i^o < 0$$

$$y_{i+1}^o = y_i^o$$

$$\therefore d_{i+1}^o = d_i^o + 4x_i^o + 6$$

$$d_i^o > 0$$

$$y_{i+1}^o = y_i^o \quad \text{---}$$

$$\therefore d_{i+1}^o = d_i^o + 4(x_i^o - y_i^o) + 10.$$

$$d_0 \rightarrow (0|0) \rightarrow$$

$$d_0^o = 2(0+1)^2 + (0)^2 + (0-1)^2 - 2r^2$$

$$= 2 + 1 - 2r^2$$

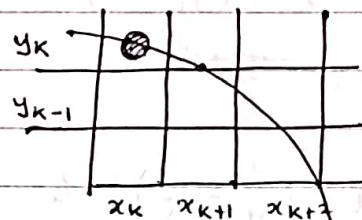
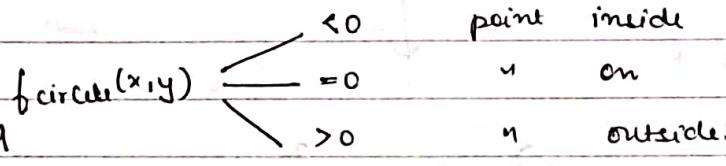
$$= \boxed{3 - 2r^2}$$

### Mid point

we sample at unit interval & plot pixel which is closest to true line path.  
consider a circle function

$$f_{\text{circle}} = (x_1y)$$

$$= x^2 + y^2 - r^2$$



consider pixel  $x_n, y_k$  is plotted

now,

we need to decide whether next pixel to be plotted is

$$(x_{k+1}, y_k) \text{ or } (x_{k+1}, y_{k-1})$$

mid point can be found.

$$\frac{x_{k+1} + x_{k+1}}{2} = x_{k+1}$$

$$\frac{y_k + y_{k-1}}{2} = y_k - \frac{1}{2}$$

$\therefore f_{\text{circle}}(x_{k+1}, y_k - \frac{1}{2})$

$$P_k = \left( \frac{x_{k+1} + 1}{2} \right)^2 + \left( y_k - \frac{1}{2} \right)^2 \rightarrow r^2$$

decision parameter:

$$\therefore \begin{cases} < 0 \\ > 0 \end{cases}$$

therefore

$$P_{k+1} = \left( x_{k+1} + 1 \right)^2 + \left( y_{k+1} - \frac{1}{2} \right)^2 \rightarrow r^2$$

$$P_{k+1} - P_k = \left( x_{k+1} + 1 \right)^2 - \left( x_k + 1 \right)^2 + \left( y_{k+1} - \frac{1}{2} \right)^2 - \left( y_k - \frac{1}{2} \right)^2$$

$$x_{k+1} = x_k + 1$$

$$\frac{a^2 - b^2}{=}$$

$$(x_k + 1 + 1)^2 - (x_k + 1)^2 \neq$$

$$(y_k + y_{k+1} - x_{k+1}) (x_{k+1} + 1 + x_{k+1}) + (y_{k+1} - \frac{1}{2} - y_k + \frac{1}{2}) (y_{k+1} - \frac{1}{2} + y_k - \frac{1}{2})$$

$$P_{k+1} - P_k = (2x_{k+1}) + (y_{k+1} - y_k) (y_{k+1} + y_k - 1)$$

$$P_k < 0$$

$$y_{k+1} = y_k$$

$$\boxed{P_{k+1} = P_k + 2x_k + 1}$$

$$\begin{aligned} & y_{k+1} - y_k + \frac{1}{2} \\ & y_{k+1} - \frac{1}{2} + y_k - \frac{1}{2} \\ & y_k - 1 - y_k \end{aligned}$$

$$P_k > 0$$

$$y_{k+1} = y_k - 1$$

$$P_{k+1} = P_k + 2x_k + 3 + 2y_k - 2$$

$$\boxed{= P_k + 2(x_k - y_k) + 1}$$

$$\begin{aligned} & y_{k+1} - y_k + y_{k+1} - y_k - 1 \\ & (y_{k+1} - y_k)(y_{k+1} - y_k - 1) \\ & (y_{k+1} - y_k)(y_{k+1} - y_k - 2) \\ & (y_{k+1} - y_k)(y_{k+1} - y_k - 2) \end{aligned}$$

$$P_0 = (0, \frac{r}{2})$$

$$\textcircled{1} (0+1)^2 + \left(r - \frac{1}{2} - \frac{1}{2}\right)^2 + r^2$$

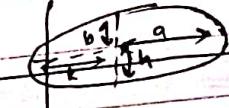
$$= 1 + \left(\frac{r+1}{2}\right)^2 - r^2$$

$$= r^2 + \frac{1}{4} + \frac{1}{4}r^2 - r^2$$

$$= \frac{1}{4}r^2$$

$$= \frac{5}{4}r^2$$

ellipses



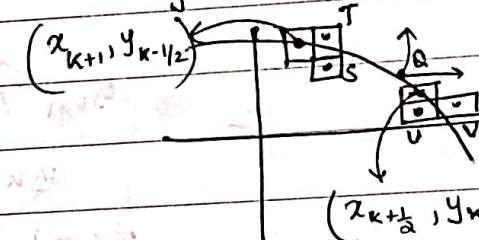
4 way symmetry.

$$(x-a)^2 + \frac{(y-k)^2}{b^2} = x^2$$

in polar coordinates:

$$x = a \cos \theta + h$$

$$y = b \sin \theta + k.$$



$$\text{ellipse } (x,y) = b^2 x^2 + a^2 y^2 - r^2 = 0$$

Part 1:

$$\text{slope } m = \frac{dy}{dx} = -\frac{f(x)}{f(y)} = -\frac{-2b^2 x}{2a^2 y}$$

$$f(x,y) = f(x_{k+1}, y_{k-1/2}).$$

$$P_i = (x_{k+1})^2 b^2 + (y_{k-1/2})^2 a^2 - r^2 a^2 b^2$$

$$P_{i+1} = (x_{k+1} + 1)^2 b^2 + a^2 (y_{k+1} - 1/2)^2 - r^2$$

$$P_{i+1}^o - P_i^o =$$

$$x_{k+1}^o = x_k + 1$$

$$\therefore (x_{k+2})^2 b^2 - (x_{k+1})^2 b^2 + (y_{k+1} - 1/2)^2 a^2 - (y_{k-1/2})^2 a^2$$

$p_i^o < 0$

(0, b)

$$d\hat{P}_{K+1} = dP_K + b^2 (2x_K^o + 3)$$

$$P_0 = b^2 + a^2(b - 1/2) \quad P_0^o > 0$$

$$= b^2 - a^2 b + \frac{a^2}{4}$$

$$d\hat{P}_{K+1} = dP_K + b^2 (2x_K^o + 3) + 2a^2 - 2a^2 y_K$$

Part 2:

$$P_j^o = (x_{K+1/2})^2 b^2 + (y_{K+1})^2 a^2 - r^2 a^2 b^2$$

$\stackrel{< 0}{> 0}$

$$P_{j+1}^o = (x_{K+1+1/2})^2 b^2 + (y_{K+1+1})^2 a^2 - r^2 a^2 b^2$$

$$y_K = y_{K+1}$$

$$P_{j+1}^o - P_j^o =$$

$$\cancel{x_{K+1}} = \cancel{x_{K+1}}$$

$$P_j^o < 0 \rightarrow x_K = x_{K+1}$$

$$P_{j+1}^o = P_j^o + [1 + 2x_{K+1}] + a^2 [1 - 2y_{K+2}]$$

$$P_j^o > 0.$$

$$\downarrow \quad x_{K+1} = x_K$$

$$P_{K+1} = P_K + 3a^2 - 2a^2 y_K$$