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**I.T. – 5**

**Q. Implement various Page Replacement Algorithms**

**PageReplacement.java**  
import java.io.IOException;

import java.util.\*;

public class PageReplacement {

public static void main(String []args) throws IOException{

int a;

int i=1;

Scanner input=new Scanner(System.in);

while(i==1){

System.out.println("\*\*\*Page Replacement Menu\*\*\*");

System.out.println("1.FIFO");

System.out.println("2.LRU");

System.out.println("3.OPTIMAL");

System.out.println("4.EXIT");

System.out.println("ENTER YOUR CHOICE:");

a=input.nextInt();

switch(a){

case 1:{

new fifo();

break;

}

case 2:{

new lru();

break;

}

case 3:{

new optimal();

break;

}

case 4:{

System.out.println("PAGE REPLACEMENT CLOSED");

i=0;

break;

}

default:{

System.out.flush();

System.err.println("Enter the correct input");

break;

}

}

}

}

}

**fifo.java**

import java.io.BufferedReader;

import java.io.IOException;

import java.io.InputStreamReader;

class fifo {

int n, page[], f, frames[], faults, count;

double rate;

BufferedReader input=new BufferedReader(new InputStreamReader(System.in));

fifo() throws IOException{

System.out.println("Enter number of pages");

n=Integer.parseInt(input.readLine());

page=new int[n];

System.out.println("Enter number of page frames");

f=Integer.parseInt(input.readLine());

frames=new int[f];

count=1;

read();

call\_fifo();

}

public void reset(){

int j;

for(j=0;j<f;j++)

frames[j]=-1;

faults=0;

count=1;

}

public void read() throws IOException

{

int i;

System.out.println("Enter the pages");

for(i=0;i<n;i++)

{

System.out.println("Enter page number "+(i+1));

page[i]=Integer.parseInt(input.readLine());

}

for(i=0;i<f;i++)

frames[i]=-1;

}

public void call\_fifo(){

int i,j,k=0;

reset();

boolean found=false;

for(i=0;i<n;i++)

{

for(j=0;j<f;j++)

{

if(page[i]==frames[j])

found=true;

}

if(found==false)

{

frames[k]=page[i];

if(k==f-1)

k=0;

else

k++;

faults++;

}

display();

found=false;

}

System.out.println("Number of page faults = "+faults);

}

void display()

{

int i;

System.out.print("Page frame "+count+" :");

for(i=0;i<f;i++){

if(frames[i]==-1)

System.out.print("-1");

else

System.out.print(" "+frames[i]);

}

System.out.print("\n");

count++;

}

}

**lru.java**

import java.util.\*;

class lru {

int frm[],indfrm;

int p[],indp,i,j,fs[],indfs,n;

int index,k,l,flag1=0,flag2=0,pf=0,frsize;

Scanner input=new Scanner(System.in);

lru(){

call\_lru();

}

public void disp(){

int i;

System.out.println();

for(i=0;i<3;i++)

System.out.println("\t"+frm[i]);

}

public void call\_lru(){

System.out.println("Enter the frame size");

indfrm=input.nextInt();

frsize=indfrm;

System.out.println("Enter the number of pages");

n=input.nextInt();

p=new int[n];

frm=new int[indfrm];

fs=new int[indfrm];

System.out.println("Enter the page number");

for(i=0;i<n;i++){

p[i]=input.nextInt();

}

for(i=0;i<indfrm;i++){

frm[i]=-1;

}

for(j=0;j<n;j++){

flag1=0;

flag2=0;

for(i=0;i<indfrm;i++){

if(frm[i]==p[j]){

flag1=1;

flag2=1;

break;

}

}

if(flag1==0){

for(i=0;i<indfrm;i++){

if(frm[i]==-1)

{

frm[i]=p[j];

flag2=1;

break;

}

}

}

if(flag2==0){

for(i=0;i<indfrm;i++){

fs[i]=0;

}

for(k=j-1,l=1;l<=frsize-1;l++,k--){

for(i=0;i<indfrm;i++){

if(frm[i]==p[k]){

fs[i]=1;

}

}

}

for(i=0;i<indfrm;i++){

if(fs[i]==0)

index=i;

}

frm[index]=p[j];

pf++;

}

disp();

}

System.out.println();

System.out.println("number of page faults: "+pf);

}

}

**optimal.java**

import java.util.\*;

public class optimal {

int n, page[], f, frames[], faults, count;

double rate;

Scanner input= new Scanner(System.in);

optimal(){

System.out.println("Enter number of pages");

n=input.nextInt();

page=new int[n];

System.out.println("Enter number of page frames");

f=input.nextInt();

frames=new int[f];

count=1;

int i;

System.out.println("Enter the pages");

for(i=0;i<n;i++)

{

System.out.println("Enter page number "+(i+1));

page[i]=input.nextInt();

}

for(i=0;i<f;i++)

frames[i]=-1;

call\_opt();

}

public void display()

{

int i;

System.out.print("Page frame "+count+" :");

for(i=0;i<f;i++)

{

if(frames[i]==-1)

System.out.print(" -");

else

System.out.print(" "+frames[i]);

}

System.out.print("\n");

count++;

}

public void reset()

{

int j;

for(j=0;j<f;j++)

frames[j]=0;

faults=0;

count=1;

}

public void call\_opt(){

int i,j=0,k,duration[],max,flag[];

reset();

duration=new int[f];

flag=new int[f];

boolean found=false;

for(i=0;i<n;i++)

{

for(j=0;j<f;j++)

{

flag[j]=0;

duration[j]=n;

}

for(k=i+1;k<n;k++)

{

for(j=0;j<f;j++)

if(page[k]==frames[j]&&flag[j]==0)

{

duration[j]=k;

flag[j]=1;

}

}

for(j=0;j<f;j++)

if(page[i]==frames[j])

found=true;

if(found==false)

{

max=0;

for(j=0;j<f;j++)

{

if(duration[j]>duration[max])

max=j;

if(frames[j]<0)

{

max=j;

break;

}

}

frames[max]=page[i];

faults++;

}

display();

found=false;

}

System.out.println("Number of page faults = "+faults);

}

}

**C:\Users\Ashesh\Documents\Prog\OS>java PageReplacement**

**\*\*\*Page Replacement Menu\*\*\***

**1.FIFO**

**2.LRU**

**3.OPTIMAL**

**4.EXIT**

**ENTER YOUR CHOICE:**

**1**

**Enter number of pages**

**12**

**Enter number of page frames**

**3**

**Enter the pages**

**Enter page number 1: 3**

**Enter page number 2: 2**

**Enter page number 3: 1**

**Enter page number 4: 0**

**Enter page number 5: 3**

**Enter page number 6: 2**

**Enter page number 7: 4**

**Enter page number 8: 3**

**Enter page number 9: 2**

**Enter page number 10: 1**

**Enter page number 11: 0**

**Enter page number 12: 4**

**Page frame 1 : 3-1-1**

**Page frame 2 : 3 2-1**

**Page frame 3 : 3 2 1**

**Page frame 4 : 0 2 1**

**Page frame 5 : 0 3 1**

**Page frame 6 : 0 3 2**

**Page frame 7 : 4 3 2**

**Page frame 8 : 4 3 2**

**Page frame 9 : 4 3 2**

**Page frame 10 : 4 1 2**

**Page frame 11 : 4 1 0**

**Page frame 12 : 4 1 0**

**Number of page faults = 9**

**\*\*\*Page Replacement Menu\*\*\***

**1.FIFO**

**2.LRU**

**3.OPTIMAL**

**4.EXIT**

**ENTER YOUR CHOICE: 1**

**Enter number of pages 12**

**Enter number of page frames 4**

**Enter the pages**

**Enter page number 1: 3**

**Enter page number 2: 2**

**Enter page number 3: 1**

**Enter page number 4: 0**

**Enter page number 5: 3**

**Enter page number 6: 2**

**Enter page number 7: 4**

**Enter page number 8: 3**

**Enter page number 9: 2**

**Enter page number 10: 1**

**Enter page number 11: 0**

**Enter page number 12: 4**

**Page frame 1 : 3-1-1-1**

**Page frame 2 : 3 2-1-1**

**Page frame 3 : 3 2 1-1**

**Page frame 4 : 3 2 1 0**

**Page frame 5 : 3 2 1 0**

**Page frame 6 : 3 2 1 0**

**Page frame 7 : 4 2 1 0**

**Page frame 8 : 4 3 1 0**

**Page frame 9 : 4 3 2 0**

**Page frame 10 : 4 3 2 1**

**Page frame 11 : 0 3 2 1**

**Page frame 12 : 0 4 2 1**

**Number of page faults = 10**