Contents

JSCSP30) USCS303-Operating System (OS)	2
Practical-08:Page Replacement Algorithm First In First Out (FIFO)	2
Practical Date:31st August 2021	2
Pratical Aim: Page Replacement Algorithm First(FIFO)	2
Algorithm	2
Page Replacement Algorithm	
• First In First Out (FIFO)	2
Solved Example	3
Example:01	3
Example:02	4
Example :03	5
Question	6
Implementation	6
File Name: P8_PR_FIFO_SJ.java	
Input	9
Ouput	9
Sample Ouput of Example:01	
Sample Ouput of Example:02	10
Sample Ouput of Example:03	

USCSP30) **USCS303-Operating System (OS)**

Practical-08:Page Replacement Algorithm First In First Out (FIFO)

Practical Date:31st August 2021

Pratical Aim: Page Replacement Algorithm First(FIFO)

Algorithm

♣ Page Replacement Algorithm

- In operating systems that use paging for memory management, **page replacement** algorithm are needed to decide which page needed to be replaced when new page comes in.
- Whenever a new page is referred and not present in memory, page fault occurs and Operating System replaces one of the existing pages with newly needed page.
- ☼ Different page replacement algorithms suggest different ways to decide which page to replace.
- The target for all algorithms is to reduce number of page faults.
- ☆ Page Fault A page fault happens when a running program accesses a memory page that is mapped into the virtual address space, but not loaded in physical memory.
 - + Step 1: First of all, find the location of the desired page on the disk.
 - **→ Step 2:** Find a free Frame:
 - Step 2.1: If there is a free frame, then use it.
 - Step 2.2: If there is no free frame then make use of the page replacement algorithm in order to select the victim frame.
 - Step 2.3: Then after that write the victim frame to the disk and then make the changes in the page table and frame table accordingly.
 - → Step 3: After that read the desired page into the newly freed frame and then change the page and frame tables.
 - **Step 4:** Restart the process.

♣ First In First Out (FIFO)

☆ It is a very simple way of Page replacement and is referred to as First In First Out (FIFO).

- This algorithm mainly replaces the oldest page that has been present in the main memory for the longest time.
- ☆ This algorithm is implemented by keeping the track of all the pages in the queue.
- As new pages are requested and are swapped in, they are added to the tail of a queue and the page which is at the head becomes the victim.
- This is not an effective way of page replacement but it can be used for small systems.

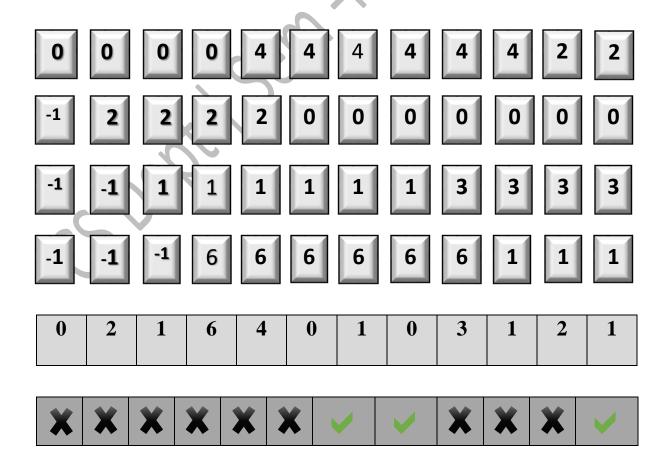
Solved Example

Example:01

- Apply the FIFO replacement algorithms for the following page-reference strings: 0, 2, 1, 6, 4, 0, 1, 0, 3, 1, 2, 1.
- ☆ Indicate the number of page faults for FIFO algorithm assuming demand paging with four frames.
- ☆ Find the number of hits, number of faults and hit.

Solution:

Page Reference String: 0, 2, 1, 6, 4, 0, 1, 0, 3, 1, 2, 1Demand Paging Or Number of Frames:4



Number of Hits:count of no replacements=3 ✓

Number of Faults:count of replacement=9

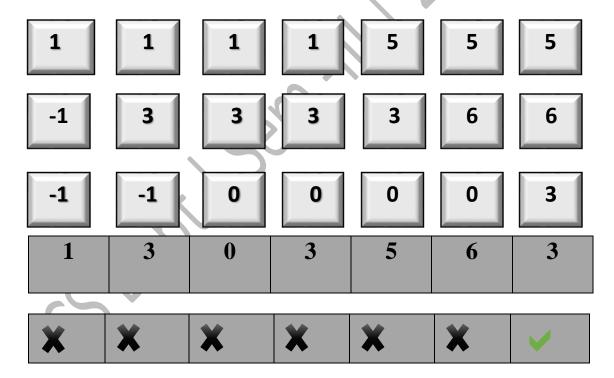
Hit Ratio:Number of Hits/Len(Ref String)=3/12=0.25

Example:02

- **→** Consider the following example 3 frames with 1,3,0,3,5,6,3 page reference strings.
- → Find the number of hits,number of faultsand hit ratio using FIFO Page Replacment Algorithm

Solution:

Page Reference String: 1,3,0,3,5,6,3
Demand Paging Or Number of Frames:7



Number of Hits: Count of no replacements = 1

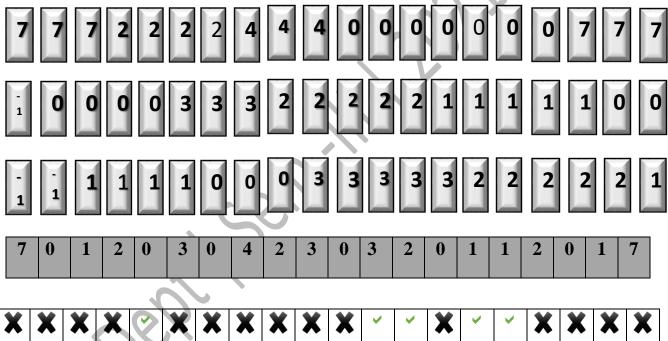
Number of Faults: Count of replacements = 6

Hit Ratio: Number of Hits/Len (Ref String) = 1/7 = 0.14

Example:03

- ★ Consider the following example 3 frames with 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1 page-reference strings.
- → Find the number of hits, number of faults and hit ratio using FIFO Page Replacement Algorithm.

Solution:



Number of Hits:count of no replacements=5 ✓

Number of Faults:count of replacement=15

Hit Ratio:Number of Hits/Len(Ref String)=5/20=0.25

Question

Write a Java Program that implements the FIFO page-replacements Algorithm.

Implementation

```
File Name: P8_PR_FIFO_SJ.java
// Name: Sahil Jadhav
// Batch: B2
// PRN: 2020016400783091
// Date: 31 August,2021
// Prac-08: Page Replacement Algorithm(FIFO)
import java.io.*;
import java.util.*;
public class P8_PR_FIFO_SJ
       public static void main(String[] args) throws IOException
              Scanner scan = new Scanner(System.in);
              int frames, pointer = 0, hit = 0, fault = 0,ref_len;
              Boolean isFull=false;
              int buffer[];
               ArrayList<Integer>stack=new ArrayList<Integer>();
              int reference[];
              int mem_layout[][];
              System.out.print("Please enter the number of Frames: ");
              frames= scan.nextInt();
              System.out.print("Please enter the length of the Reference string: ");
               ref_len = scan.nextInt();
```

```
reference = new int[ref_len];
mem_layout= new int[ref_len][frames];
buffer = new int[frames];
for(int j = 0; j < \text{frames}; j++)
buffer[j] = -1;
System.out.println("Please enter the reference string: ");
for(int i = 0; i < ref_len; i++)
       reference[i] = scan.nextInt();
System.out.println();
for(int i = 0; i < ref_len; i++)
       if(stack.contains(reference[i]))
               stack.remove(stack.indexOf(reference[i]));
        stack.add(reference[i]);
       int search=-1;
        for (int j=0;j<frames;j++)
               if(buffer[j]==reference[i])
               search =j;
               hit++;
               break;
if(search == -1)
```

```
buffer[pointer] = reference[i];
       fault++;
       pointer++;
       if(pointer == frames)
       pointer = 0;
for(int j = 0; j < frames; j++)
       mem_layout[i][j]=buffer[j];
for(int i = 0; i < frames; i++)
for(int j = 0; j < ref_len; j++)
        System.out.printf("\%3d",mem\_layout[j][i]);
    System.out.println();
}
System.out.println("The number of Hits: " + hit);
System.out.println("Hit Ratio: " + (float)((float)hit/ref_len));
System.out.println("The number of Faults: " + fault);
```

Input

```
Command Prompt
```

```
C:\Users\SAHIL>cd\
C:\>cd C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21
C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>javac P8_PR_FIFO_SJ.java
C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>java                           P8_PR_FIFO_SJ
Please enter the number of Frames: 4
Please enter the length of the Reference string: 12
Please enter the reference string:
021640103121
 0 0 0 0 4 4 4 4 4 4 2 2
-1 2 2 2 2 0 0 0 0 0 0 0
-1 -1 1 1 1 1 1 1 3 3 3 3
-1 -1 -1 6 6 6 6 6 6 1 1 1
The number of Hits: 3
Hit Ratio: 0.25
The number of Faults: 9
```

Ouput

```
0 2 1 6 4 0 1 0 3 1 2 1

0 0 0 0 4 4 4 4 4 4 2 2

-1 2 2 2 2 0 0 0 0 0 0 0

-1 -1 1 1 1 1 1 1 3 3 3

-1 -1 -1 6 6 6 6 6 6 1 1 1

The number of Hits: 3

Hit Ratio: 0.25

The number of Faults: 9

C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>
```

Sample Ouput of Example:01

```
C:\>cd C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21
C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>javac P8_PR_FIFO_SJ.java
C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>java P8_PR_FIFO_SJ
Please enter the number of Frames: 4
Please enter the length of the Reference string: 12
Please enter the reference string:
0 2 1 6 4 0 1 0 3 1 2 1

0 0 0 0 4 4 4 4 4 4 2 2
-1 2 2 2 2 0 0 0 0 0 0 0
-1 -1 1 1 1 1 1 1 3 3 3 3
-1 -1 -1 6 6 6 6 6 6 1 1 1
The number of Hits: 3
Hit Ratio: 0.25
The number of Faults: 9
```

Sample Ouput of Example:02

```
C:\>cd C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21

C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>javac P8_PR_FIFO_SJ.java

C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>java P8_PR_FIFO_SJ

Please enter the number of Frames: 3

Please enter the length of the Reference string: 7

Please enter the reference string:

1 3 0 3 5 6 3

1 1 1 1 5 5 5

-1 3 3 3 3 6 6

-1 -1 0 0 0 0 3

The number of Hits: 1

Hit Ratio: 0.14285715

The number of Faults: 6

C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>__
```

Sample Ouput of Example:03

Command Prompt

```
C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>javac P8_PR_FIFO_SJ.java

C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>java P8_PR_FIFO_SJ

Please enter the number of Frames: 3

Please enter the length of the Reference string: 20

Please enter the reference string:

7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

7 7 7 2 2 2 2 4 4 4 0 0 0 0 0 0 7 7 7

-1 0 0 0 0 3 3 3 2 2 2 2 2 1 1 1 1 1 0 0

-1 -1 1 1 1 1 0 0 0 3 3 3 3 2 2 2 2 2 1

The number of Hits: 5

Hit Ratio: 0.25

The number of Faults: 15

C:\USCSP301\USCS303_OS_B2\prac_08_SJ_31_08_21>_
```

Batch No: B2

Page