

SMT. CHANDIBAI HIMATHMAL MASUKHANI COLLEGE

Contents

USCSP301_USCS303:OPERATING SYSTEM(OS) Practical: 08	2
Practical-08: Page Replacement Algorithm FIFO	2
Practical Date: 30th September 2021	2
Practical Aim: Page Replacement Algorithm FIFO	2
ALGORITHM.....	2
SOLVED EXAMPLE:.....	3
QUESTION:	4
IMPLEMENTATION:.....	4
INPUT.....	7
OUTPUT.....	7
SAMPLE OUTPUT 01	8
SAMPLE OUTPUT 02	8
SAMPLE OUTPUT 03	9

USCSP301_USCS303:OPERATING SYSTEM(OS) Practical: 08

Practical-08: Page Replacement Algorithm FIFO

Practical Date: 30th September 2021

Practical Aim: Page Replacement Algorithm FIFO

ALGORITHM

Page Replacement Algorithm

- (1) 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.
- (2) 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.
- (3) Different page replacement algorithm suggest different ways to decide which page is replace.
- (4) The target for all algorithms is to reduce number of page faults.
- (5) **Page Fault** – A page fault happens when a running program accesses a memory page which is mapped into 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 a free frame then use it.

Step 2.2: If there is no free frame then make use of 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.

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First In First Out (FIFO)

- (1) It is a very simple way of Page replacement and is referred to as **First In First Out (FIFO)**.
- (2) This algorithm mainly replaces the oldest page that has been present in the main memory for the longest time.
- (3) This algorithm is implemented by keeping the track of all the pages in the queue.
- (4) As new pages are requested and are swapped in, they are added to the tail of the queue and the page which is at the head becomes the victim.
- (5) This is not an effective way of page replacement but it can be used for small systems.

SOLVED EXAMPLE:

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

Page reference String: 0,2,1,6,4,0,1,0,3,1,2,1.

Demand Paging or Number of Frames: 4

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

0	2	1	6	4	0	1	0	3	2	1
---	---	---	---	---	---	---	---	---	---	---

Number of Hits: count of no replacements = 3

Number of Faults: count of replacements = 9

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

EXAMPLE 2:

Consider the following example 3 frames with 1,3,0,3,5,6,3 page-reference strings.

Find the number of hits, number of faults and hit ratio using FIFO Page replacement Algorithm.

Number of Hits: count of no replacements = 1

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Number of Faults: count of replacements = 6

Hit Ratio: $\text{Number of Hits} / \text{Len(Ref String)} = 1/7 = 0.14$

EXAMPLE 3:

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.

Number of Hits: count of no replacements = 1

Number of Faults: count of replacements = 6

Hit Ratio: $\text{Number of Hits} / \text{Len(Ref String)} = 3/20 = 0.15$

QUESTION:

Write a java program that implements the FIFO page-replacement algorithm.

IMPLEMENTATION:

```
//Name:Ritika Sahu
```

```
//Batch : B1
```

```
//PRN:2020016400783543
```

```
//Date: 30 August, 2021.
```

```
//Practical 8: Page Replacement Algorithm FIFO
```

```
import java.io.*;
```

```
import java.util.*;
```

```
public class P8_PR_FIFO_RS
```

```
{
```

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

```
{
```

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```
Scanner scan = new Scanner(System.in);  
  
int frames, pointer = 0, hit = 0, fault = 0, ref_len;  
  
int buffer[];  
  
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 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 < frames; j++)  
    buffer[j] = -1;
```

```
System.out.print("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++)  
{
```

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```
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]);
```

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```
        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

```
F:\USCSP301_USCS303_OS_B0\Prac_08_PR_FIFO>java P8_PR_FIFO_NR
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
```

OUTPUT

```

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
```

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SAMPLE OUTPUT 01

```
F:\USCSP301_USCS303_OS_B0\Prac_08_PR_FIFO>java P8_PR_FIFO_NR
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   -1   -1   -1   -1   -1   -1   -1   -1   -1   -1   -1
-1   -1   -1   -1   -1   -1   -1   -1   -1   -1   -1   -1
-1   -1   -1   -1   -1   -1   -1   -1   -1   -1   -1   -1

The number of Hits: 3
Hit Ratio: 0.25
The number of Faults: 9
```

SAMPLE OUTPUT 02

```
F:\USCSP301_USCS303_OS_B0\Prac_08_PR_FIFO>java P8_PR_FIFO_NR
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   -1   -1   -1   -1   -1   -1
-1   -1   -1   -1   -1   -1   -1

The number of Hits: 1
Hit Ratio: 0.14285715
The number of Faults: 6
```


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SAMPLE OUTPUT 03

```
F:\USCSP301_USCS303_OS_B0\Prac_08_PR_FIFO>java P8_PR_FIFO_NR
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
```