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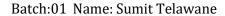
USCSP301-USCS303: Operating System(OS) Practical-08

Practical-08: Page Replacement Algorithm FIFO

Practical Date: 30 th Aug, 2021					
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Page Replacement Algorithm: FIFO

- Content:
 - o In FIFO page replacement algorithm, the oldest page, which has spent the longest time in memory is chosen and replaced.
- Process:
 - o Implement FIFO Algorithm and find out page hits and page faults.
- Prior Knowledge:
 - o Page Replacement Algorithm.



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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 inn 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.

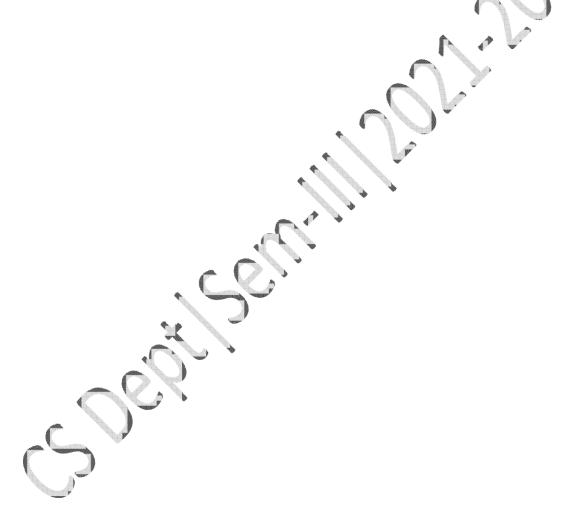
Step 3: After that read the desired page into the newly freed frame and then change the page and frame tables.

Step 4: Restart the process.



First In First Out (FIFO)

- It is 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.



EXAMPLE

FIFO Page Replacement Example

- Apply the FIFO replacement algorithm 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 ratio.

Page Reference String: 0,2,1,6,4,0,1,0,3,1,2,1

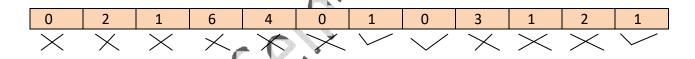
Demand Paging or Number of Frames: 4

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 3 3 3 3

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

Question:

Write a Java Program that implements the FIFO page-replacement algorithm.

Source Code:

```
//NAME: Sumit Telawane
//BATCH: B1
//PRN: 2020016400825777
//DATE: 30th Aug, 2021
//PRAC-08: PAGE REPLACEMENT ALGORITHM
import java.io.*;
import java.util.*;
public class P8 PR FIFO ST
 public static void main(String[] args) throws IOException
 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 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<frames; j++)</pre>
 buffer[j] = -1;
System.out.println("Please enter the reference string: ");
for(int i=0; i<ref_len; i++)</pre>
 reference[i] = scan.nextInt();
}
System.out.println();
for(int i=0; i< ref_len; i++)</pre>
{
int search =-1;
for(int j=0; j<frames; j++)</pre>
{
if(buffer[j] ==reference[i])
break;
}
}
if (search==-1)
```

```
buffer[pointer]= reference[i];
fault++;
 pointer++;
if(pointer==frames)
 pointer = 0;
}
for(int j=0; j<frames; j++)</pre>
mem_layout[i][j]=buffer[j];
}
for(int i=0; i<frames; i++)</pre>
{
for(int j =0; j<ref_len; j++)</pre>
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);
```

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Input:

```
D:\os\BATCH_B1\USCS3P01_USCS303_OS_B1_P8>java P8_PR_FIFO_ST
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
```

Sample Output - 01

```
D:\os\BATCH_B1\USCS3P01_USCS303_OS_B1_P8>java P8_PR_FIFO_ST
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 Output - 02

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```
D:\os\BATCH_B1\USCS3P01_USCS303_OS_B1_P8>java P8_PR_FIFO_ST
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
```

Sample Output – 03:

```
Please enter the number of
Please enter the length of
Please enter the reference
7 0 1 2 0 3 0 4 2 3 0 3 2 1
                            Frames: 3
the Reference string: 20
    number of Faults: 15
```