Assignment No. 05

Problem Statement: Write a program to simulate Page replacement algorithm.

Objectives:

1. To study page replacement policies to understand memory management.

2. To understand efficient frame management using replacement policies.

Software Requirement:

1. Eclipse
2. JDK

Hardware Requirement: for simulation no dependency

Theory: CONCEPT OF PAGE REPLACEMENT:

1. Page Fault: Absence of page when referenced in main memory during paging leads to a page fault.

2. Page Replacement: Replacement of already existing page from main memory by the required new page is called as page replacement. And the techniques used for it are called as page replacement algorithms.

NEED OF PAGE REPLACEMENT:

Page replacement is used primarily for the virtual memory management because in virtual memory paging system principal issue is replacement i.e. which page is to be removed so as to bring in thenew page thus the use of the page replacement algorithms. Demand paging is the technique used to increase system throughput. To implement demand paging page replacement is primary requirement.If a system has better page replacement technique it improves demand paging which in turn drastically yields system performance gains.

PAGE REPLACEMENT POLICIES:

1. Determine which page to be removed from main memory.

2. Find a free frame.

 1) If a frame is found use it

 2) if no free frame found, use page replacement algorithm to select a victim

frame.

      3) Write the victim page to the disk.

3. Read the desired page into the new free frame, change the page and frame tables.

4. Restart the user process.

PAGE REPLACEMENT ALGORITHMS:

1. FIFO

This is the simplest page replacement algorithm. In this algorithm, the operating system

keeps track of all pages in the memory in a queue, the oldest page is in the front of the

queue. When a page needs to be replaced page in the front of the queue is selected for

removal.

2. OPTIMAL PAGE REPLACEMENT ALGORITHM: Replace the page that will not be used for

longest period of time as compared to the other pages in main memory. An optimal page replacement

algorithm has lowest page fault rate of all algorithm. It is called as OPT or MIN.

ADVANTAGE:

1) This algorithm guarantees the lowest possible page-fault rate for a fixed no. of

frames.

DISADVANTAGE:

1) The optimal page replacement algorithm is very difficult to implement, as it

requires the knowledge of reference strings i.e. strings of memory references.

3. LEAST RECENTLY USED (LRU): LRU algorithm uses the time of the page's last usage. It uses

the recent past as an approximation of the near future, then we can replace the page that has not been

used for the longest period of the time i.e. the page having larger idle time is replaced. ADVANTAGE:

1) The LRU policy is often used for page replacement and is considered to be good

DISADVANTAGES: 1) It is very difficult to implement. 2) Requires substantial hardware assistance.

3) The problematic determination of the order for the frames defined by the time

of last usage

Algorithm:

1. FIFO :

1. Start the process

2. Read number of pages n

3. Read number of pages no

4. Read page numbers into an array a[i]

5. Initialize avail[i]=0 .to check page hit

6. Replace the page with circular queue, while re-placing check page availability in the frame Place avail[i]=1 if page is placed in the frame Count page faults

7. Print the results.

8. Stop the process.

2. LEAST RECENTLY USED

1. Start the process

2. Declare the size

3. Get the number of pages to be inserted

4. Get the value

5. Declare counter and stack

6. Select the least recently used page by counter value

7. Stack them according the selection.

8. Display the values

9. Stop the process

3. OPTIMAL ALGORTHIM:

1. Start Program

2. Read Number Of Pages And Frames

3.Read Each Page Value

4. Search For Page In The Frames

5. If Not Available Allocate Free Frame

6. If No Frames Is Free Replace The Page With The Page That Is Least Used

7.Print Page Number Of Page Faults

8.Stop process.

Input:

1. Number of frames

2. Number of pages

3. Page sequence

Output:
1. Sequence of allocation of pages in frames (for each algorithm)

2. Cache hit and cache miss ratio.

Conclusion:
Successfully implemented FIFO page replacement policy

Frequently Asked Questions:
    i)   1. What is virtual memory?

    ii)   2. Explain working of LRU page replacement algorithm

    iii)   3. Explain working of OPTIMAL page replacement algorithm

    iv)   4. Which Page replacement algorithm is best?

    v)   5. Explain what is Belody's Anomaly?

    vi)   6. Explain the scenario in which page replacement algorithm is used?

    vii)   7. Explain what is page fault?

    viii)   8. Explain what is paging scheme? 9. Explain what is counting based page replacement algorithms?