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Implementation of the Page Replacement Algorithms (FIFO, LRU and Optimal Algorithm)

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I. DOCUMENTATION

1. First Sample Input

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Inputs

Reference String
7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1

Number of Frames
3

Calculate

Output

Reference String: 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1
Number of Frames: 3

First-In-First-Out (FIFO) Algorithm

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

Total Page Faults: 15

Optimal Algorithm

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

Total Page Faults: 9

Least Recently Used (LRU) Algorithm

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

Total Page Faults: 12

Analysis

Algorithm	Page Faults
First-In-First-Out (FIFO)	15
Optimal (OPT)	9
Least Recently Used (LRU)	12

Algorithm(s) in this scenario with least total page faults:
Optimal Algorithm

Info about Optimal Algorithm:

- The Optimal Page Replacement Algorithm (OPT) is a theoretical page replacement algorithm that replaces the page that will not be used for the longest period of time in the future.
- It is considered the best page replacement algorithm in terms of page faults, but it is impractical to implement in real systems because it requires future knowledge of page access patterns.
- The optimal algorithms often serve as a benchmark to compare the performance of other page replacement algorithms.

Algorithm	Page Faults

Table 1: First Input Results



2. Second Sample Input

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Inputs

Reference String

8,0,6,9,8,8,1,6,4,8,1,3,5,3,3,6,8,9,7,3,8

Number of Frames

4

Calculate

Output

Reference String: 8,0,6,9,8,8,1,6,4,8,1,3,5,3,3,6,8,9,7,3,8

Number of Frames: 4

First-In-First-Out (FIFO) Algorithm

8	0	6	9	8	8	1	6	4	8	1	3	5	3	3	6	8	9	7	3	8
8	8	8	8			1		1	1		1	5			5		5	5	3	3
	0	0	0			0		4	4		4	4			6		6	6	6	8
		6	6			6		6	8		8	8			8		9	9	9	9
			9			9		9	9		3	3			3		3	7	7	7

Total Page Faults: 14

Optimal Algorithm

Algorithm	Page Faults

Table 2: Second Input Results



3. Third Sample Input

OS

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Page Replacement Algorithms

Inputs

Reference String
0,6,4,1,7,0,6,6,8,4,8,7,8,0,9,8,7,7,4,5,7,3,0,4

Number of Frames
5

Calculate

Output

Reference String: 0,6,4,1,7,0,6,6,8,4,8,7,8,0,9,8,7,7,4,5,7,3,0,4
Number of Frames: 5

First-In-First-Out (FIFO) Algorithm

0	6	4	1	7	0	6	6	8	4	8	7	8	0	9	8	7	7	4	5	7	3	0	4
0	0	0	0	0				8					8	8			8	8	7	7	7		
	6	6	6	6				6					0	0			0	0	0	3	3		
		4	4	4				4					4	9			9	9	9	9	0		
			1	1				1					1	1			4	4	4	4	4		
								7					7	7			7	5	5	5	5		

Total Page Faults: 13

Optimal Algorithm

0	6	4	1	7	0	6	6	8	4	8	7	8	0	9	8	7	7	4	5	7	3	0	4
0	0	0	0	0				0					0				0		0				
	6	6	6	6				8					8				8		8				
		4	4	4				4					4				4		4				
			1	1				1					9				5		3				
								7					7				7		7				

Total Page Faults: 9

Least Recently Used (LRU) Algorithm

0	6	4	1	7	0	6	6	8	4	8	7	8	0	9	8	7	7	4	5	7	3	0	4
0	0	0	0	0				0	0				0				5		5	5			
	6	6	6	6				6	6				9				9		3	3			
		4	4	4				8	8				8				8		8	0			
			1	1				1	4				4				4		4	4			
								7	7				7				7		7	7			

Total Page Faults: 11

Q Analysis

Algorithm	Page Faults
First-In-First-Out (FIFO)	13
Optimal (OPT)	9
Least Recently Used (LRU)	11

Algorithm(s) in this scenario with least total page faults:

Optimal Algorithm

Info about Optimal Algorithm:

- The Optimal Page Replacement Algorithm (OPT) is a theoretical page replacement algorithm that replaces the page that will not be used for the longest period of time in the future.
- It is considered the best page replacement algorithm in terms of page faults, but it is impractical to implement in real systems because it requires future knowledge of page references.
- The optimal algorithm is often used as a benchmark to compare the performance of other page replacement algorithms.

Algorithm	Page Faults

Table 3: Third Input Results

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