Bansilal Ramnath Agarwal Charitable Trust's
Vishwakarma Institute of Technology
(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Operating System Lab

Assignment No: 6

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1. First in First Out (FIFO) Page Replacement Algorithm

Code:

```python
#!/bin/env python3

def FIFO(input_ , pg_frame_count):

    change = 0
    hit, fault = 0, 0
    frames = []
    print('\nInput \t Frames')

    for i in input_ :
        if(len(frames) < pg_frame_count):
            if i not in frames:
                frames.append(i)
                print(i, ' \t*', [j for j in frames])
                fault += 1
            else:
                print(i, ' \t ', [j for j in frames])
                hit += 1
        else:
            if i not in frames:
                frames[change] = i
                print(i, ' \t*', [j for j in frames])
                change = (change +1) % pg_frame_count
                fault += 1
            else:
                print(i, ' \t ', [j for j in frames])
                hit += 1

    return hit, fault

if __name__ == '__main__':
    input_ = [7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 1, 2, 0]
    pg_frame_count = int(input("Enter page frame count : "))
    hit, fault = FIFO(input_, pg_frame_count)
    print(f'\nFor the given input: \n{input_}\n\nTotal hits = {hit}\nFault = {fault}')

```

Output:

```
~/vit-comp/Module-4/Operating-System/Assignment-6 on main !1
❯ python3 FIFO.py
Enter page frame count : 3

Input    Frames
7       * [7]
0       * [7, 0]
1       * [7, 0, 1]
2       * [2, 0, 1]
0         [2, 0, 1]
3       * [2, 3, 1]
0       * [2, 3, 0]
4       * [4, 3, 0]
2       * [4, 2, 0]
3       * [4, 2, 3]
0       * [0, 2, 3]
3         [0, 2, 3]
1       * [0, 1, 3]
2       * [0, 1, 2]
0         [0, 1, 2]

For the given input:
[7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 1, 2, 0]

Total hits = 3
Fault = 12
```

2. Least Recently Used (LRU) Page Replacement Algorithm

Code:

```python
#!/bin/env python3

def replace(inp, frames):

    ff = []
    for i in inp[::-1]:
        if i not in ff and i in frames:
            ff.append(i)
        else:
            pass
    return ff[-1]

def LRU(inp , pg_frame_count):

    change = 0
    hit, fault = 0, 0
    frames = []
    print('\nInput \t Frames')
    counter = 0
    for i in inp:
        counter += 1
        new_inp = inp[:counter - 1]
        if(len(frames) < pg_frame_count):
            if i not in frames:
                frames.append(i)
                print(i, ' \t*', [j for j in frames])
                fault += 1
            else:
                print(i, ' \t' , [j for j in frames])
                hit += 1
        else:
            if i in frames:
                print(i, ' \t ', [j for j in frames])
                hit += 1
            else:
                change = replace(new_inp, frames)
                frames[frames.index(change)] = i
                print(i, ' \t*', [j for j in frames])
                fault += 1

    return hit, fault

if __name__ == '__main__':

    input_ = [7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1]
    pg_frame_count = int(input("Enter page frame count : "))
    hit, fault = LRU(input_, pg_frame_count)
    print(f'\nFor the given input: \n{input_}\n\nTotal hits = {hit}\nFault = {fault}')

```

Output:

```
❯ python3 LRU.py
Enter page frame count : 4

Input    Frames
7       * [7]
0       * [7, 0]
1       * [7, 0, 1]
2       * [7, 0, 1, 2]
0         [7, 0, 1, 2]
3       * [3, 0, 1, 2]
0         [3, 0, 1, 2]
4       * [3, 0, 4, 2]
2         [3, 0, 4, 2]
3         [3, 0, 4, 2]
0         [3, 0, 4, 2]
3         [3, 0, 4, 2]
2         [3, 0, 4, 2]
1       * [3, 0, 1, 2]
2         [3, 0, 1, 2]
0         [3, 0, 1, 2]
1         [3, 0, 1, 2]
7       * [7, 0, 1, 2]
0         [7, 0, 1, 2]
1         [7, 0, 1, 2]

For the given input:
[7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1]

Total hits = 12
Fault = 8
```

3. Optimal Page Replacement Algorithm

Code:

```python
#!/bin/env python3

def replace(inp, frames):

    ff = []
    for i in frames:
        if i not in inp:
            return i

    for i in inp:
        if i not in ff and i in frames:
            ff.append(i)
        else:
            pass
    return ff[-1]

def Optimal(inp , pg_frame_count):

    change = 0
    hit, fault = 0, 0
    frames = []
    print('\nInput \t Frames')
    counter = 0
    for i in inp:
        counter += 1
        new_inp = inp[counter:]
        if(len(frames) < pg_frame_count):
            if i not in frames:
                frames.append(i)
                print(i, ' \t*', [j for j in frames])
                fault += 1
            else:
                print(i, ' \t' , [j for j in frames])
                hit += 1
        else:
            if i in frames:
                print(i, ' \t ', [j for j in frames])
                hit += 1
            else:
                change = replace(new_inp, frames)
                frames[frames.index(change)] = i
                print(i, ' \t*', [j for j in frames])
                fault += 1

    return hit, fault

if __name__ == '__main__':

    input_ = [7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1]
    pg_frame_count = int(input("Enter page frame count : "))
    hit, fault = Optimal(input_, pg_frame_count)
    print(f'\nFor the given input: \n{input_}\n\nTotal hits = {hit}\nFault = {fault}')

```

Output:

```
~/vit-comp/Module-4/Operating-System/Assignment-6 on main
❯ python3 Optimal.py
Enter page frame count : 4

Input    Frames
7       * [7]
0       * [7, 0]
1       * [7, 0, 1]
2       * [7, 0, 1, 2]
0         [7, 0, 1, 2]
3       * [3, 0, 1, 2]
0         [3, 0, 1, 2]
4       * [3, 0, 4, 2]
2         [3, 0, 4, 2]
3         [3, 0, 4, 2]
0         [3, 0, 4, 2]
3         [3, 0, 4, 2]
2         [3, 0, 4, 2]
1       * [1, 0, 4, 2]
2         [1, 0, 4, 2]
0         [1, 0, 4, 2]
1         [1, 0, 4, 2]
7       * [1, 0, 7, 2]
0         [1, 0, 7, 2]
1         [1, 0, 7, 2]

For the given input:
[7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1]

Total hits = 12
Fault = 8
```