CSC3002F: Operating Systems

Practical Assignment 1: Memory Management

Department of Computer Science
University of Cape Town, South Africa

March 31, 2019

DUE: Wednesday, 10th of April, 2019, 11.55 PM

Assignment Description

Write a Python program that implements the *FIFO*, *LRU*, and *optimal* page replacement algorithms presented in *Chapter 9: Virtual Memory* of Silberschatz et al. [Silberschatz et al., 2012].

First, generate a random page-reference string where page numbers range from 0 to 9. Apply the random page-reference string to each algorithm, and record the number of page faults incurred by each algorithm.

Implement the *FIFO*, *LRU*, and *optimal* (OPT) replacement algorithms so that the number of page frames can vary from 1 to 7. Assume that *demand paging* is used. The *main* function should include the following.:

```
def main():
    #...TODO...
    size = int(sys.argv[1])
    print 'FIFO', FIFO(size,pages), 'page faults.'
    print 'LRU', LRU(size,pages), 'page faults.'
    print 'OPT', OPT(size,pages), 'page faults.'

if __name__ == "__main__":
     if len(sys.argv) != 2:
        print 'Usage: python paging.py [number of pages]'
     else:
          main()
```

Implement these FIFO, LRU and OPT algorithms as functions within one file called *paging.py*, making sure that you clearly identify yourself (name and student number) in comments at the top of the file.

The total assignment mark (100) will be calculated as follows.:

1. Correct implementation and functioning of FIFO. **(30%)**
2. Correct implementation and functioning of LRU. **(30%)**
3. Correct implementation and functioning of OPT. **(40%)**

Note: Values in bold parentheses are the percentage weighting of each question as a portion of the total assignment mark.

References

[Silberschatz et al., 2012] Silberschatz, A., Galvin, P., and Gagne, G. (2012). *Operating System Concepts - 9th Edition*. John Wiley & Sons, New York, USA.