

CMSC 412 - Final Project- Demand Paging virtual memory simulator

Author: Tyler D Clark

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Description A command line tool for simulating Demand paging algorithms. The program has the following options from the main menu.

0 - exits the program

1 - Read reference string

2 - Generate reference string

3 - Display current reference string

4 - Simulate FIFO

5 - Simulate OPT

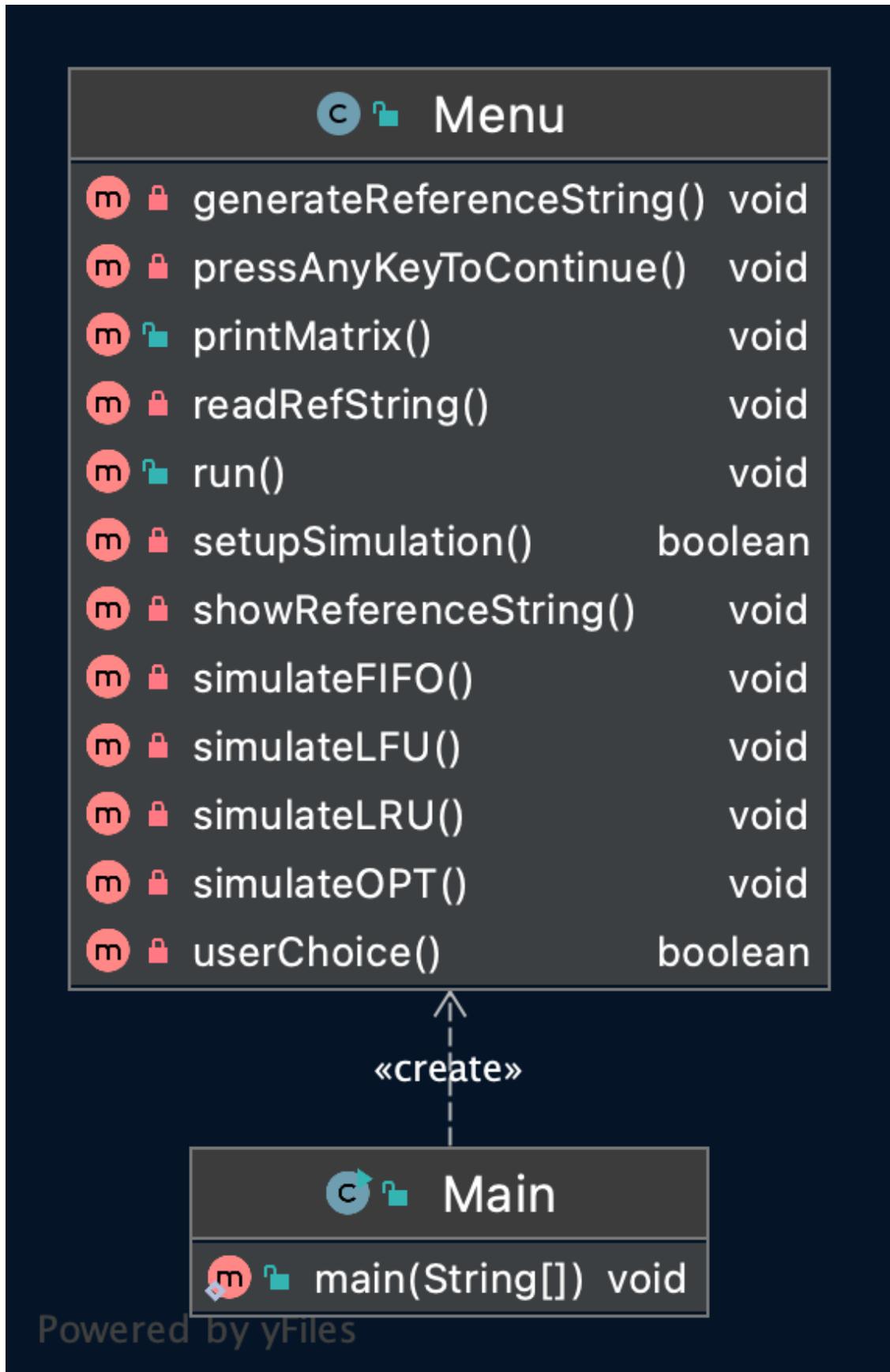
6 - Simulate LRU

7 - Simulate LFU

File Layout

```
.
.
└── doc
    └── final-project.md
    └── img
└── src
    └── dev
        └── tylerdclark
            ├── Main.java
            └── Menu.java
```

UML chart



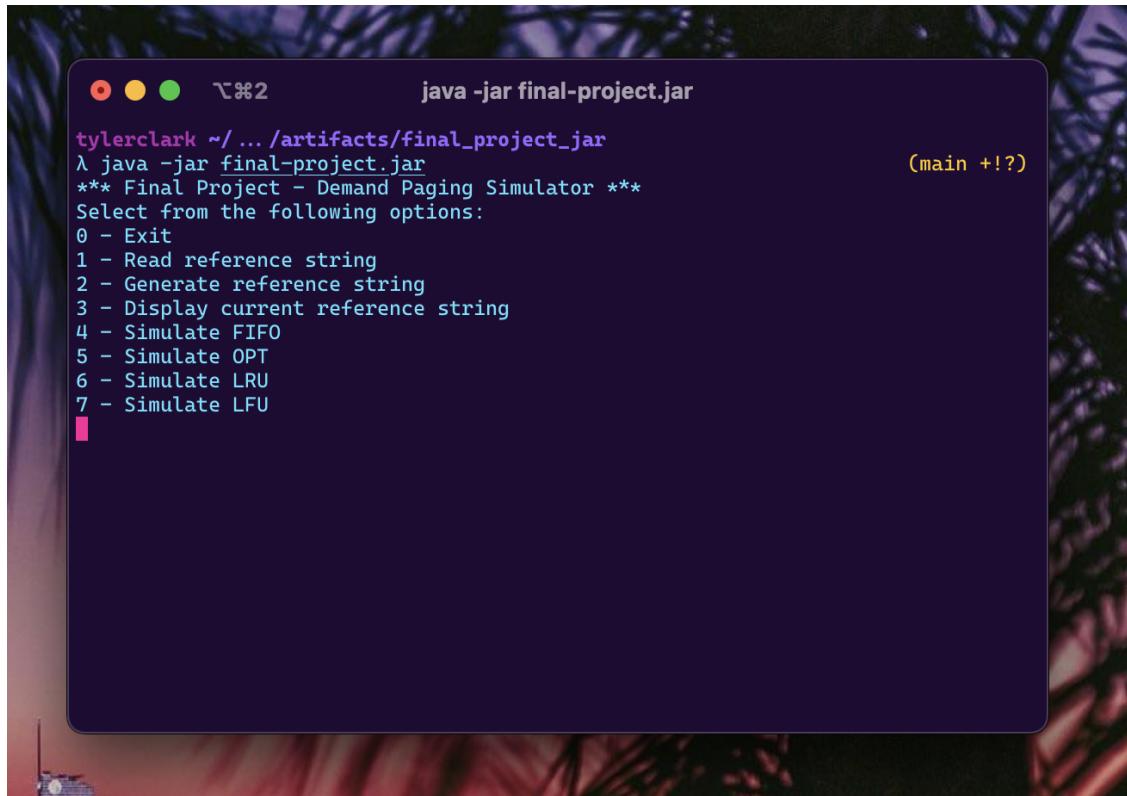
Running the program

Run the program with the following command:

```
java -jar final-project.jar
```

from the out directory

screenshot:



Testing the program

As per the instructions, testing the program will include using the reference string:

```
0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
```

to test the 4 algorithms with $N = 5$ physical frames.

Testing FIFO

Beginning Simulation:

```
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 9, 1, 8, 2, 7, 3, 6, 4, 5]
Was added as the reference string.
*** Final Project - Demand Paging Simulator ***
Select from the following options:
0 - Exit
1 - Read reference string
2 - Generate reference string
3 - Display current reference string
4 - Simulate FIFO
5 - Simulate OPT
6 - Simulate LRU
7 - Simulate LFU
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 0:
Physical Frame 1:
Physical Frame 2:
Physical Frame 3:
Physical Frame 4:
Victim frames:
Page Faults:
Press Enter key to continue ...

```

During Simulation:

```
Memory: [5, 6, 7, 8, 9]
Press Enter key to continue...
Memory: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 0: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Physical Frame 1: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Physical Frame 2: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Physical Frame 3: 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Physical Frame 4: 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Victim frames:
Page Faults:
Press Enter key to continue ...
Memory: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 0: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Physical Frame 1: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Physical Frame 2: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Physical Frame 3: 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Physical Frame 4: 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Victim frames:
Page Faults:
Press Enter key to continue ...

```

After Simulation:

```
Memory: [6, 0, 2, 7, 3]
Press Enter key to continue...
Memory: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 0: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Physical Frame 1: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Physical Frame 2: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Physical Frame 3: 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Physical Frame 4: 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Victim frames:
Page Faults: F F F F F F F F F F F F F F F F F F F F F F F F F F F F
Press Enter key to continue ...
Memory: [6, 0, 2, 7, 3]
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 0: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Physical Frame 1: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Physical Frame 2: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Physical Frame 3: 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Physical Frame 4: 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Victim frames:
Page Faults: F F F F F F F F F F F F F F F F F F F F F F F F F F F F
Press Enter key to continue ...
Table finished.
Faults: 18

```

Testing OPT

Beginning Simulation:

```
Table finished.
Faults: 18
*** Final Project - Demand Paging Simulator ***
Select from the following options:
0 - Exit
1 - Read reference string
2 - Generate reference string
3 - Display current reference string
4 - Simulate FIFO
5 - Simulate OPT
6 - Simulate LRU
7 - Simulate LFU
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 0:
Physical Frame 1:
Physical Frame 2:
Physical Frame 3:
Physical Frame 4:
Victim frames:
Page Faults:
Press Enter key to continue ...

```

During Simulation:

After Simulation:

```

● ● ● VM#2
java -jar final-project.jar

Memory: [4, 1, 2, 8, 9]
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 0 8 2 7 3 6 4 5
Physical Frame: 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 7 7 3 6 4 5
Physical Frame 1: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Physical Frame 2: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Physical Frame 3: 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Physical Frame 4: 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Victim frames
Page Faults: F F F F F F F F F F F F F F F F F F F F F F F F
Press Enter key to continue ...
Memory: [5, 1, 2, 8, 9]
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 0 8 2 7 3 6 4 5
Physical Frame: 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 7 7 3 6 4 5
Physical Frame 1: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Physical Frame 2: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Physical Frame 3: 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Physical Frame 4: 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Victim frames
Page Faults: F F F F F F F F F F F F F F F F F F F F F F F F
Press Enter key to continue ...
Table finished.
Faults: 15

```

Testing LRU

Beginning Simulation:

```
Table finished.  
Faults: 15  
** Final Project - Demand Paging Simulator **  
Select from the following options:  
0 - Exit  
1 - Read reference string  
2 - Generate reference string  
3 - Display current reference string  
4 - Simulate FIFO  
5 - Simulate OPT  
6 - Simulate LRU  
7 - Simulate LFU  
8 - Help  
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5  
Physical Frame 0:  
Physical Frame 1:  
Physical Frame 2:  
Physical Frame 3:  
Physical Frame 4:  
Victim frames:  
Page Faults:  
Press Enter key to continue ...
```

During Simulation:

After Simulation:

```

    ● ● ● □□□
                                          java -jar final-project.jar

Memory: [7, 6, 2, 4, 3]
Reference String:   0     1     2     3     4     5     6     7     8     9     0     9
Physical Frame 0:  0     0     0     0     0     5     5     5     5     0     0     0
Physical Frame 1:  1     1     1     1     1     6     6     6     6     6     6     6
Physical Frame 2:  2     2     2     2     2     7     7     7     7     1     1     1
Physical Frame 3:  3     3     3     3     3     8     8     8     8     7     7     2
Physical Frame 4:  4     4     4     4     4     9     9     9     9     9     9     2
Victim frames
Page Faults:      F     F     F     F     F     F     F     F     F     F     F     F
Press Enter key to continue ...

Memory: [7, 6, 5, 4, 3]
Reference String:   0     1     2     3     4     5     6     7     8     9     0     9
Physical Frame 0:  0     0     0     0     0     5     5     5     5     0     0     0
Physical Frame 1:  1     1     1     1     1     6     6     6     6     6     6     6
Physical Frame 2:  2     2     2     2     2     7     7     7     7     1     1     1
Physical Frame 3:  3     3     3     3     3     8     8     8     8     7     7     2
Physical Frame 4:  4     4     4     4     4     9     9     9     9     9     9     2
Victim frames
Page Faults:      F     F     F     F     F     F     F     F     F     F     F     F
Press Enter key to continue ...

Table finished.
Faults: 18

```

Testing LFU

Beginning Simulation:

```
java -jar final-project.jar

Table Finished.
Faults: 18
** Final Project - Demand Paging Simulator ***
Select from the following options:
0 - EXIT
1 - Read reference string
2 - Generate reference string
3 - Display current reference string
4 - Simulate FIFO
5 - Simulate OPT
6 - Simulate LRU
7 - Simulate LFU
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 0:
Physical Frame 1:
Physical Frame 2:
Physical Frame 3:
Physical Frame 4:
Victim frames
Page Faults:
Press Enter key to continue ...
```

During Simulation:

```
● ● ● \^M2
java -jar final-project.jar

Press Enter key to continue ...

Memory: [0, 1, 2, 3, 4]
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 0: 0 0 0 0 0 5 6 7 8 9 1 1 1 1 1 1 1 1 1 1
Physical Frame 1: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Physical Frame 2: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Physical Frame 3: 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Physical Frame 4: 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Victim frames
Page Faults: F F F F F F F F F F F F
Press Enter key to continue ...

Memory: [0, 1, 2, 3, 4]
Reference String: 0 1 2 3 4 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 0: 0 0 0 0 0 5 6 7 8 9 0 9 1 8 2 7 3 6 4 5
Physical Frame 1: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Physical Frame 2: 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Physical Frame 3: 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Physical Frame 4: 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Victim frames
Page Faults: F F F F F F F F F F F F
Press Enter key to continue ...
^M
```

After Simulation: