CSC369: Assignment 3

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Algorithm Comparison Tables:

I. Trace File: Simpleloop

Memory Size = 50	FIFO	CLOCK	LRU	RAND
Hit Rate	22.4822	25.1481	25.2073	22.4822
Hit Count	759	849	851	759
Miss Count	2617	2527	2525	2617
Overall eviction count	2567	2477	2475	2567
Clean eviction count	60	15	14	60
Dirty eviction count	2507	2462	2461	2507

Memory Size = 100	FIFO	CLOCK	LRU	RAND
Hit Rate	23.7855	25.1481	25.2073	23.8744
Hit Count	803	849	851	806
Miss Count	2573	2527	2525	2570
Overall eviction count	2473	2427	2425	2470
Clean eviction count	38	15	14	31
Dirty eviction count	2435	2412	2411	2439

II. Trace File: Matmul

Memory Size = 50	FIFO	CLOCK	LRU	RAND
Hit Rate	62.9391	65.7665	65.7665	67.2663
Hit Count	1913768	1999739	1999739	2045342
Miss Count	1126896	1040925	1040925	995322

Overall eviction count	**1126846**	**1040875**	**1040875**	**995272**
Clean eviction count	**1104475**	**1039933**	**1039933**	**974769**
Dirty eviction count	**22371**	**942**	**942**	**20503**

Memory Size = 100	**FIFO**	**CLOCK**	**LRU**	**RAND**
Hit Rate	**64.3709**	**67.0594**	**66.9061**	**89.3805**
Hit Count	**1957302**	**2039051**	**2034389**	**2717762**
Miss Count	**1083362**	**1001613**	**1006275**	**322902**
Overall eviction count	**1083262**	**1001513**	**1006175**	**3044828**
Clean eviction count	**1071730**	**1000572**	**1005234**	**3040664**
Dirty eviction count	**11532**	**941**	**941**	**4164**

III. **Trace File:** Blocked

Memory Size = 50	**FIFO**	**CLOCK**	**LRU**	**RAND**
Hit Rate	**99.8245**	**99.8473**	**99.8618**	**99.7716**
Hit Count	**3507538**	**3508339**	**3508848**	**3505678**
Miss Count	**6166**	**5365**	**4856**	**8026**
Overall eviction count	**6116**	**5315**	**4806**	**7976**
Clean eviction count	**4142**	**3061**	**2623**	**5796**
Dirty eviction count	**1974**	**2254**	**2183**	**2180**

Memory Size = 100	**FIFO**	**CLOCK**	**LRU**	**RAND**
Hit Rate	**99.8817**	**99.8866**	**99.8971**	**99.8563**
Hit Count	**3509549**	**3509721**	**3510089**	**3508654**
Miss Count	**4155**	**3983**	**3615**	**5050**

Overall eviction count	**4055**	**3883**	**3515**	**4950**
Clean eviction count	**2759**	**2590**	**2587**	**3409**
Dirty eviction count	**1296**	**1293**	**928**	**1541**

Discussion:

FIFO:

The **hit rate** of FIFO is lower than CLOCK and LRU for both 50 and 100 memory sizes on all three types of trace files. The above tables show that when the memory size is increased from 50 to 100 the hit rate for FIFO increases for all three cases. The **overall eviction count** for FIFO is the highest as well when compared to CLOCK and LRU with both clean eviction count highest in all cases and dirty eviction count higher in most cases. The overall space and time complexity of the algorithm is constant whereas that's not the case for both LRU and CLOCK.

CLOCK:

Clock always outperforms FIFO in terms of hit rate. Clock's hit rate is slightly lower than that of LRU's. In case of matmul and memory size 100, it outperforms LRU but by a very small margin. This could only be possible by chance that the LRU evicts some page and CLOCK does not so we get a higher hit rate for CLOCK. Overall we can see that the data supports that the LRU us better than CLOCK for most of the cases. Overall eviction count for both of the CLOCK and LRU algorithms is pretty much the same. The CLOCK algorithm behaves very similar to LRU over as, and it supports our intuition that the CLOCK is an approximation of LRU and the data supports that our implementation of CLOCK is a good approximation of LRU.

LRU:

Over all LRU beats both CLOCK and FIFO in terms of hit rate. The overall hit rate increases with increase in memory from 50 to 100 for most of the cases. It is because we have more pages in memory and there only the least recently used one is evicted thus there is a higher chance for hits and hence the higher hit rate. Finally the overall eviction count decreases or remains the same when the memory is increased. This data makes sense as we know that the larger the memory the lower the need for the evictions will be.

Custom Trace-file Analysis:

Trace 1	FIFO	CLOCK	LRU
Hit Count	**10**	**12**	**11**
Miss Count	**25**	**23**	**24**
Hit Rate	**28.5714**	**34.2857**	**31.4286**
Miss Rate	**71.4286**	**65.7143**	**68.5714**

Trace 2	FIFO	CLOCK	LRU
Hit Count	**38**	**38**	**38**
Miss Count	**2**	**2**	**2**
Hit Rate	**95.0000**	**95.0000**	**95.0000**
Miss Rate	**5.0000**	**5.0000**	**5.0000**

Trace 3	FIFO	CLOCK	LRU
Hit Count	**0**	**0**	**0**
Miss Count	**33**	**33**	**33**
Hit Rate	**0.0000**	**0.0000**	**0.0000**
Miss Rate	**100.0000**	**100.0000**	**100.0000**