1 Tables in Task2

Table 1.1.1: Trace file: simpleloop, memory size: 50

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	71.4829	7520	3000	2950	237	2713
FIFO	71.6730	7540	2980	2930	201	2729
CLOCK	73.4125	7723	2797	2747	93	2654
LRU	73.5076	7733	2787	2732	86	2651
OPT	74.4962	7837	2683	2633	25	2608

Table 1.1.2: Trace file: simpleloop, memory size: 100

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	73.4696	7729	2791	2691	62	2629
FIFO	73.7072	7754	2766	2666	44	2622
CLOCK	74.3251	7819	2701	2601	6	2595
LRU	74.3821	7825	2695	2595	3	2592
OPT	74.8669	7876	2644	2544	0	2544

Table 1.1.1: Trace file: simpleloop, memory size: 150

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	74.1350	7799	2721	2571	16	2555
FIFO	74.0970	7795	2725	2575	16	2559
CLOCK	74.4106	7828	2692	2542	0	2542
LRU	74.4202	7829	2691	2541	0	2541
OPT	74.8669	7876	2644	2494	0	2494

Table 1.1.2: Trace file: simpleloop, memory size: 200

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	74.1065	7796	2724	2524	17	2507
FIFO	74.1730	7803	2717	2517	12	2505
CLOCK	74.4106	7828	2682	2492	0	2492
LRU	74.4202	7829	2691	2491	0	2491
OPT	74.8669	7876	2644	2444	0	2444

Table 1.2.1: Trace file: matmul, memory size: 50

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	66.2876	1413560	718904	718854	690547	28307
FIFO	61.7997	1317857	814607	814557	782548	32009
CLOCK	64.7171	1380069	752395	752345	751335	1010
LRU	64.7172	1380070	752394	752344	751335	1009
OPT	80.0900	1707891	424573	424523	423525	998

Table 1.2.2: Trace file: matmul, memory size: 100

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	89.0151	1898214	234250	234150	228430	5720
FIFO	63.2832	1349491	782973	782873	766600	16273
CLOCK	66.0531	1408559	723905	723805	722804	1001
LRU	65.8949	1305186	727278	727178	726180	998
OPT	96.8483	2065256	67208	67108	66113	995

Table 1.2.1: Trace file: matmul, memory size: 150

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	96.7197	2062513	69951	69801	67877	1924
FIFO	98.8266	2107398	25066	24916	23746	1170
CLOCK	98.6261	2103167	29297	29147	28150	997
LRU	98.8767	2108611	23953	23803	22806	997
OPT	99.0919	2113100	19364	19214	18219	995

Table 1.2.2: Trace file: matmul, memory size: 200

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	98.0769	2091454	41010	40810	39411	1399
FIFO	98.8426	2107783	24681	24481	23357	1124
CLOCK	98.8767	2108609	23955	23755	22759	996
LRU	98.8773	2108523	23941	23741	22745	996
OPT	99.3405	2118400	14064	13864	12869	995

Table 1.3.1: Trace file: blocked, memory size: 50

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	99.4606	230494	1250	1200	328	872
FIFO	99.4900	230562	1182	1132	286	846
CLOCK	99.5832	230778	966	916	121	795
LRU	99.5879	230789	955	905	119	786
OPT	99.6384	230906	838	788	32	756

Table 1.3.2: Trace file: blocked, memory size: 100

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	99.5875	230788	956	856	91	765
FIFO	99.5952	230806	938	838	65	773
CLOCK	99.6285	230883	861	761	11	750
LRU	99.6306	230888	856	729	4	725
OPT	99.6574	230950	749	694	0	694

Table 1.3.1: Trace file: blocked, memory size: 150

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	99.6103	230841	903	753	38	715
FIFO	99.6177	230858	886	736	23	713
CLOCK	99.6328	230893	851	701	0	701
LRU	99.6328	230893	851	701	0	701
OPT	99.6574	230950	794	644	0	644

Table 1.3.2: Trace file: blocked, memory size: 200

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	99.6216	230867	877	677	21	656
FIFO	99.6216	230867	877	677	14	663
CLOCK	99.6328	230893	851	651	0	651
LRU	99.6328	230893	851	651	0	651
OPT	99.6574	230950	794	594	0	594

Table 1.4.1: Trace file: my, memory size: 50

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	91.9435	8856	776	726	219	507
FIFO	92.2446	8885	747	697	200	497
CLOCK	93.8123	9036	596	546	84	362
LRU	93.8434	9039	593	543	85	458
OPT	94.6013	9112	520	470	16	454

Table 1.4.2: Trace file: my, memory size: 100

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	94.2795	9081	551	451	42	409
FIFO	94.3210	9085	547	447	37	410
CLOCK	94.7778	9129	503	403	5	398
LRU	94.7986	9131	501	401	4	397
OPT	94.8505	9136	496	396	0	396

Table 1.4.1: Trace file: my, memory size: 150

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	94.6532	9117	515	365	10	355
FIFO	94.6740	9119	513	363	9	354
CLOCK	94.8505	9136	496	346	0	346
LRU	94.8505	9136	496	346	0	346
OPT	94.8505	9136	496	346	0	346

Table 1.4.2: Trace file: my, memory size: 200

	Hit Rate	Hit Count	Miss Count	Overall Eviction Count	Clean Eviction Count	Dirty Eviction Count
RAND	94.7882	9130	502	302	1	301
FIFO	94.7363	9125	507	307	4	303
CLOCK	94.8505	9136	496	296	0	296
LRU	94.8505	9136	496	296	0	296
OPT	94.8505	9136	496	296	0	296

2 Comparison

Table 2.1.1 Trace file: simpleloop

Memory Size	50	100	150	200
RAND	71.4829	73.4696	74.1350	74.1065
FIFO	71.6730	73.7072	74.0970	74.1730
CLOCK	73.4125	74.3251	74.4106	74.4106
LRU	73.5076	74.3821	74.4202	74.4202
OPT	74.4962	74.8669	74.8669	74.8669

Table 2.1.2 Trace file: matmul

Memory Size	50	100	150	200
RAND	66.2876	89.0151	96.7197	98.0769
FIFO	61.7997	63.2832	98.8266	98.8426
CLOCK	64.7171	66.0531	98.6261	98.8767
LRU	64.7172	65.8949	98.8767	98.8773
OPT	80.0900	96.8483	99.0919	99.3405

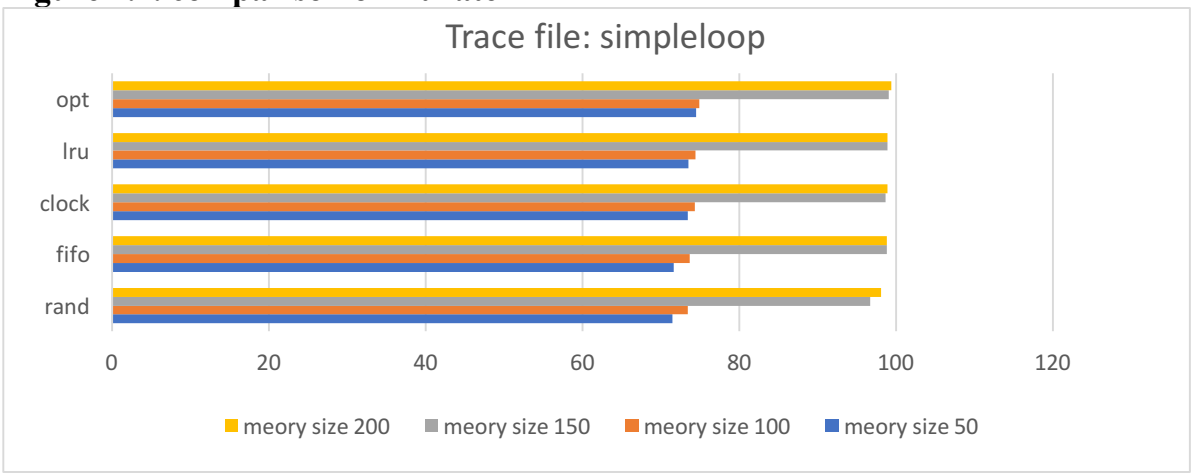
Table 2.1.3 Trace file: blocked

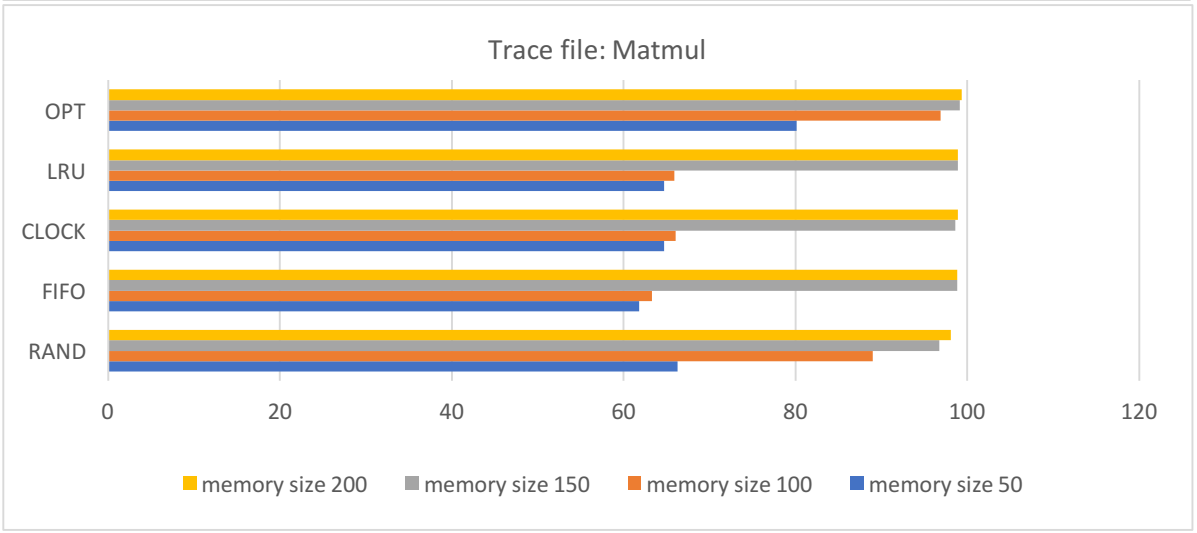
Memory Size	50	100	150	200
RAND	99.4606	99.5875	99.6103	99.6216
FIFO	99.4900	99.5952	99.6177	99.6216
CLOCK	99.5832	99.6285	99.6328	99.6328
LRU	99.5879	99.6306	99.6328	99.6328
OPT	99.6384	99.6574	99.6574	99.6574

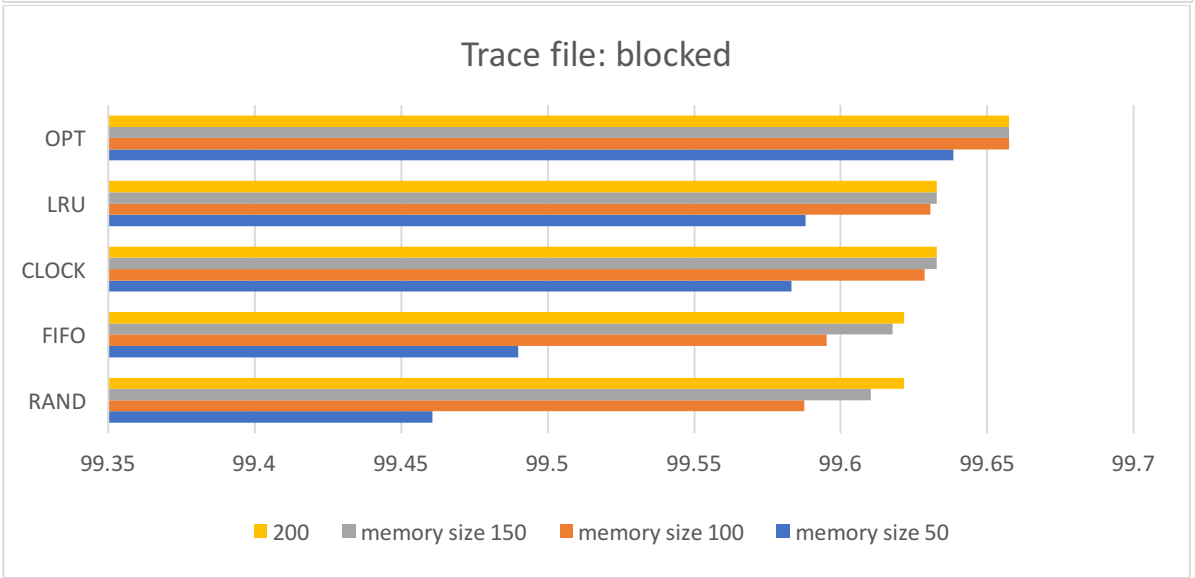
Table 2.1.4 Trace file: my

Memory Size	50	100	150	200
RAND	91.9435	94.2795	94.6532	94.7882
FIFO	92.2446	94.3210	94.6740	94.7360
CLOCK	93.8123	94.7778	94.8505	94.8505
LRU	93.8434	94.7986	94.8505	94.8505
OPT	94.6013	94.8505	94.8505	94.8505

Figure 2.2. comparison of hit rate







As we can see from the figure above, we have the hit rate trend:

FIFO < CLOCK ~= LRU < OPT

OPT is always the best algorithm in all cases, because OPT always choose the best page to evict, which will not be used in the longest time. Thus, OPT always has the least eviction count through all algorithm. However, in reality, we do not know what the exact trace is, thus, LRU and clock is designed by analyzing the past to predict future.
As for all algorithms, hitting rate raises when memory size raised.The result of LRU and CLOCK demonstrate that these two algorithm has almost equal hit rate. Cause these two are the similar algorithm. We can see clock as a approximate LRU, and both two algorithm perform better than FIFO.

3 LRU Description

Memory size	50	100	150	200
simpleloop	73.5076	74.3821	74.4202	74.4202
matmul	64.7172	65.8949	98.8767	98.8773
blocked	99.5879	99.6306	99.6328	99.6328
my	93.8434	94.7986	94.8505	94.8505

Overall, as the memory size increase, hit rate increased. LRU makes the use of locality, which means the data within a process tend to cluster in physical memory. Once eviction needed, LRU choose the page that hasn't been used for the longest time.And with the increase of memory, we can store more pages in physical memory, which can store a program as a whole, which improving the hitting rate. As for matmul, we can see there is a huge jump between memory 100 and memory 150. We can do some calculation to analysis this result. For storing each matrix be multipleied, we simply need 100 pages, and 200 pages for storing 2 matrix. 100 memory is far from enough to store matrix. With 150 memory, we can store one and a half matrix at once, which largely reduce eviction for new page.