simpleloop

Rand(Simpleloop)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	72.4673	7983	3033	2983	274	2709
100	74.6732	8226	2790	2690	71	2619
150	75.2905	8294	2722	2572	20	2552
200	75.3086	8296	2720	2520	18	2502

Fifo(Simpleloop)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	72.9757	8039	2977	2927	202	2725
100	74.9274	8254	2762	2662	44	2618
150	75.2996	8295	2721	2571	16	2555
200	75.3722	8303	2713	2513	12	2501

LRU(Simpleloop)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	74.7095	8230	2786	2736	88	2648
100	75.5810	8326	2690	2590	2	2588
150	75.6082	8329	2687	2537	0	2537
200	75.6082	8329	2687	2487	0	2487

Clock(Simpleloop)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	74.5189	8209	2807	2757	102	2655
100	75.5628	8324	2692	2592	3	2589

150	75.5901	8327	2689	2539	0	2539
200	75.5991	8328	2688	2488	0	2488

Opt(Simpleloop)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	75.6718	8336	2680	2630	27	2603
100	76.0349	8376	2640	2540	0	2540
150	76.0349	8376	2640	2490	0	2490
200	76.0349	8376	2640	2440	0	2440

matmul

Rand(matmul)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	65.5231	1892670	995882	995832	956703	39129
100	88.7950	2564889	323663	323563	316038	7525
150	96.6551	2791932	96620	96470	94139	2331
200	98.0340	2831763	56789	56589	54953	1636

fifo(matmul)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	60.9748	1761289	1127263	1127213	1083217	43996
100	62.4882	1805003	1083549	1083449	1061223	22226
150	98.8088	2854143	34409	34259	32943	1316
200	98.8268	2854664	33888	33688	32433	1255

lru(matmul)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count

50	63.9535	1847331	1041221	1041171	1040063	1108
100	65.1571	1882097	1006455	1006355	1005274	1081
150	98.8615	2855666	32886	32736	31656	1080
200	98.8619	2855678	32874	32674	31594	1080

clock(matmul)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	63.9524	1847299	1041253	1041203	1040089	1114
100	63.9597	1847508	1041044	1040944	1039861	1083
150	98.8503	2855343	33209	33059	31976	1083
200	98.8609	2855648	32904	32704	31623	1081

opt(matmul)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	79.6624	2301090	587462	587412	586325	1087
100	96.7874	2795755	92797	92697	91612	1085
150	99.0786	2861938	26614	26464	25379	1085
200	99.3331	2869288	19264	19064	17979	1085

blocked

rand(blocked)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	99.6564	2410466	8310	8260	5743	2517
100	99.7848	2413570	5206	5106	3385	1721
150	99.8195	2414409	4367	4217	2743	1474
200	99.8404	2414916	3860	3660	2323	1337

fifo(blocked)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	99.7343	2412350	6426	6376	4100	2276
100	99.8219	2414469	4307	4207	2727	1480
150	99.8260	2414567	4209	4059	2636	1423
200	99.8692	2415613	3163	2963	1865	1098

lru(blocked)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	99.7878	2413643	5133	5083	2746	2337
100	99.8435	2414991	3785	3685	2603	1082
150	99.8442	2415007	3769	3619	2558	1061
200	99.8472	2415080	3696	3496	2435	1061

clock(blocked)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	99.7858	2413596	5180	5130	2802	2328
100	99.8334	2414747	4029	3929	2604	1325
150	99.8375	2414846	3930	3780	2571	1209
200	99.8686	2415598	3178	2978	1916	1062

opt(blocked)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	99.8471	2415077	3699	3649	2563	1086
100	99.8761	2415778	2998	2898	1825	1073
150	99.8957	2416253	2523	2373	1296	1077
200	99.9060	2416503	2273	2073	1005	1068

My program:

rand(my program)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	96.3651	5859	221	171	63	108
100	98.2072	5971	109	9	0	9
150	98.2237	5972	108	0	0	0
200	98.2237	5972	108	0	0	0

fifo(my program)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	96.6776	5878	202	152	37	115
100	98.1579	5968	112	12	0	12
150	98.2237	5972	108	0	0	0
200	98.2237	5972	108	0	0	0

lru(my program)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	97.6316	5936	144	94	16	78
100	98.2237	5972	108	8	0	8
150	98.2237	5972	108	0	0	0
200	98.2237	5972	108	0	0	0

clock(my program)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	97.4178	5923	157	107	18	89
100	98.1579	5968	112	12	0	12

150	98.2237	5972	108	0	0	0
200	98.2237	5972	108	0	0	0

opt(my program)

	Hit rate	Hit count	Miss count	Overall eviction count	Clean eviction count	Dirty eviction count
50	98.0592	5962	118	68	8	60
100	98.2237	5972	108	8	0	8
150	98.2237	5972	108	0	0	0
200	98.2237	5972	108	0	0	0

My program does a loop over a array with a relatively long length and sets all elements to 0.

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By comparing different algorithms with the same amount of memory(e.g. -m 50 -a rand; -m 50 -a fifo; -m 50 -a lru), we can see that rand is the worse algorithm while opt produces the best results, they generate respectively the lower bound and the upper bound of the hit rate. FIFO has poor approximation of opt, because it is not necessary for the data that come first to be accessed least. So it tends to have the lowest hit rate among fifo, lru and clock. CLOCK resembles fifo but have better behaviours, as it gives the data a second chance to stay. Therefore, it does better because it makes better use of locality. LRU is the best among fifo, lru and clock. Since data that are accessed most recently tends to be accessed again in the future, lru allows data with best locality to stay in memory. But if the program shows rather good locality(like blocked), these algorithms does not differ so much. This means that all algorithms try to use locality but lru gives the best predictions of which data is accessed most, clock the second, the fifo the worst(not considering rand and opt here because they are the bounds). So lru is the best approximation of opt. By comparing the amount of memory for the algorithms(different memory sizes, same algorithm), we can see that with more memory, the algorithms achieve higher hit rate and less evictions. This is because if there is a larger memory, more data can be kept. Then fewer frames need to be evicted. (Although fifo could suffer from Belady's anomaly, we did not witness it.)

LRU has higher hit rate when the memory size is relatively small. By "relatively small" we mean that the data that have good locality(accessed very frequently) cannot even stay in memory because of its size(e.g. There are 3 most-frequently-used pieces of data, but the memory size is only 2, so one of the pieces has to be evicted). But once the memory is large enough to fit all data that have good locality, the margin benefit of having larger memory is very small. And in term of performance, opt needs a heavy overhead to implemented. As the memory gets bigger, there are more frames to keep track of. So the runtime becomes longer.