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HW#4 CS149

Part (1)

Problem 1

Let the sequence be a randomly selected page s = (s1,s2,s3,…sn). Let cost of all pages be equal.

Make partition phases (p1,p2,p3,…pn), such that FIFO has at most k faults on p0 and k for p(j).

P(j) has exactly k faults for every j >= 0.

In p(0) there is only new so opt and FIFO would be the same.

For P(j), j >= 0. Let S(t) be requested in p(j) and s(t+1 -1)

S(s1) = g and S(s2) = g, then t(j) <= s1< s2 <= t(j+1)

Making OPT(s) >= 1 and FIFO(s) = K(j) (K / (>=1))

FIFO(s)/OPT(s) = K competitive

Problem 2

Let the sequence be a randomly selected page s = (s1,s2,s3,…sn) Let cost of all pages be equal.

Let partitions phases p1,p2,p2,… pn.

let there be k faults for every j =< k-1

Making S = p(0), p(1),..(n). P(0) = (x (j+1) making p(k(j+1)

Phase opt can have k about of phases, from having s(n) can have no hits and complete new ever time depending on size of phase.

Making OPT(miss) = k. LFU(miss) = k-1

LFU(miss)/OPT(miss) = k/k = infinity. Making not competitive.

Part:3
FIFO
Hits: 87 + 78 +81 + 87 + 84 = 417/5 = average 83%
miss: 13 + 22 +19 + 13 + 16 =83/5 = average 14%
RR
Hits: 81 + 88 + 83 + 86 + 88 = 426/5 = average 85%
Miss: 19 +12 + 17 + 14 + 12 = 74/5 = average 14%

LRU
Hits: 85 + 87 + 89 + 83 + 85 = 429 = average 85%
Miss: 15 +13 + 11 + 17 + 15 = 71/5 = average 14%
LFU
Hits: 87 + 88 + 84 + 81 + 83 = 423 = average 84%
Miss: 13 + 12 + 16 + 19 + 17 = 77 = average 15%
MFU
Hits: 81 + 74 + 79 + 83 + 79 = 396/5 = average 79%
Miss: 19 + 26 + 21 + 17 + 21 = 104/5 = average 20%

From the observations that I made from the conditions that we had set, they follow close to the expected. FIFO and LRU ranges are very similar to each other which would explain why they are so often compared to each other. Random pick was not reliable because sometimes it would do really good, but then other times it would do the worst out all the programs, but in the 5 I recorded its randomness was in the upper bound. LFU also worked with similar averages to LRU, but it had a bigger variation on how good or bad it would do. MFU worked as well as I thought it would, because if it leaves 3 permanently in the memory pretty much and just keeps replacing the first because it was the most frequently used in most causes giving it only 70% + ((9/20) *3) % for the average probability it almost all causes.
FIFO if full 70% + 10% + (8/20) *2% = 85% hit
LRU if full is same as FIFO 85%
RR has lower bound of 70% + ((9/20) *3) % = 77.5% and upper of 70% + 10% + (8/20) *2% = 85%
LFU has the same lower of upper and lower as RR, but the lower 25% and upper has a 75% chance of happening.
MFU just seems to hold the 70% + ((9/20) *3) % = 77.5% as lower, but the lower has a far higher chance of happening then the upper of 85%, that only really would ever in the first couple of phases.