LIRS Cache algorithm

Реализован Михаилом Баргатиным, Алпатовой Полиной, Толченицыной Елизаветой

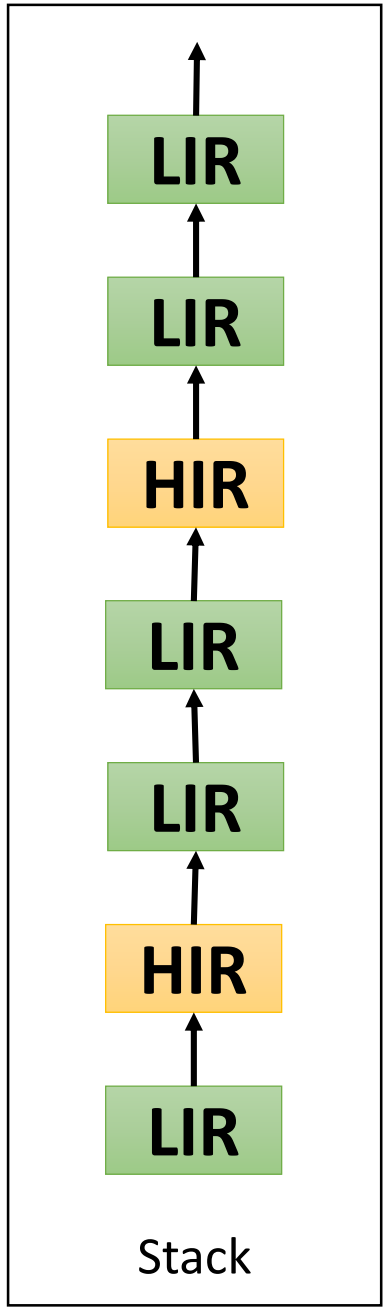
Concept

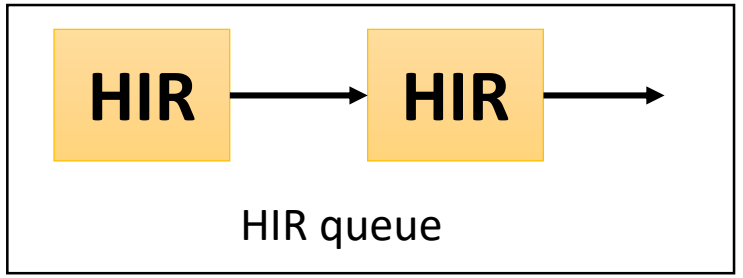
HIR - non-resident HIR blocks

HIR - resident HIR blocks

LIR - resident LIR blocks

LIR capacity = 99% of CacheSize

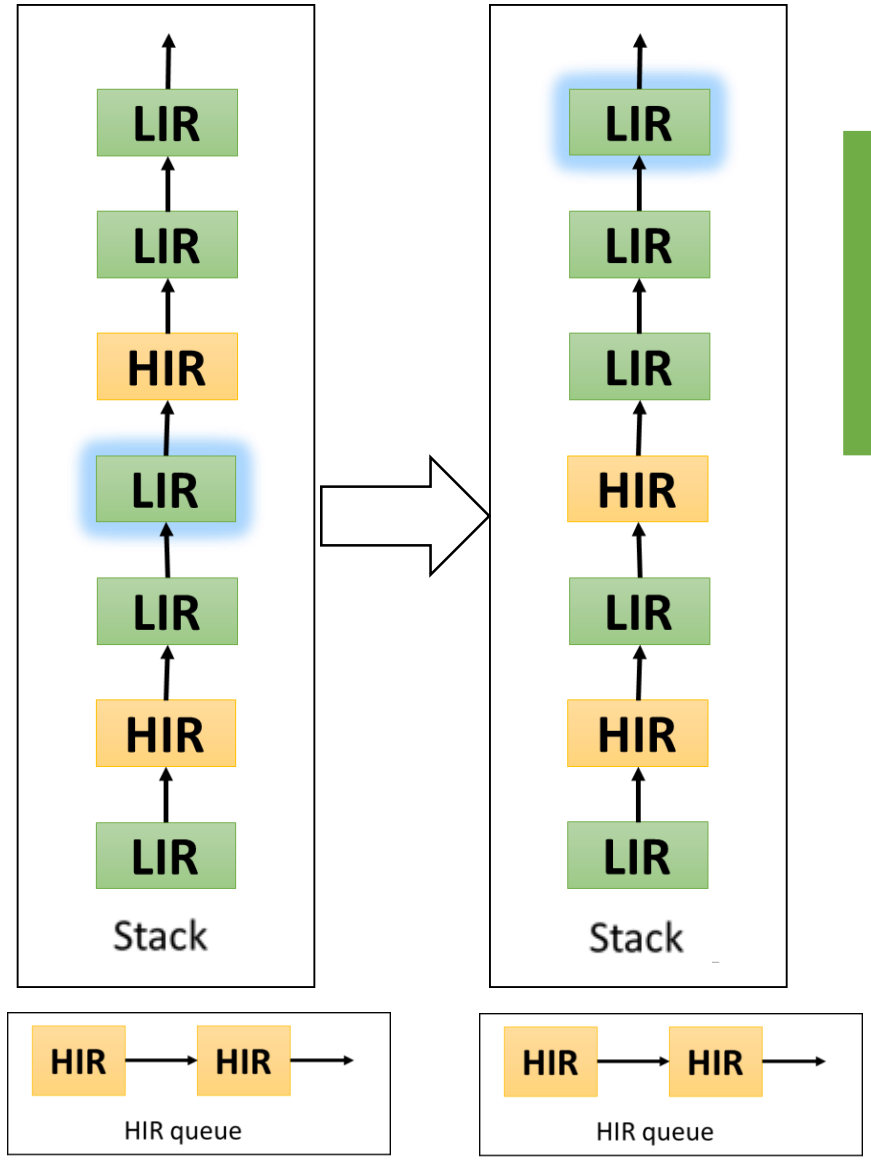




Cases of algorithm's behavior if new element is:

1. LIR block (always resident)
2. HIR block (resident)
   1) Block IS in Stack
   2) Block IS NOT in Stack, but IS in HIR queue
3. HIR block (non-resident)
   1) Not in Stack or hir queue (completely new)
   2) Block IS in Stack, but NOT in HIR queue

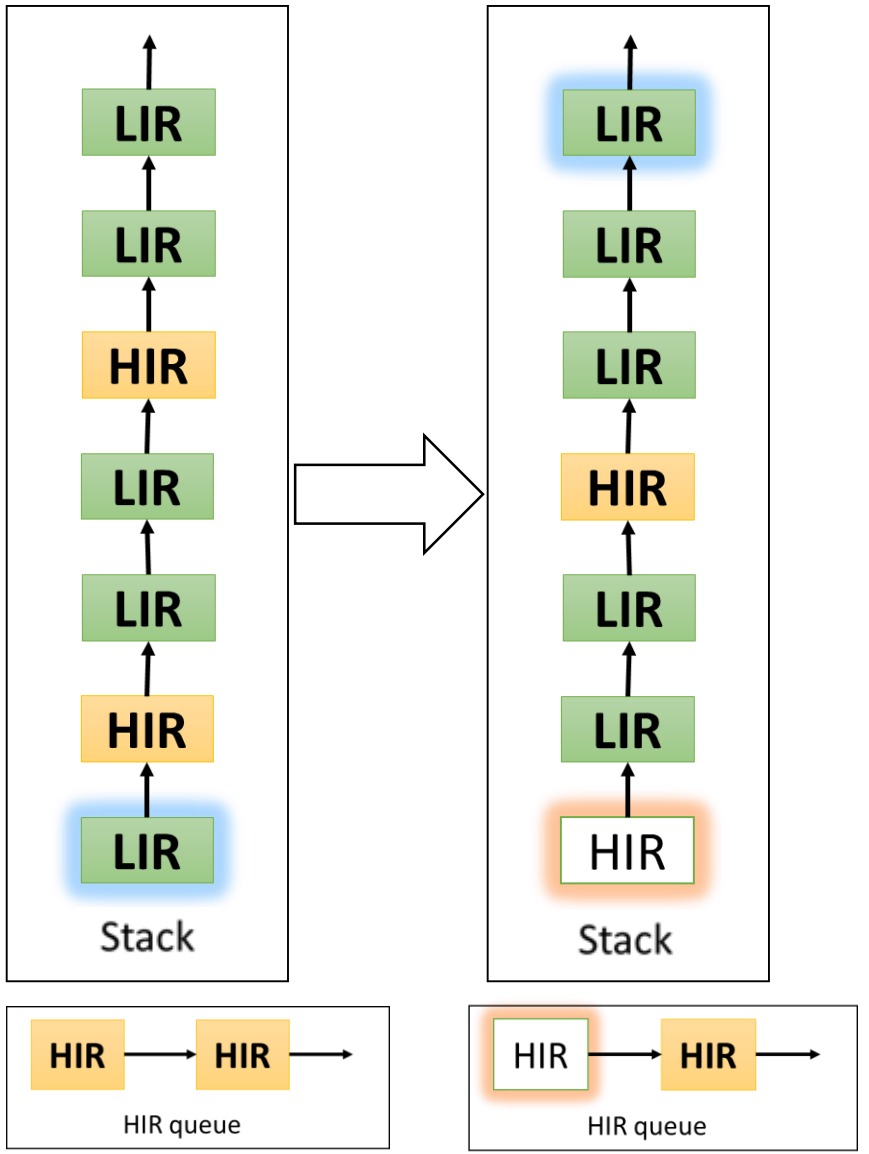
- MoveToFrontStack
- StackPrune



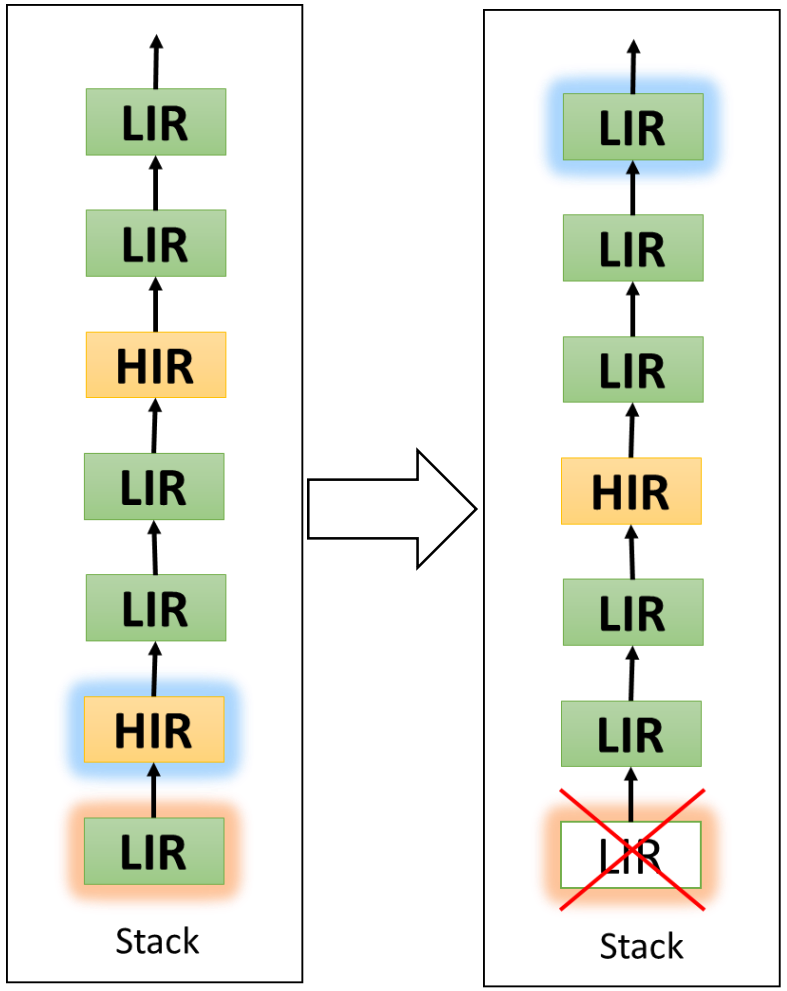
Found in Stack as LIR

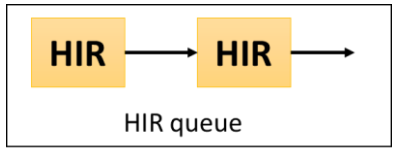
1 2

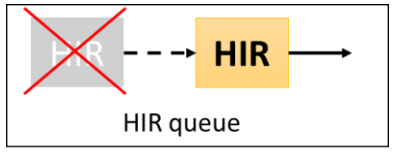
- MoveToFrontStack
- StackPrune



- MoveToFrontStack
- DeleteFromHIR
- StackPrune





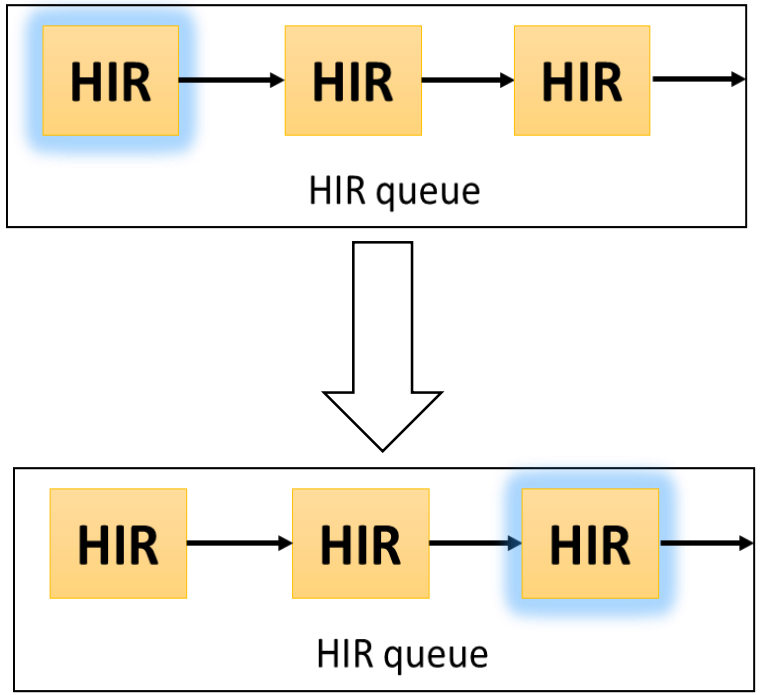


Found as HIR (Resident)

IS in Stack

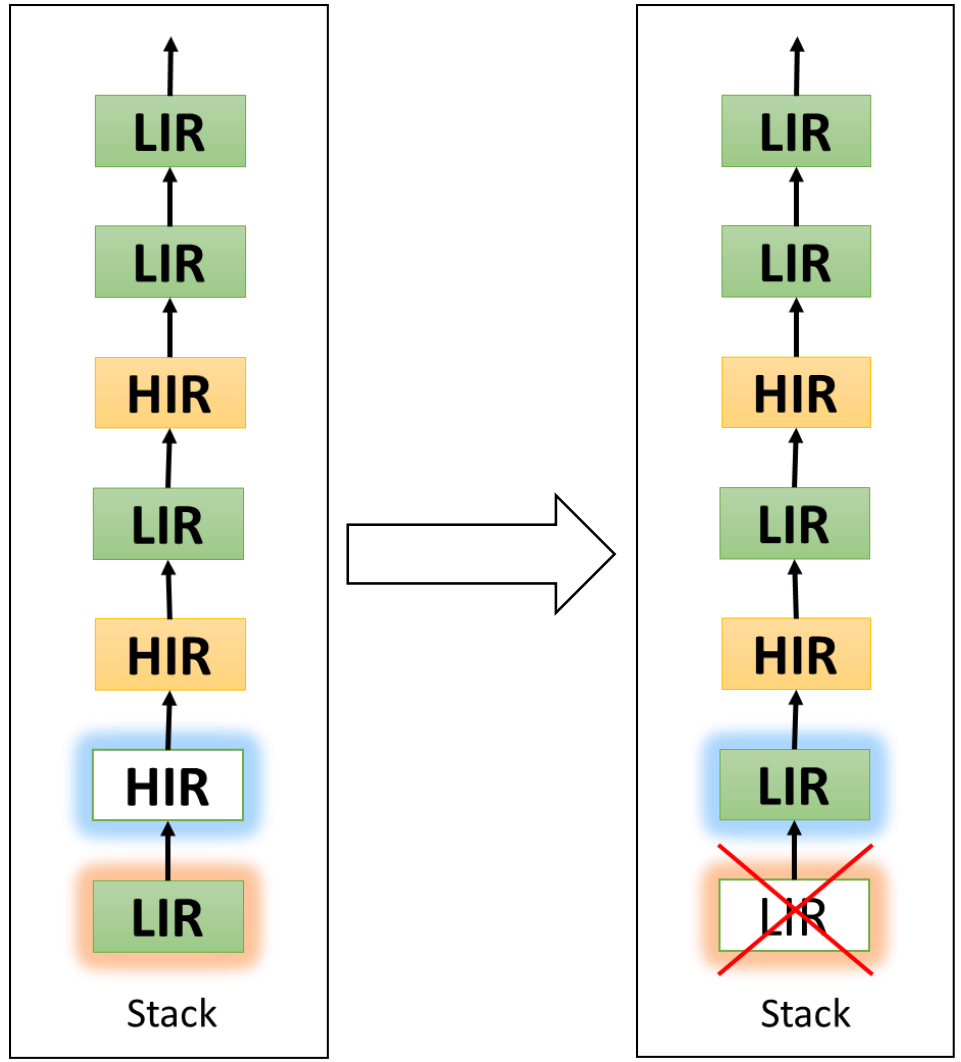
IS NOT in Stack

- MoveToFrontHIRQueue

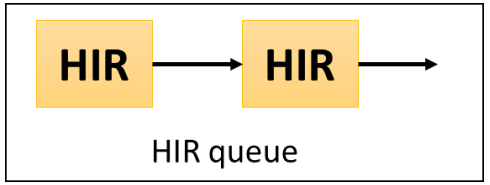


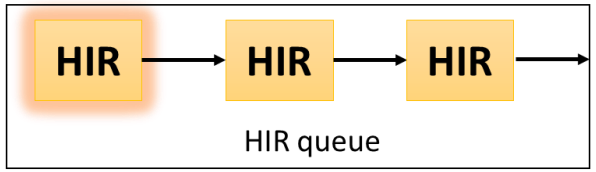
Found as HIR (Non-resident)

The element IS in Stack, but have been removed from HIR queue



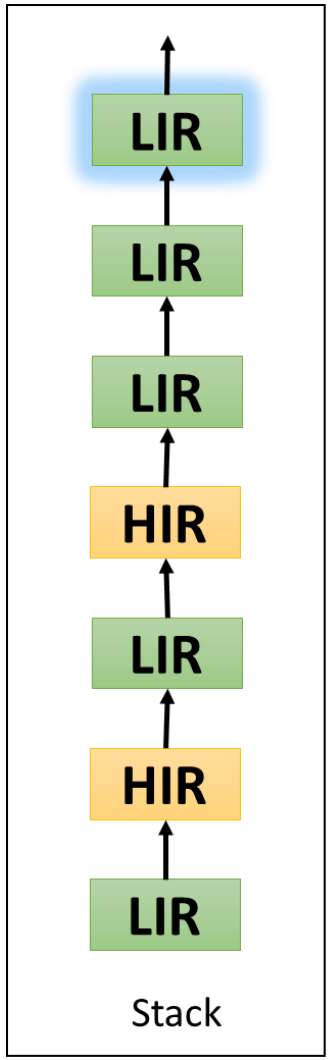
- ChangeStatus
- AddToHIRQueue
- StackPrune





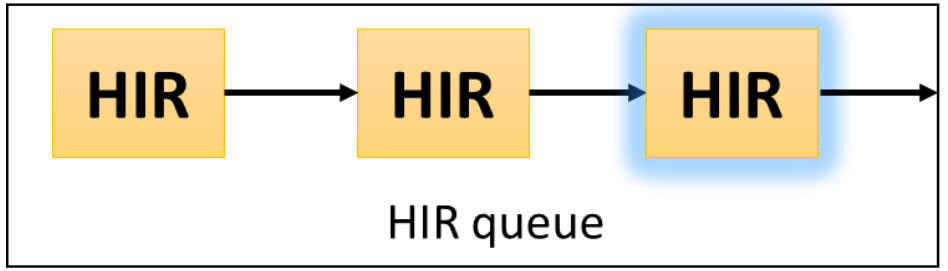
Completely new element

- AddToStackAsLIR

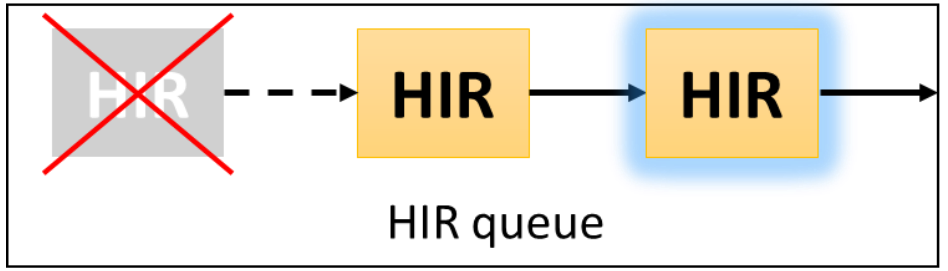


if not enough space in LIRs

- AddToHIRQueue

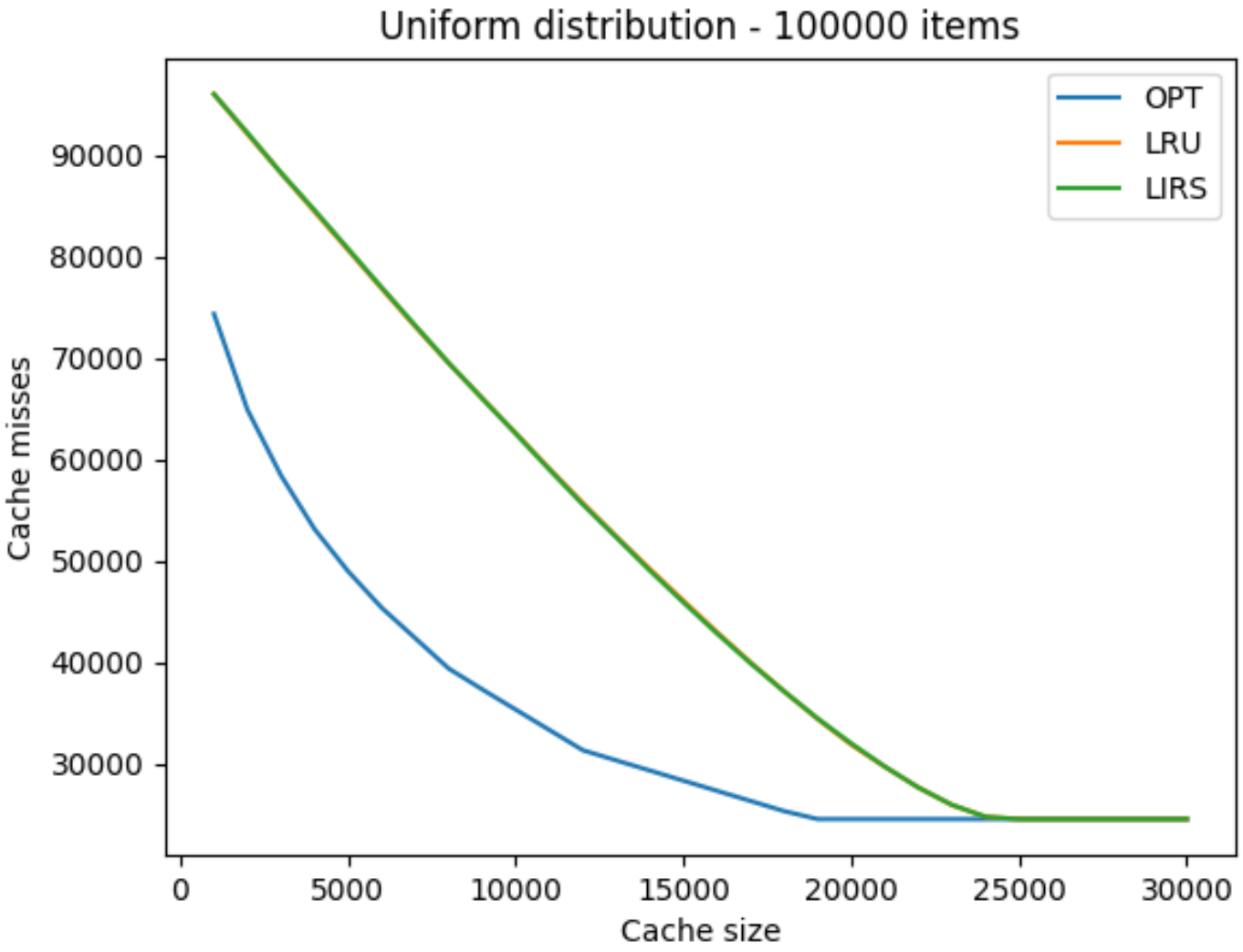


if not enough space in LIRs and HIRs

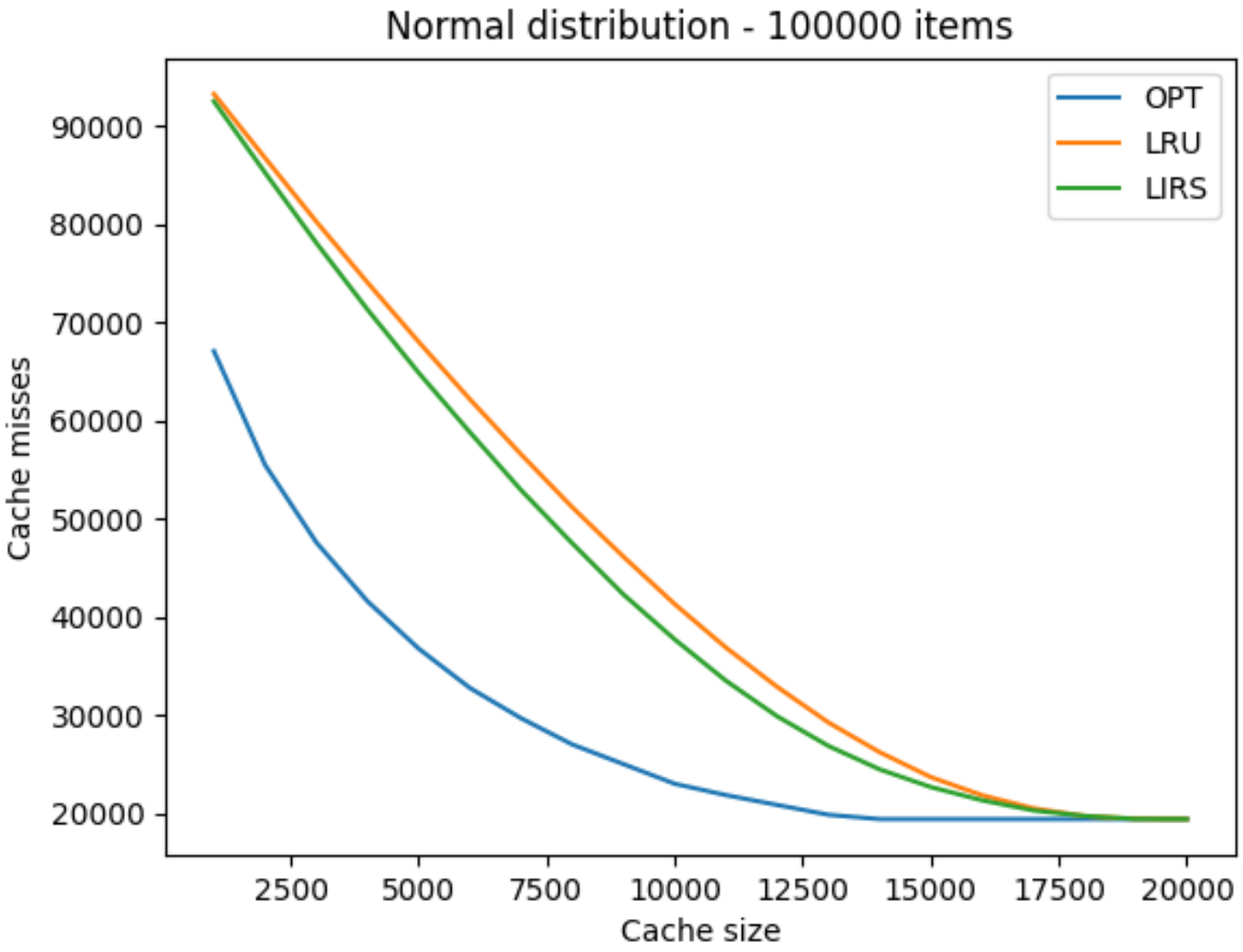


- PopHIRQueue
- AddToHIRQueue

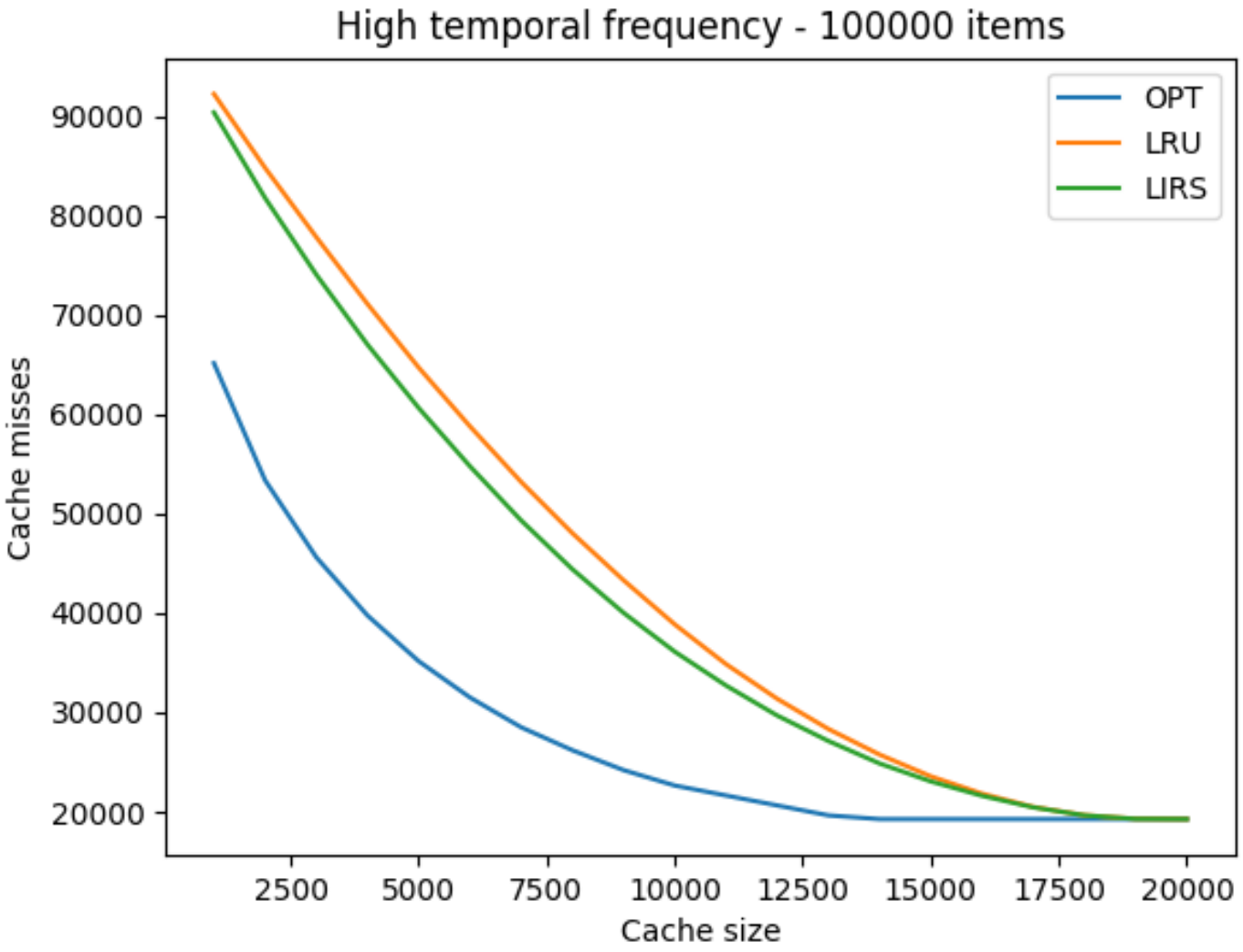
LIRS vs LRU


Uniform distribution - 100000 items
OPT
LRU
LIRS
Cache misses
90000
80000
70000
60000
50000
40000
30000
0
5000
10000
15000
20000
25000
30000
Cache size

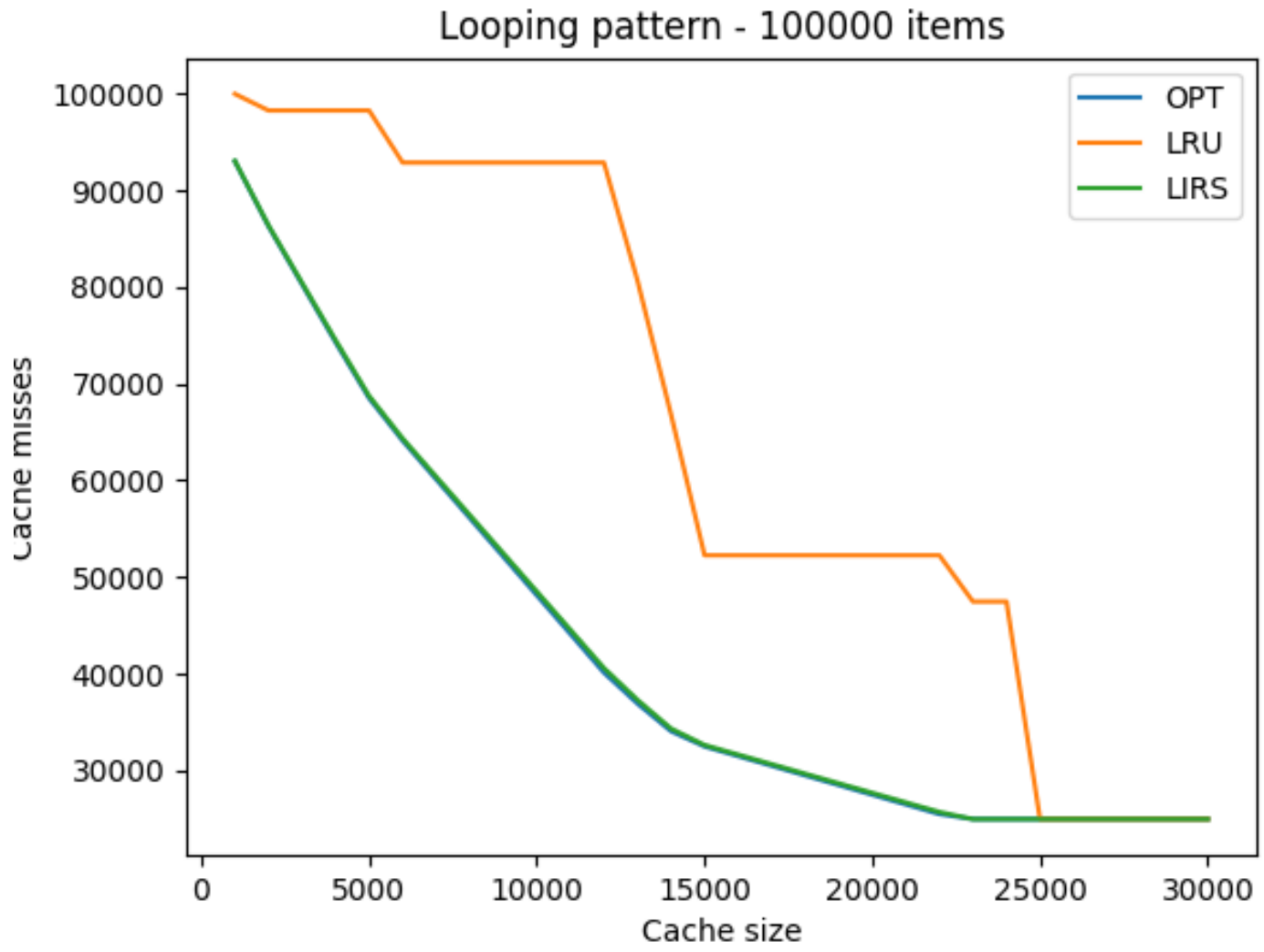
LIRS vs LRU


Normal distribution - 100000 items
OPT
LRU
LIRS
Cache misses
90000
80000
70000
60000
50000
40000
30000
20000
2500
5000
7500
10000
12500
15000
17500
20000
Cache size

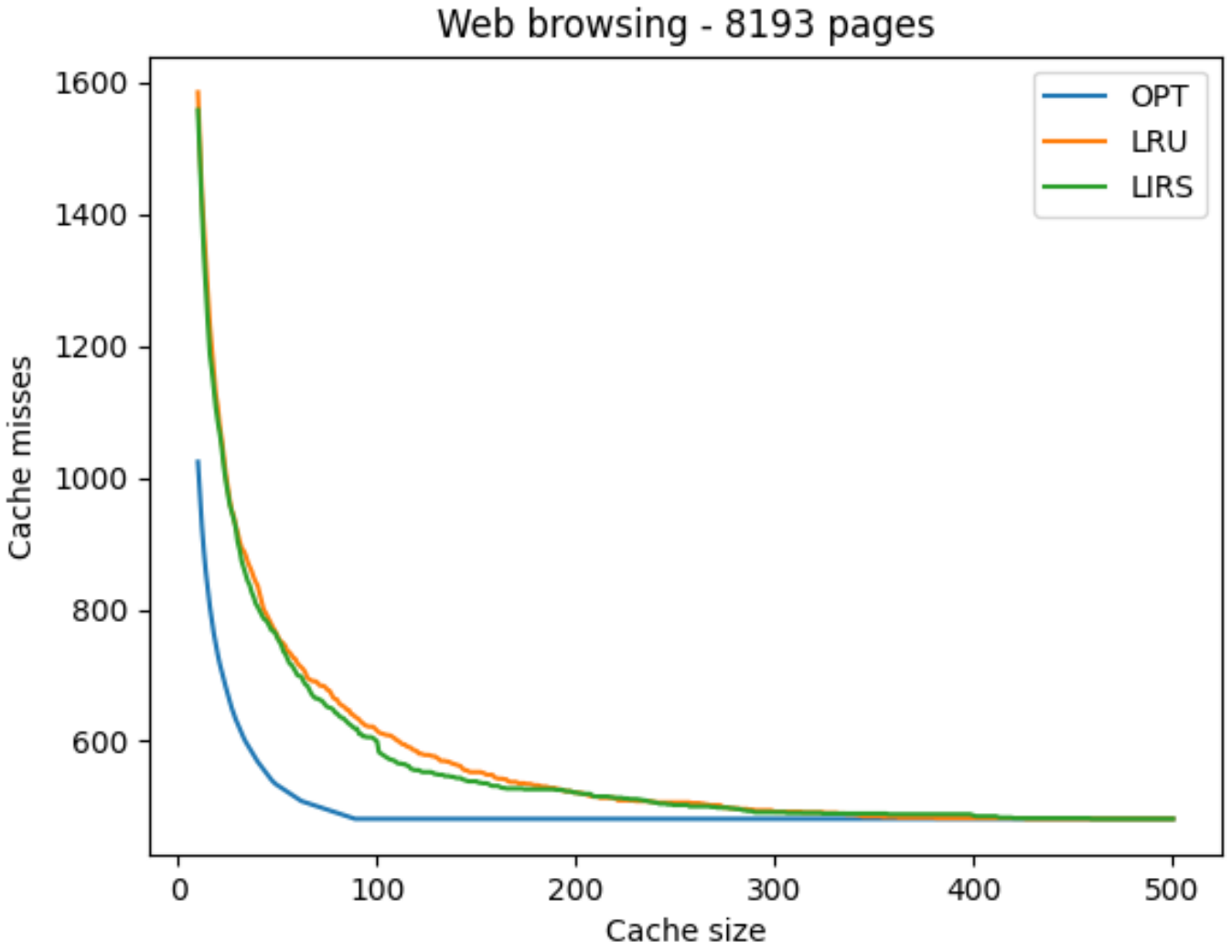
LIRS vs LRU


High temporal frequency - 100000 items
OPT
LRU
LIRS
Cache misses
90000
80000
70000
60000
50000
40000
30000
20000
2500
5000
7500
10000
12500
15000
17500
20000
Cache size

LIRS vs LRU


Looping pattern - 100000 items
OPT
LRU
LIRS
Cache misses
100000
90000
80000
70000
60000
50000
40000
30000
0
5000
10000
15000
20000
25000
30000
Cache size

LIRS vs LRU


Web browsing - 8193 pages
OPT
LRU
LIRS
Cache misses
1600
1400
1200
1000
800
600
0
100
200
300
400
500
Cache size