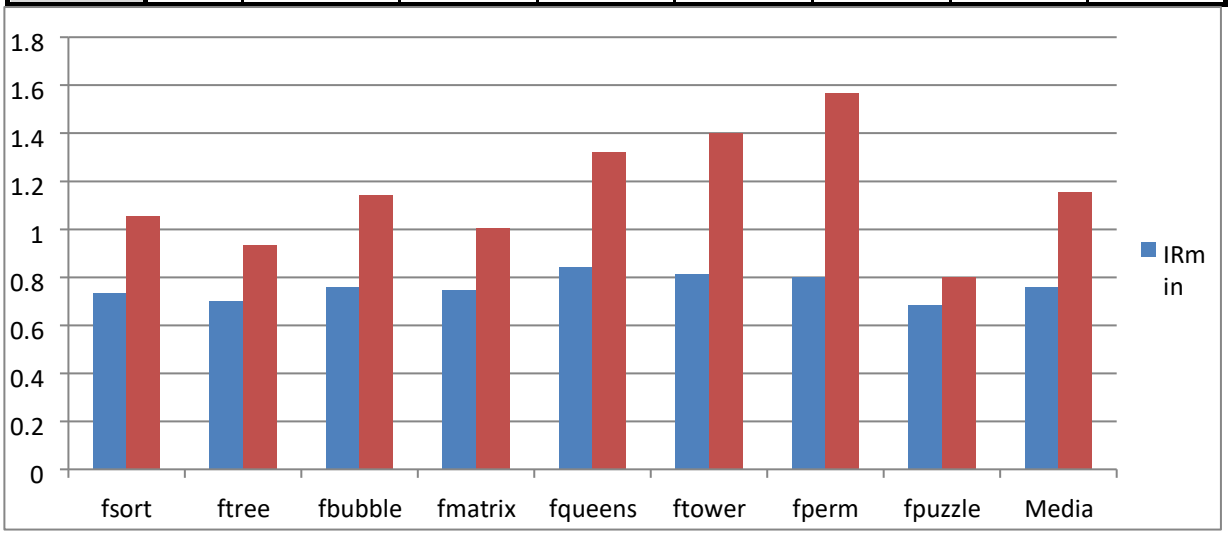
Laborator 1

b1) Generaţi în urma simulării de tip execution driven fişierele trace (*.trc) aferente celor 8 benchmark-uri Stanford care să cuprindă doar tipurile de instrucţiuni: de salt (Branch) şi cele cu referire la memorie (Load/Store).

b2) Exemplificaţi grafic rata de procesare obţinută pe cele 8 benchmark-uri în funcţie de tipul modelului arhitectural. IR = f(tip_model) - model minimal vs. model maximal. Vizualizaţi gradele de utilizare ale resurselor hardware pe cele 2 modele. Interpretări. Concluzii.

| | *fsort* | *ftree* | *fbubble* | *fmatrix* | *fqueens* | *ftower* | *fperm* | *fpuzzle* | *Media* |
|---|---|---|---|---|---|---|---|---|---|
| **IRmin** | 0.736 | 0.701682 | 0.757493 | 0.747852 | 0.842562 | 0.81353 | 0.80178 | 0.682565 | 0.760414 |
| **IRmax** | 1.057 | 0.933834 | 1.140583 | 1.004132 | 1.318666 | 1.39933 | 1.565578 | 0.798885 | 1.15227 |
| ***Minim*** | ***fsort*** | ***ftree*** | ***fbubble*** | ***fmatrix*** | ***fqueens*** | ***ftower*** | ***fperm*** | ***fpuzzle*** | |
| **Nr. Instr exe** | 72101 | 136040 | 206035 | 231814 | 206420 | 251149 | 355643 | 6825651 | |
| **. Cicli in exe** | 97983 | 193877 | 271996 | 309973 | 244991 | 308715 | 443567 | 10000001 | |
| ***Maxim*** | ***fsort*** | ***ftree*** | ***fbubble*** | ***fmatrix*** | ***fqueens*** | ***ftower*** | ***fperm*** | ***fpuzzle*** | |
| **Nr. Instr exe** | 72101 | 136040 | 206035 | 231814 | 206420 | 251149 | 355643 | 6881833 | |
| **. Cicli in exe** | 68203 | 145679 | 180640 | 230860 | 156537 | 179478 | 227164 | 8614302 | |




Concluzii:

1.Pentru simulariile maximale sunt mai putini cicli de executie

2.IRmax foloseste mai putini ciclii de executie

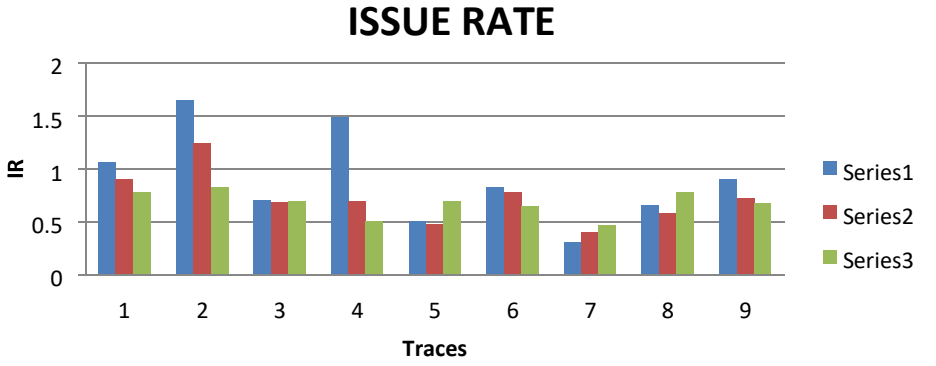
3.Performanta este seminifcativ mai buna pe modelul maximal

**Laboratorul 3- Simularea interfetei procesor-cache pentru o arhitectura risc superscalara parametrizabile**

**1)**Rezultate urmate de grafice privind influenta ratei de fetch (FR) asupra ratei de procesare IR(FR) si asupra ratei de miss în cache-ul de instructiuni RmissIC(FR).

**ISSUE RATE**

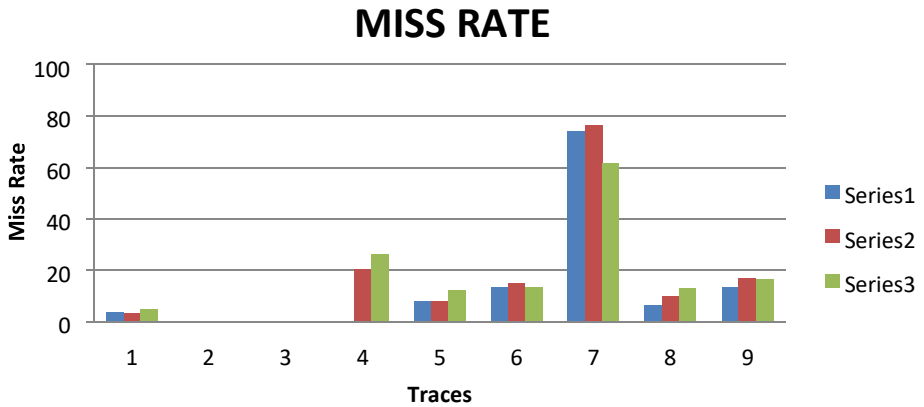
| | SORT | BUBBLE | MATRIX | PERM | PUZZLE | QUEENS | TOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| FR=4 | 1.058 | 1.648 | 0.705 | 1.483 | 0.505 | 0.818 | 0.308 | 0.651 | 0.897 |
| FR=8 | 0.904 | 1.242 | 0.678 | 0.692 | 0.474 | 0.777 | 0.401 | 0.578 | 0.71825 |
| FR=16 | 0.776 | 0.825 | 0.69 | 0.507 | 0.691 | 0.644 | 0.469 | 0.776 | 0.67225 |




**MISS RATE**

| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEENS | TOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| FR=4 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.1025 |
| FR=8 | 3.09 | 0.04 | 0.05 | 20.38 | 7.94 | 14.82 | 76.46 | 9.52 | 16.5375 |
| FR=16 | 4.7 | 0.05 | 0.06 | 26.13 | 12 | 13.2 | 61.7 | 12.94 | 16.3475 |

Rata de miss in cacheul de instructiuni este cea mai mare in cazul trace-ului tower cand FR=8

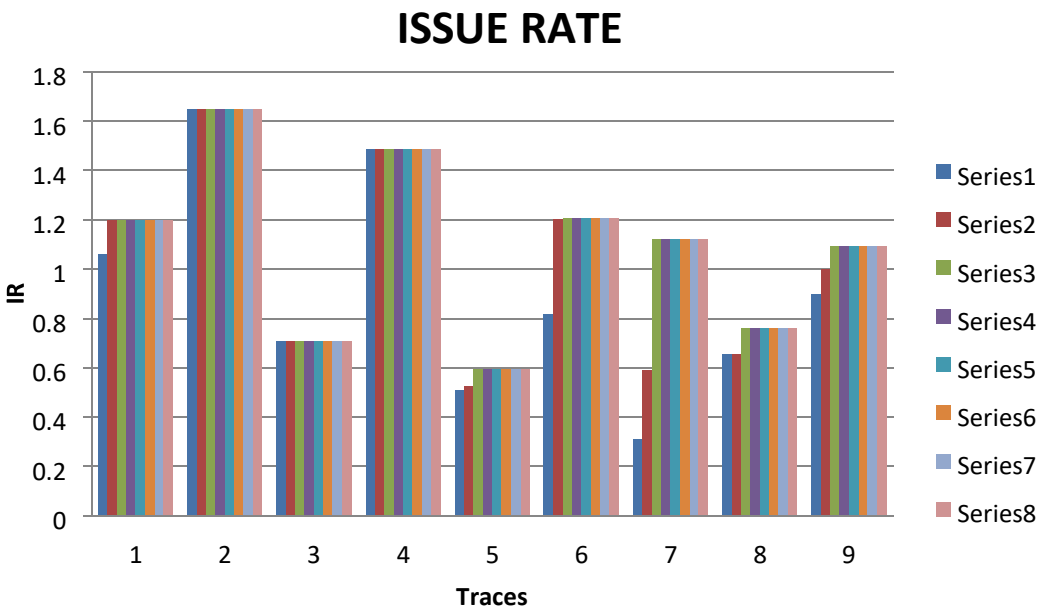



**2)**Studiati influenta capacitatii cache-ului de instructiuni asupra ratei **de procesare IR(SIZE_IC) si asupra ratei de miss la cache-ul de instructiuni RmissIC(SIZE_IC).**

**ISSUE RATE**

| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEENS | TOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| SIZE_IC=64 | 1.058 | 1.648 | 0.705 | 1.483 | 0.505 | 0.818 | 0.308 | 0.651 | 0.897 |
| SIZE_IC=128 | 1.196 | 1.648 | 0.706 | 1.484 | 0.524 | 1.201 | 0.586 | 0.651 | 0.9995 |
| SIZE_IC=256 | 1.196 | 1.648 | 0.706 | 1.484 | 0.595 | 1.207 | 1.12 | 0.759 | 1.08938 |
| SIZE_IC=512 | 1.196 | 1.648 | 0.706 | 1.484 | 0.595 | 1.207 | 1.12 | 0.759 | 1.08938 |
| SIZE_IC=1024 | 1.196 | 1.648 | 0.706 | 1.484 | 0.595 | 1.207 | 1.12 | 0.759 | 1.08938 |
| SIZE_IC=2048 | 1.196 | 1.648 | 0.706 | 1.484 | 0.595 | 1.207 | 1.12 | 0.759 | 1.08938 |
| SIZE_IC=4096 | 1.196 | 1.648 | 0.706 | 1.484 | 0.595 | 1.207 | 1.12 | 0.759 | 1.08938 |
| SIZE_IC=8192 | 1.196 | 1.648 | 0.706 | 1.484 | 0.595 | 1.207 | 1.12 | 0.759 | 1.08938 |

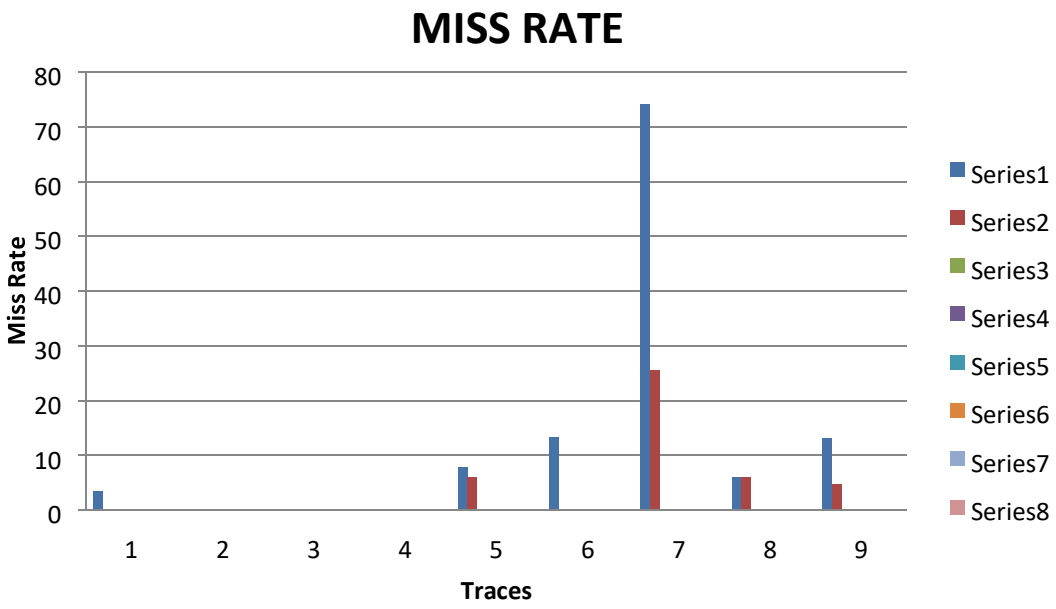
Daca cache-ul de instructiuni este mai mic in cazul IC=64 si Ic=128 se va obtine un issue rate mai mic De la IC=256 in sus se vor obtine aceleasi performante.




**MISS RATE**

| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEENS | TOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| SIZE_IC=64 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.1025 |
| SIZE_IC=128 | 0.18 | 0.05 | 0.05 | 0.02 | 6 | 0.2 | 25.65 | 6.06 | 4.77625 |
| SIZE_IC=256 | 0.17 | 0.05 | 0.05 | 0.02 | 0.05 | 0.07 | 0.08 | 0.1 | 0.07375 |
| SIZE_IC=512 | 0.17 | 0.05 | 0.05 | 0.02 | 0.05 | 0.07 | 0.08 | 0.1 | 0.07375 |
| SIZE_IC=1024 | 0.17 | 0.05 | 0.05 | 0.02 | 0.05 | 0.07 | 0.08 | 0.1 | 0.07375 |
| SIZE_IC=2048 | 0.17 | 0.05 | 0.05 | 0.02 | 0.05 | 0.07 | 0.08 | 0.1 | 0.07375 |
| SIZE_IC=4096 | 0.17 | 0.05 | 0.05 | 0.02 | 0.05 | 0.07 | 0.08 | 0.1 | 0.07375 |
| SIZE_IC=8192 | 0.17 | 0.05 | 0.05 | 0.02 | 0.05 | 0.07 | 0.08 | 0.1 | 0.07375 |

Rata de miss creste in cazul in care dimensiunea cacheului de instructiuni este de 64 si 128.

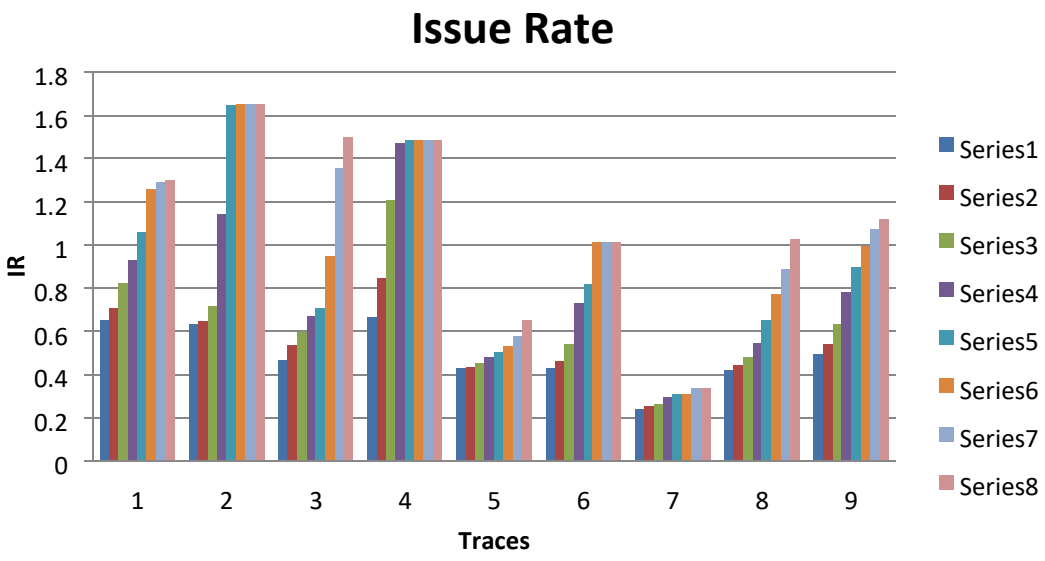



**3)**Studiati influenta capacitatii cache-ului de date asupra ratei de procesare **IR(SIZE_DC) si asupra ratei de miss la cache-ul de date RmissDC(SIZE_DC).**

| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEENS | TOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| SIZE_DC=64 | 0.648 | 0.632 | 0.468 | 0.664 | 0.428 | 0.428 | 0.241 | 0.419 | 0.491 |
| IZE_DC=12 | 0.707 | 0.647 | 0.532 | 0.845 | 0.433 | 0.462 | 0.252 | 0.44 | 0.5398 |
| IZE_DC=25 | 0.82 | 0.715 | 0.595 | 1.206 | 0.454 | 0.543 | 0.264 | 0.48 | 0.6346 |
| IZE_DC=51 | 0.928 | 1.139 | 0.67 | 1.468 | 0.481 | 0.733 | 0.297 | 0.546 | 0.7828 |
| ZE_DC=102 | 1.058 | 1.648 | 0.705 | 1.483 | 0.505 | 0.818 | 0.308 | 0.651 | 0.897 |
| ZE_DC=204 | 1.257 | 1.649 | 0.948 | 1.483 | 0.529 | 1.009 | 0.308 | 0.77 | 0.9941 |
| ZE_DC=409 | 1.288 | 1.649 | 1.354 | 1.483 | 0.576 | 1.009 | 0.334 | 0.888 | 1.0726 |
| ZE_DC=819 | 1.297 | 1.649 | 1.5 | 1.483 | 0.649 | 1.009 | 0.334 | 1.027 | 1.1185 |

Pe masura ce creste dimensiunea cacheului decreste si IR

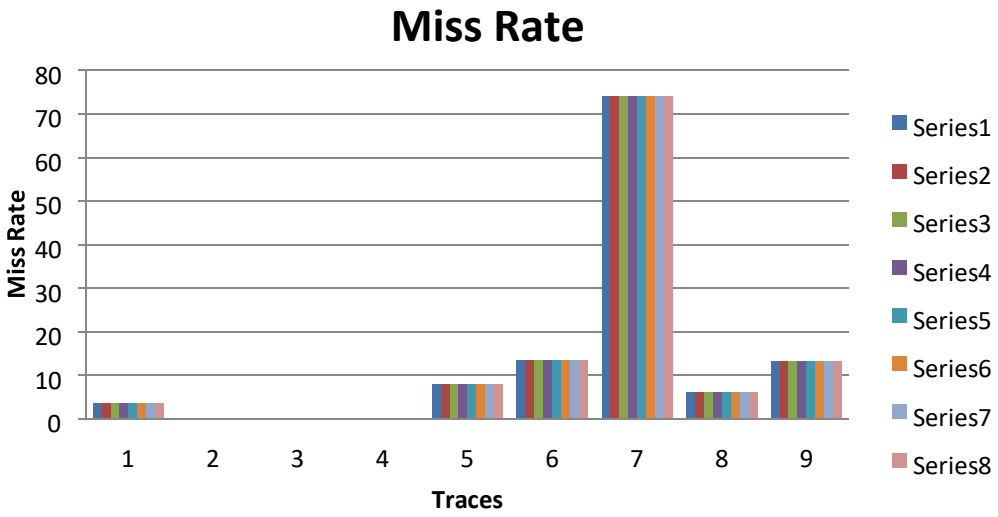
In cazul cacheului de instructiuni daca cresteam dimnesiunea cacheului mai mult de 256 Ir ramanea la fel




| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEENS | TOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| SIZE_DC=64 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.103 |
| SIZE_DC=12 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.103 |
| SIZE_DC=25 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.103 |
| SIZE_DC=51 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.103 |
| IZE_DC=102 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.103 |
| IZE_DC=204 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.103 |
| IZE_DC=409 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.103 |
| IZE_DC=819 | 3.5 | 0.05 | 0.05 | 0.03 | 7.79 | 13.3 | 74.04 | 6.06 | 13.103 |

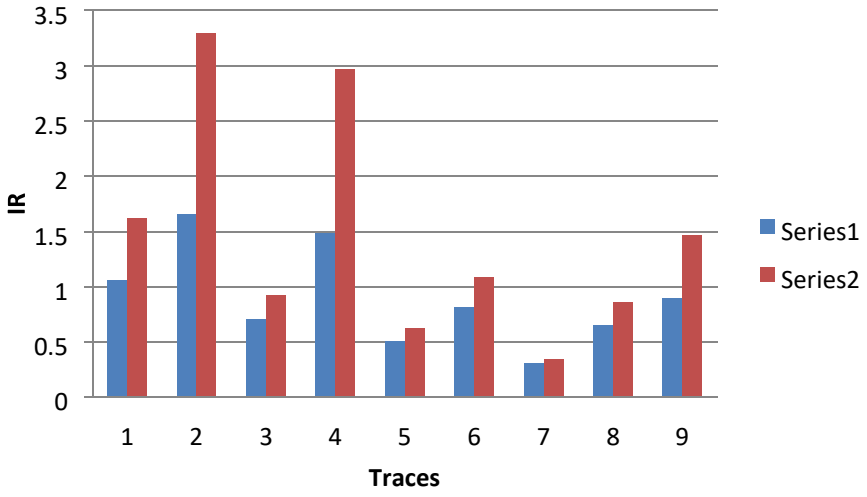
Rata de miss este foarte mare pe trace-ul Tower

Rata de miss ramane aceeasi in ciuda maririi cache-ului de date.



**4)** Determinati influenta numarului maxim de instructiuni ce pot **fi trimise simultan în executie asupra ratei de procesare IR(IRmax).**

| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEEN | STOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| **ir=2** | 1.058 | 1.648 | 0.705 | 1.483 | 0.505 | 0.818 | 0.308 | 0.651 | 0.897 |
| **ir=4** | 1.621 | 3.285 | 0.922 | 2.962 | 0.627 | 1.081 | 0.341 | 0.856 | 1.46188 |



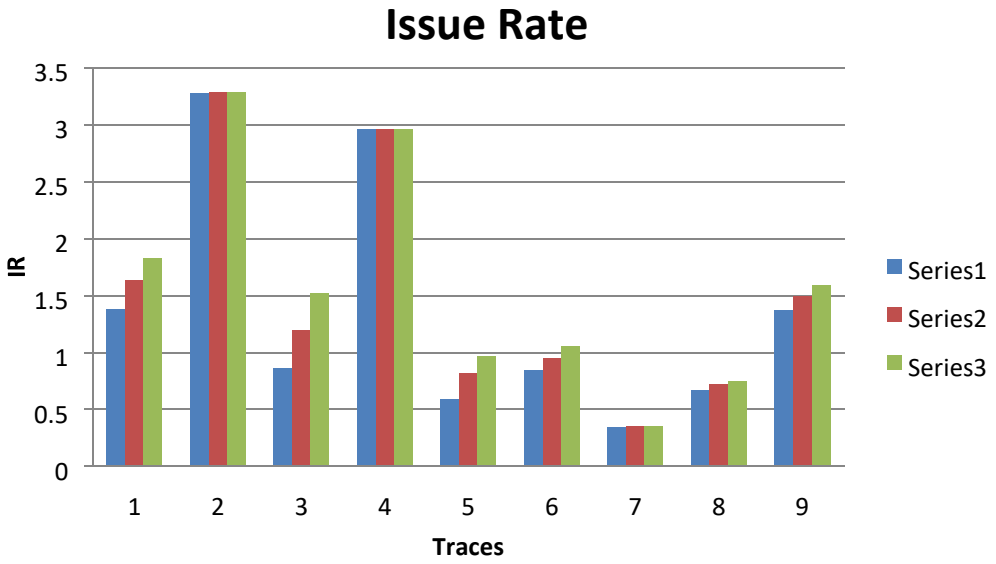
**5)**Se vor genera graficele IR(BLOC_SIZE) si RmissDC(BLOC_SIZE) în cele doua ipostaze: scriere în cache prin write back si scriere în cache prin write through.

**WRITE BACK**

IR

| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEENS | TOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| BLOC_SIZE=4 | 1.379 | 3.28 | 0.861 | 2.963 | 0.586 | 0.844 | 0.336 | 0.665 | 1.36425 |
| BLOC_SIZE=8 | 1.631 | 3.282 | 1.199 | 2.962 | 0.813 | 0.952 | 0.35 | 0.72 | 1.48863 |
| BLOC_SIZE=16 | 1.828 | 3.284 | 1.517 | 2.962 | 0.962 | 1.051 | 0.346 | 0.743 | 1.58663 |

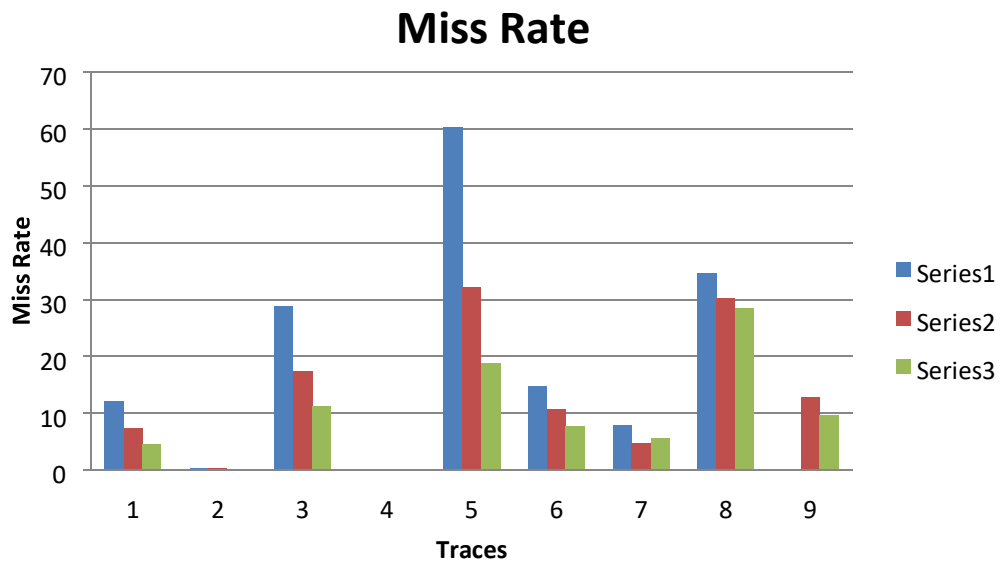
Daca crestem bloc size-ul obtinem Ir mai mare cele mai bune performante se obitn in cazul trace-urilor fsort, matrix, puzzle si queens in rest chiar daca crestem dimensiunea blocului nu obtinem Ir mai mare




**DC MISS**

| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEENS | TOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| BLOC_SIZE=4 | 12.1 | 0.36 | 28.84 | 0.04 | 60.21 | 14.75 | 7.93 | 34.54 | |
| BLOC_SIZE=8 | 7.29 | 0.19 | 17.39 | 0.02 | 32.16 | 10.68 | 4.63 | 30.14 | 12.8125 |
| BLOC_SIZE=16 | 4.46 | 0.1 | 11.31 | 0.01 | 18.81 | 7.71 | 5.55 | 28.36 | 9.53875 |

In cazul cu write back daca creste dimensiunea blocului obtinem rata de miss mai mica Cu cat bloc size-ul este mai mic rata de miss este mai mare.

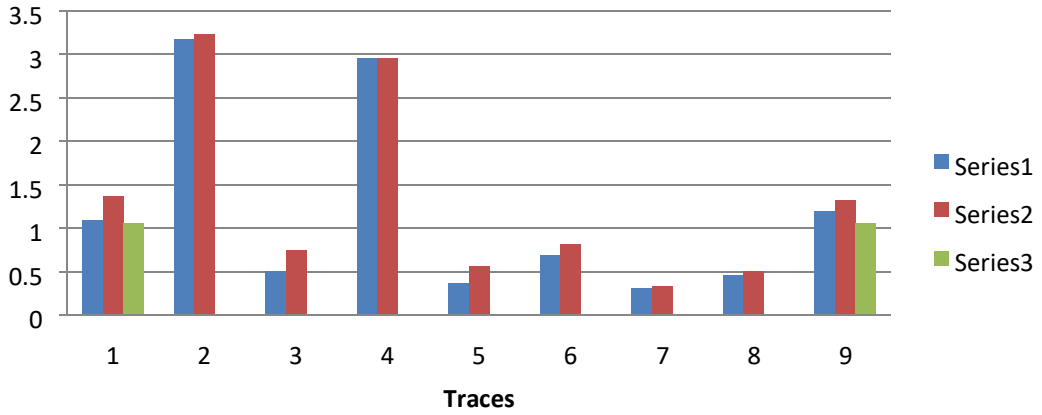



**WRITE THROUGH**

IR

| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEEN | STOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| BLOC_SIZE=4 | 1.086 | 3.174 | 0.502 | 2.95 | 0.369 | 0.692 | 0.307 | 0.466 | 1.19325 |
| BLOC_SIZE=8 | 1.37 | 3.227 | 0.746 | 2.955 | 0.568 | 0.814 | 0.331 | 0.502 | 1.31413 |
| BLOC_SIZE=16 | 1.056 | | | | | | | | 1.056 |

La write through cele mai bune performante ale IR sunt in cazul dimensiunii blocului de 8
Se obtine performanta mai buna la Bloc_size=8 decat in cazul bloc_size=16.

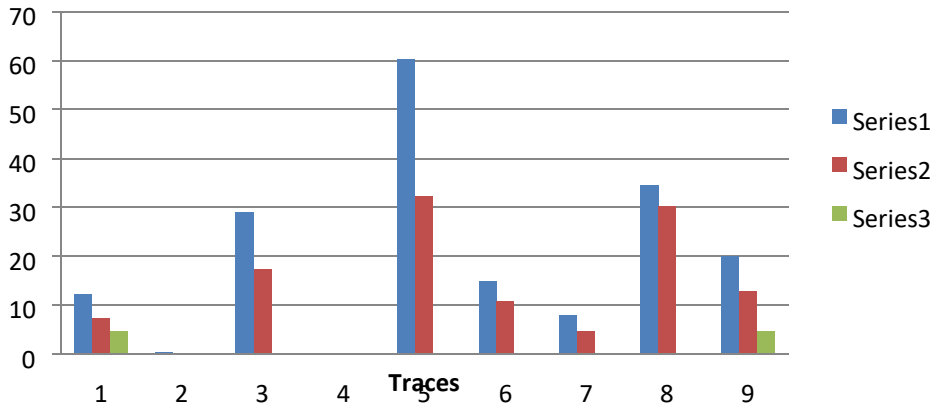



DC MISS

| | FSORT | FBUBL | MATRIX | PERM | PUZZLE | QUEEN | STOWER | TREE | MEDIE |
|---|---|---|---|---|---|---|---|---|---|
| BLOC_SIZE=4 | 12.1 | 0.36 | 28.84 | 0.04 | 60.21 | 14.75 | 7.93 | 34.54 | 19.8463 |
| BLOC_SIZE=8 | 7.29 | 0.19 | 17.39 | 0.02 | 32.16 | 10.68 | 4.63 | 30.14 | 12.8125 |
| BLOC_SIZE=16 | 4.46 | | | | | | | | 4.46 |

In cazul write through, rata de miss creste cand marimea blocului=4

Daca crestem marimea blocului rata de miss scade
La marimea blocului=16 obtinem cea mai mica rata de miss



**Laborator 4.** **Selective Victim Cache**

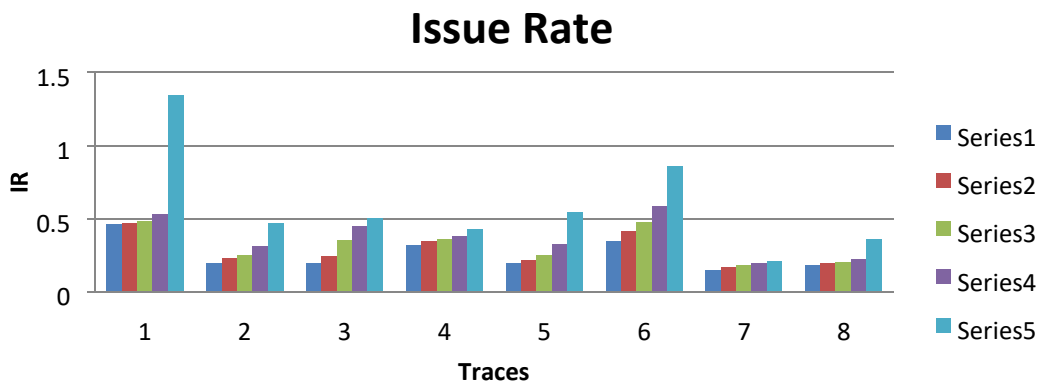
**1.** Rezultate urmate de grafice privind influenţa capacităţii cache-ului asupra ratei de procesare IR(DM_size) şi asupra ratei de miss în cache-ul de instrucţiuni RmissIC(DM_size) în cele trei solutii:

a) fără victim cache.
b) cu victim cache smplu.
c) cu selective victim cache.

a)

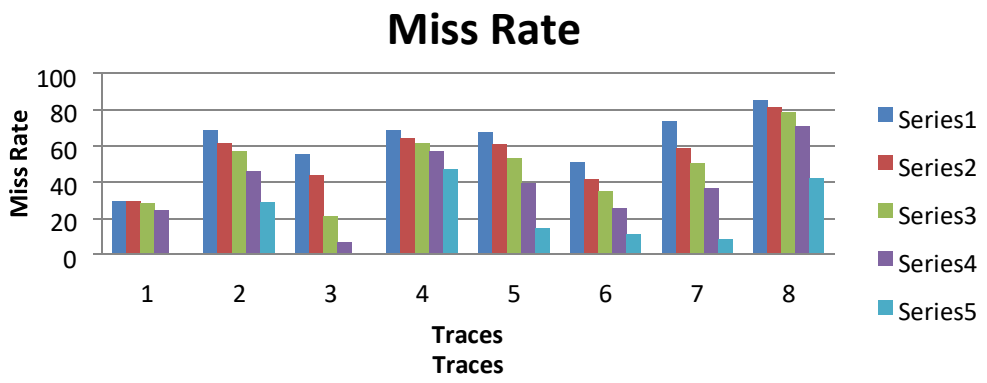
ISSUE RATE

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 0.4612 | 0.1955 | 0.1915 | 0.3179 | 0.1921 | 0.3428 | 0.1422 | 0.1786 |
| **FR_size =64** | 0.4658 | 0.2235 | 0.2396 | 0.3408 | 0.2159 | 0.4112 | 0.1693 | 0.1871 |
| **FR_size =128** | 0.4774 | 0.2448 | 0.3511 | 0.3543 | 0.2455 | 0.4708 | 0.1806 | 0.1975 |
| **FR_size =256** | 0.5281 | 0.3092 | 0.4429 | 0.3787 | 0.3219 | 0.5786 | 0.1903 | 0.2215 |
| **FR_size =1024** | 1.3385 | 0.4654 | 0.499 | 0.4208 | 0.5446 | 0.8542 | 0.208 | 0.3566 |




MISS RATE

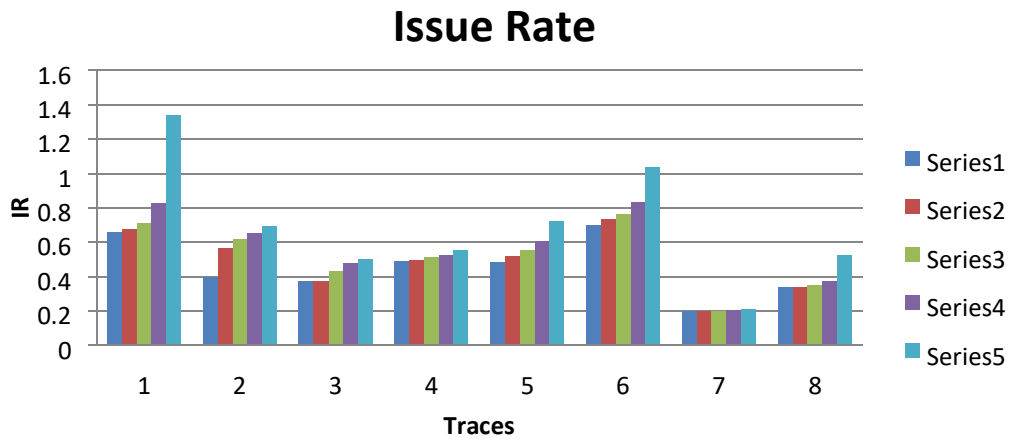
| | bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 29.36 | 68.8 | 55.39 | 68.7 | 67.69 | 51 | 73.67 | 84.81 |
| **FR_size =64** | 28.97 | 61.77 | 43.85 | 64.2 | 60.86 | 41.46 | 58.89 | 81.51 |
| **FR_size =128** | 28.03 | 57.15 | 21.01 | 61.52 | 53.16 | 34.91 | 50.12 | 78.21 |
| **FR_size =256** | 24.29 | 45.87 | 6.72 | 57.08 | 38.97 | 25.59 | 36.39 | 70.91 |
| **FR_size =1024** | 0.19 | 28.72 | 0.02 | 47.13 | 14.72 | 11.17 | 8.2 | 41.97 |




b)

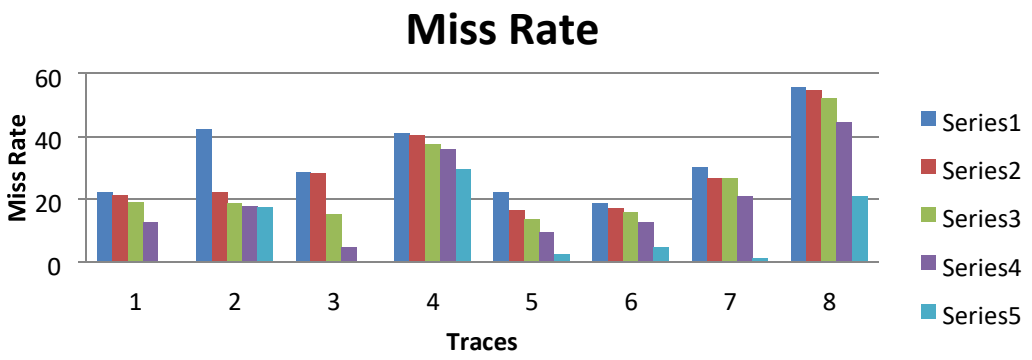
ISSUE RATE

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 0.6613 | 0.3936 | 0.3731 | 0.4877 | 0.4792 | 0.6978 | 0.1969 | 0.3348 |
| **FR_size =64** | 0.6738 | 0.5671 | 0.3748 | 0.4945 | 0.5181 | 0.7338 | 0.1978 | 0.338 |
| **FR_size =128** | 0.707 | 0.6177 | 0.4307 | 0.5097 | 0.5543 | 0.7636 | 0.1963 | 0.3471 |
| **FR_size =256** | 0.8246 | 0.6529 | 0.4768 | 0.5209 | 0.6046 | 0.8357 | 0.2006 | 0.374 |
| **FR_size =1024** | 1.3395 | 0.6907 | 0.4991 | 0.5519 | 0.7208 | 1.0357 | 0.2106 | 0.5233 |




MISS RATE

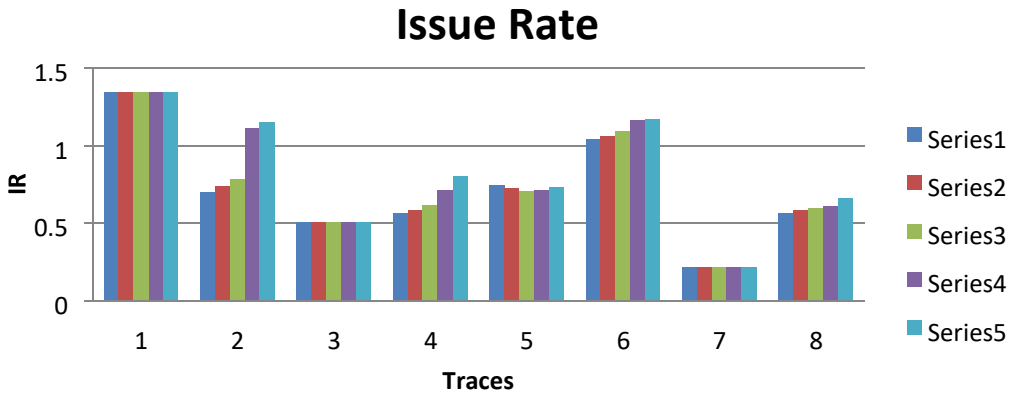
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 22.16 | 42.12 | 28.49 | 40.91 | 22.15 | 18.6 | 29.92 | 55.56 |
| **FR_size =64** | 21.25 | 22.07 | 28.14 | 40.1 | 16.55 | 17.24 | 26.74 | 54.64 |
| **FR_size =128** | 19 | 18.53 | 15.05 | 37.55 | 13.54 | 15.87 | 26.47 | 52.03 |
| **FR_size =256** | 12.68 | 17.67 | 4.57 | 35.93 | 9.37 | 12.4 | 20.97 | 44.39 |
| **FR_size =1024** | 0 | 17.42 | 0 | 29.3 | 2.4 | 4.71 | 1.3 | 21.09 |




c)

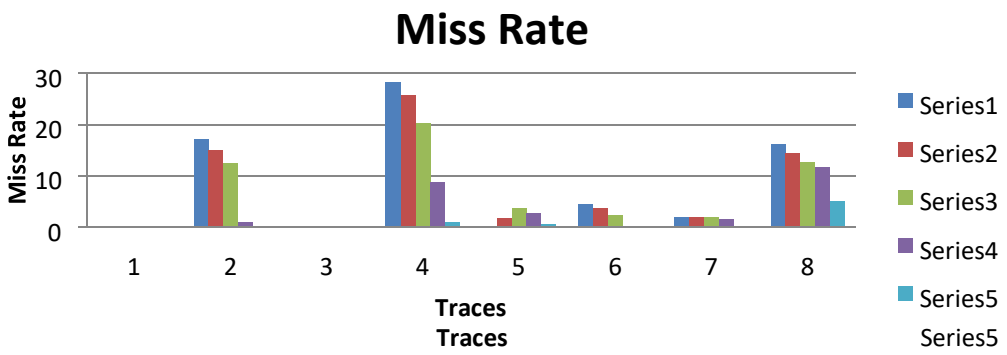
ISSUE RATE

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 1.3394 | 0.6949 | 0.4991 | 0.5606 | 0.7368 | 1.0372 | 0.217 | 0.5586 |
| **FR_size =64** | 1.3394 | 0.7329 | 0.4991 | 0.5766 | 0.7205 | 1.0577 | 0.2107 | 0.5767 |
| **FR_size =128** | 1.3394 | 0.7801 | 0.4991 | 0.6131 | 0.7007 | 1.0907 | 0.2107 | 0.5929 |
| **FR_size =256** | 1.3394 | 1.1072 | 0.4991 | 0.71 | 0.7105 | 1.1594 | 0.2107 | 0.6027 |
| **FR_size =1024** | 1.3394 | 1.1458 | 0.4991 | 0.8009 | 0.7324 | 1.1632 | 0.2108 | 0.6546 |




MISS RATE

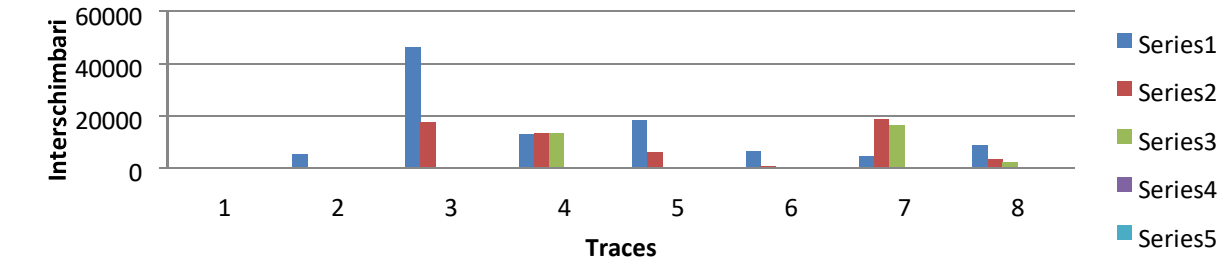
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 0 | 17.2 | 0 | 28.17 | 0.18 | 4.4 | 2.05 | 16.23 |
| **FR_size =64** | 0 | 14.96 | 0 | 25.68 | 1.76 | 3.61 | 2.04 | 14.45 |
| **FR_size =128** | 0 | 12.49 | 0 | 20.32 | 3.62 | 2.45 | 1.93 | 12.69 |
| **FR_size =256** | 0 | 0.95 | 0 | 8.78 | 2.79 | 0.18 | 1.69 | 11.67 |
| **FR_size =1024** | 0 | 0 | 0 | 1.02 | 0.66 | 0 | 0.31 | 5.02 |


Miss Rate
Miss Rate
30
20
10
0
1
2
3
4
5
6
7
8
Traces
Traces
Series1
Series2
Series3
Series4
Series5
Series5

**2.** Determinaţi în ce măsură selective victim cache-ul reduce numărul de interschimbări dintre cache-ul principal şi cel victimă Interchgs(DM_size) în situaţiile: a) cu victim cache smplu.
b) cu selective victim cache.

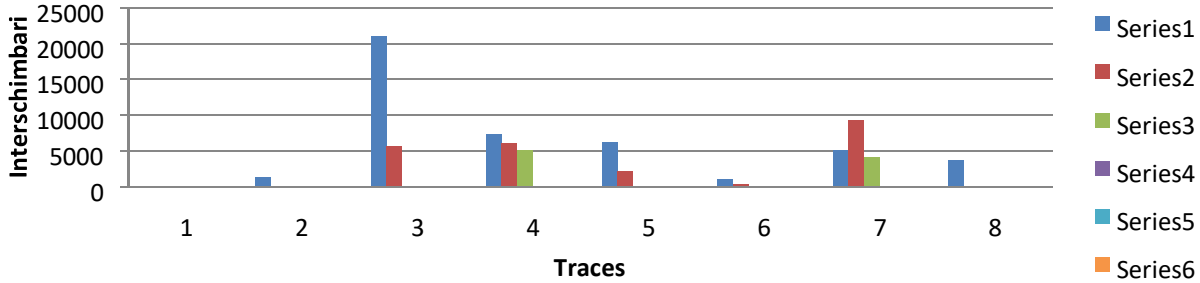
a)

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| DM_size=32 | 399 | 5049 | 46135 | 12685 | 17971 | 6241 | 4224 | 8477 |
| DM_size=64 | 2 | 5 | 17321 | 13197 | 5746 | 459 | 18483 | 2992 |
| DM_size=128 | 0 | 2 | 0 | 12992 | 56 | 2 | 16374 | 1996 |
| DM_size=256 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| DM_size=512 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| DM_size=1024 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |




b)

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| DM_size=32 | 7 | 1256 | 21006 | 7307 | 6218 | 987 | 5156 | 3680 |
| DM_size=64 | 9 | 11 | 5682 | 6006 | 2137 | 340 | 9222 | 18 |
| DM_size=128 | 0 | 2 | 0 | 5126 | 25 | 5 | 4119 | 13 |
| DM_size=256 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 0 |
| DM_size=512 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 |
| DM_size=1024 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

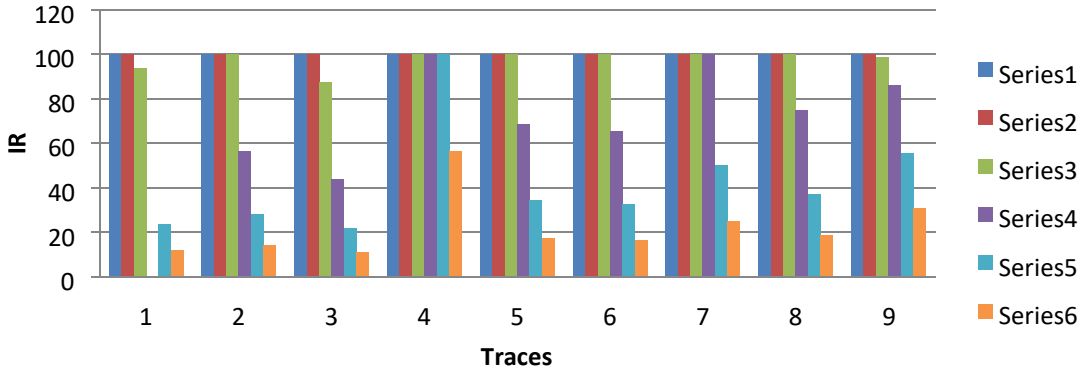



**3.** Studiaţi influenţa capacităţii cache-ului de instrucţiuni asupra ratei de utilizare a resp. cache Usage(DM_size) în situaţiile:
a) fără victim cache.
b) cu victim cache smplu.

c) cu selective victim cache.

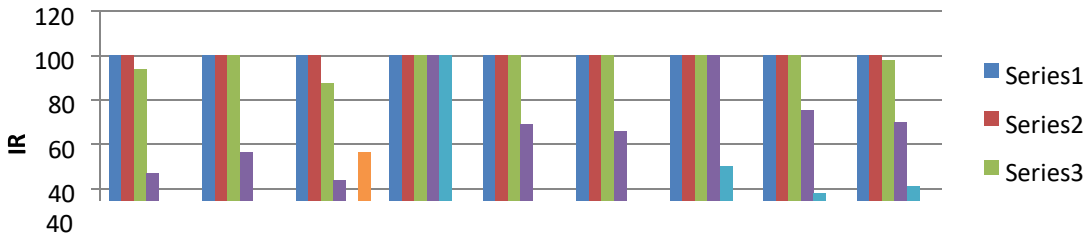
a)

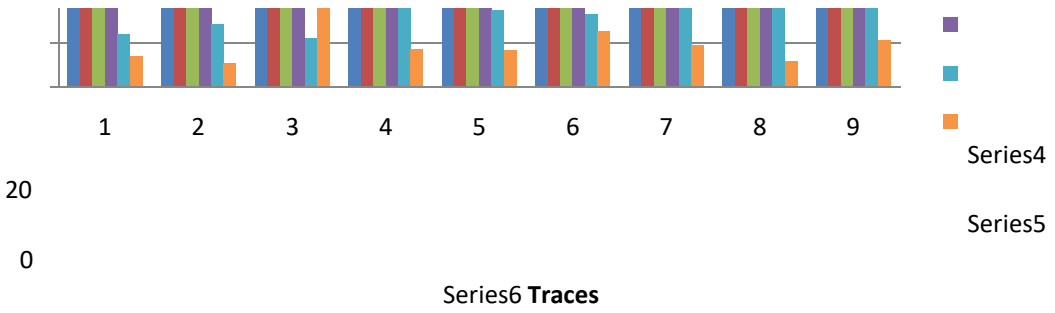
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree | Media |
|---|---|---|---|---|---|---|---|---|---|
| **32** | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **64** | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **128** | 93.75 | 100 | 87.5 | 100 | 100 | 100 | 100 | 100 | 98.8281 |
| **256** | 46,88 | 56.25 | 43.75 | 100 | 68.75 | 65.63 | 100 | 75 | 86.042 |
| **512** | 23.44 | 28.3 | 21.88 | 100 | 34.38 | 32.81 | 50 | 37.5 | 55.846 |
| **1024** | 11.72 | 14.06 | 10.94 | 56.25 | 17.19 | 16.41 | 25 | 18.75 | 31.1644 |




b)

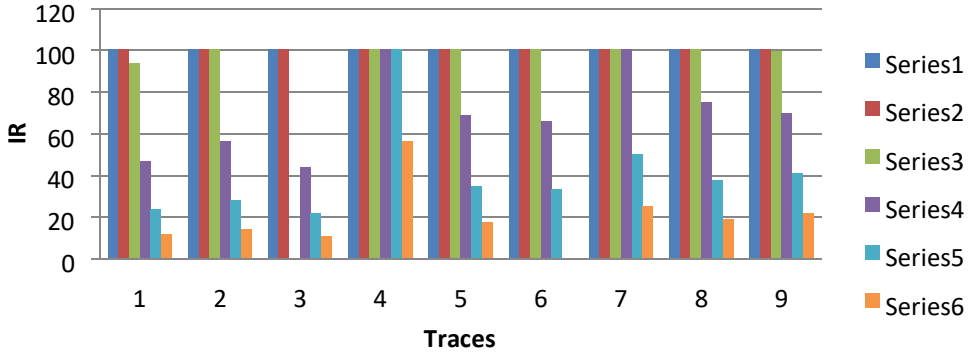
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree | Media |
|---|---|---|---|---|---|---|---|---|---|
| **32** | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **64** | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **128** | 93.75 | 100 | 87.5 | 100 | 100 | 100 | 100 | 100 | 97.6563 |
| **256** | 46.88 | 56.25 | 43.75 | 100 | 68.75 | 65.63 | 100 | 75 | 69.5325 |
| **512** | 23.44 | 28.13 | 21.88 | 100 | 34.38 | 32.81 | 50 | 37.5 | 41.0175 |
| **1024** | 14.01 | 10.94 | 56.25 | 17.19 | 16.41 | 25 | 18.75 | 11.72 | 21.2838 |






c)

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree | Media |
|---|---|---|---|---|---|---|---|---|---|
| **32** | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **64** | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| **128** | 93.75 | 100 | 87,5 | 100 | 100 | 100 | 100 | 100 | 99.1071 |
| **256** | 46.88 | 56.25 | 43.75 | 100 | 68.75 | 65.63 | 100 | 75 | 69.5325 |
| **512** | 23.44 | 28.13 | 21.88 | 100 | 34.38 | 32.81 | 50 | 37.5 | 41.0175 |
| **1024** | 11.72 | 14.06 | 10.94 | 56.25 | 17.19 | 16,41 | 25 | 18.75 | 21.9871 |




Gradul de utilizare al cache-ului e de asteptat sa scada cu cresterea capacitatii, astfel mai multe blocuri necesare ar incapea in cache - insa imbunatatirea cu VC sau SVC nu aduce nicio imbunatarire legata de gradul de utilizare

**4.**Determinaţi influenţa dimensiunii victim cache-ului de instrucţiuni asupra ratei de procesare IR(Victim_size) şi asupra ratei de miss în cache-ul de instrucţiuni RmissIC(Victim_size) în cele doua solutii:

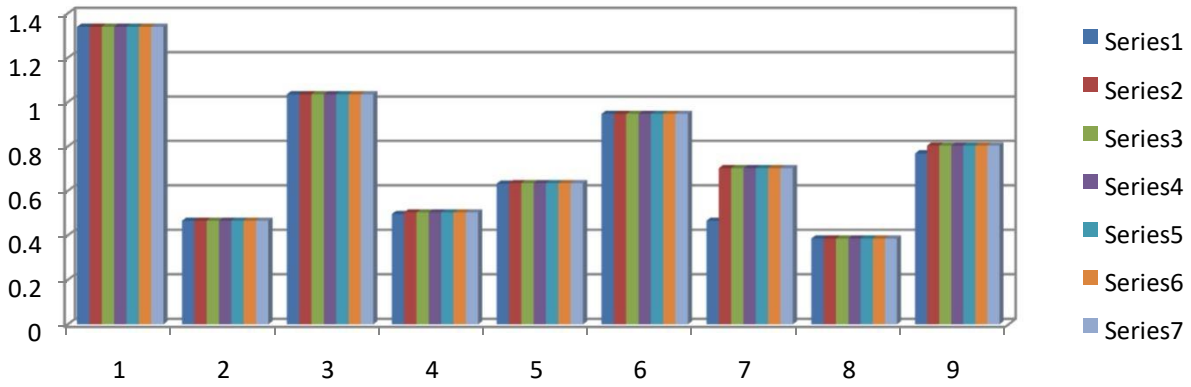
a) cu victim cache smplu.
b) cu selective victim cache.

a)

Victim_si IR (IPC) ze

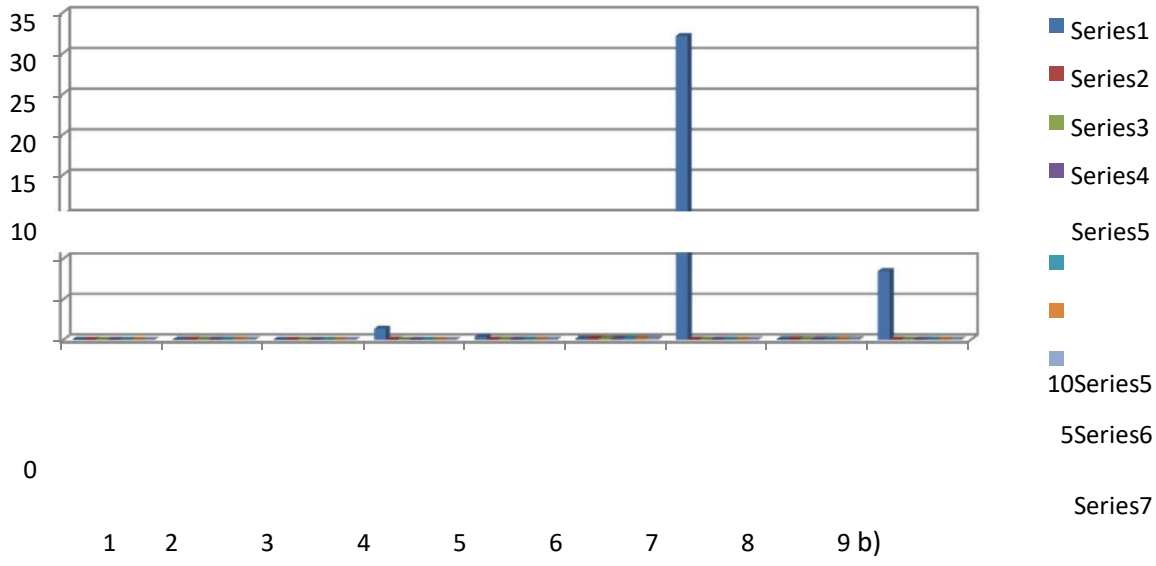
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree | Media |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.3396 | 0.4655 | 1.0352 | 0.4955 | 0.6324 | 0.9467 | 0.4656 | 0.3857 | 0.7686 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 32 | 1.3396 | 0.4655 | 1.0352 | 0.503 | 0.6346 | 0.9467 | 0.7016 | 0.3857 | 0.8037 |
| 64 | 1.3396 | 0.4655 | 1.0352 | 0.503 | 0.6346 | 0.9467 | 0.7016 | 0.3857 | 0.8037 |
| 128 | 1.3396 | 0.4655 | 1.0352 | 0.503 | 0.6346 | 0.9467 | 0.7016 | 0.3857 | 0.8037 |
| 256 | 1.3396 | 0.4655 | 1.0352 | 0.503 | 0.6346 | 0.9467 | 0.7016 | 0.3857 | 0.8037 |
| 512 | 1.3396 | 0.4655 | 1.0352 | 0.503 | 0.6346 | 0.9467 | 0.7016 | 0.3857 | 0.8037 |
| 1024 | 1.3396 | 0.4655 | 1.0352 | 0.503 | 0.6346 | 0.9467 | 0.7016 | 0.3857 | 0.8037 |



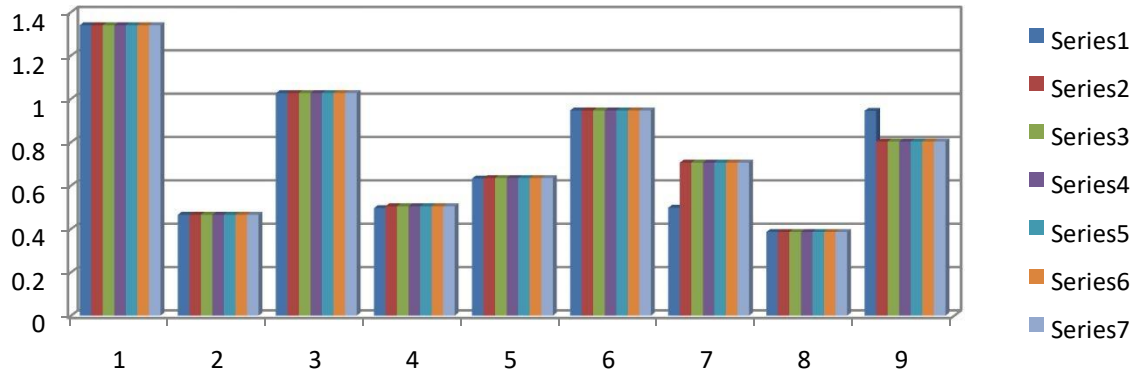

Victim_sizRmissIC (%)

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree | Media |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.03 | 0.04 | 0.02 | 1.36 | 0.37 | 0.14 | 32.13 | 0.06 | 8.47 |
| 32 | 0.03 | 0.04 | 0.02 | 0.04 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 64 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 128 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 256 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 512 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 1024 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |



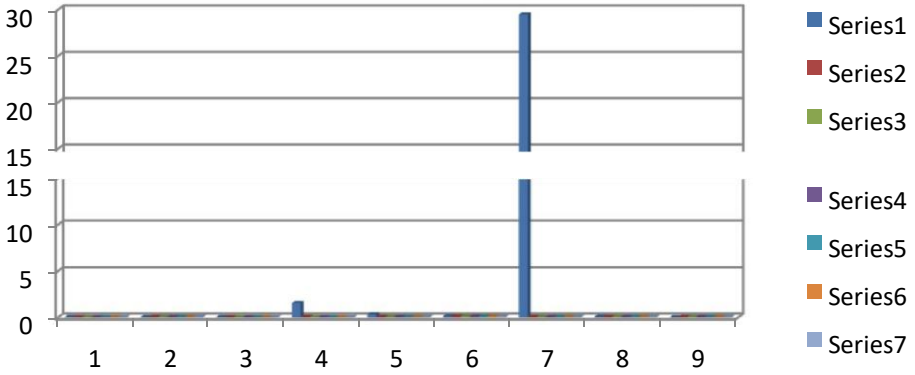
Victim_si IR (IPC) ze

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree | Media |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 1.3396 | 0.4655 | 1.0267 | 0.4962 | 0.6327 | 0.9467 | 0.4979 | 0.3858 | 0.9446 |
| 32 | 1.3396 | 0.4655 | 1.0267 | 0.5044 | 0.6346 | 0.9467 | 0.7058 | 0.3858 | 0.8033 |
| 64 | 1.3396 | 0.4655 | 1.0267 | 0.5044 | 0.6346 | 0.9467 | 0.7058 | 0.3858 | 0.8033 |
| 128 | 1.3396 | 0.4655 | 1.0267 | 0.5044 | 0.6346 | 0.9467 | 0.7058 | 0.3858 | 0.8033 |
| 256 | 1.3396 | 0.4655 | 1.0267 | 0.5044 | 0.6346 | 0.9467 | 0.7058 | 0.3858 | 0.8033 |
| 512 | 1.3396 | 0.4655 | 1.0267 | 0.5044 | 0.6346 | 0.9467 | 0.7058 | 0.3858 | 0.8033 |
| 1024 | 1.3396 | 0.4655 | 1.0267 | 0.5044 | 0.6346 | 0.9467 | 0.7058 | 0.3858 | 0.8033 |




Victim_sizRmissIC (%)

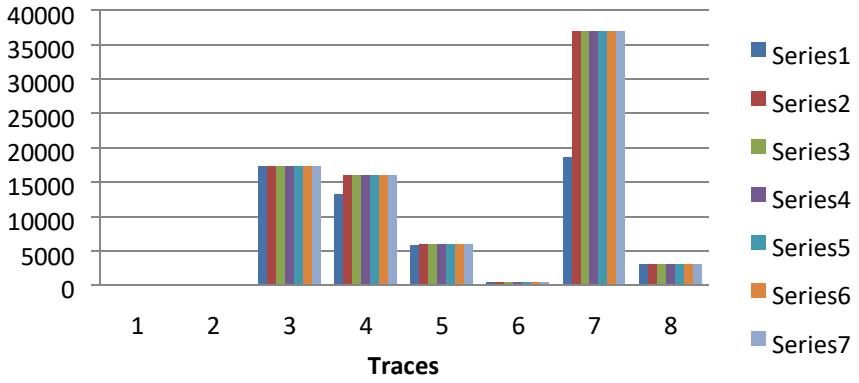
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree | Media |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.03 | 0.03 | 0.02 | 1.54 | 0.33 | 0.14 | 29.46 | 0.07 | 8.474.51 |
| 32 | 0.03 | 0.04 | 0.02 | 0.04 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 64 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 128 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 256 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 512 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |
| 1024 | 0.03 | 0.04 | 0.02 | 0.03 | 0.05 | 0.12 | 0.05 | 0.06 | 0.05 |



**5.**Studiaţi variaţia numărului de interschimbări produse între cache-ul principal şi victim cache în cazul creşterii capacităţii celui din urmă, în ipostazele: a) cu victim cache smplu.
b) cu selective victim cache.

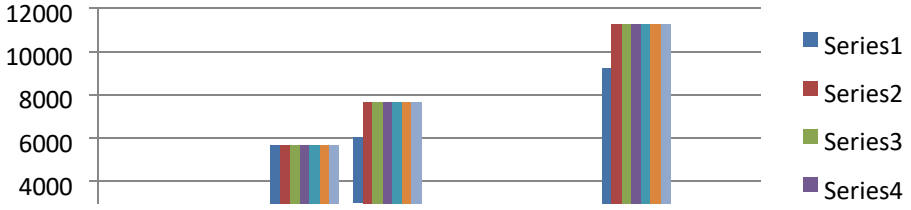
a)
Victim_size Interchanges

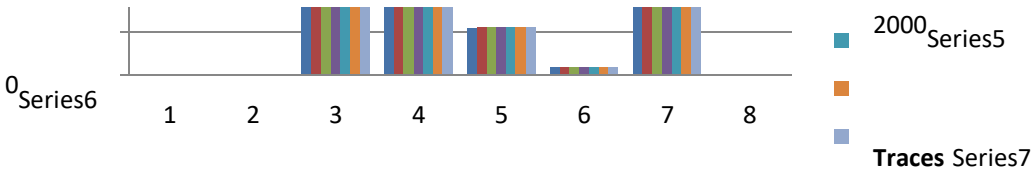
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **8** | 2 | 5 | 17321 | 13197 | 5746 | 459 | 18483 | 2992 |
| **32** | 2 | 5 | 17321 | 15923 | 5874 | 461 | 36907 | 2993 |
| **64** | 2 | 5 | 17321 | 15925 | 5874 | 461 | 36907 | 2993 |
| **128** | 2 | 5 | 17321 | 15925 | 5874 | 461 | 36907 | 2993 |
| **256** | 2 | 5 | 17321 | 15925 | 5874 | 461 | 36907 | 2993 |
| **512** | 2 | 5 | 17321 | 15925 | 5874 | 461 | 36907 | 2993 |
| **1024** | 2 | 5 | 17321 | 15925 | 5874 | 461 | 36907 | 2993 |




b)
Victim_size Interchanges

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **8** | 9 | 11 | 5682 | 6006 | 2137 | 340 | 9222 | 18 |
| **32** | 9 | 11 | 5682 | 7625 | 2209 | 340 | 11278 | 19 |
| **64** | 9 | 11 | 5682 | 7625 | 2209 | 340 | 11278 | 19 |
| **128** | 9 | 11 | 5682 | 7625 | 2209 | 340 | 11278 | 19 |
| **256** | 9 | 11 | 5682 | 7625 | 2209 | 340 | 11278 | 19 |
| **512** | 9 | 11 | 5682 | 7625 | 2209 | 340 | 11278 | 19 |
| **1024** | 9 | 11 | 5682 | 7625 | 2209 | 340 | 11278 | 19 |

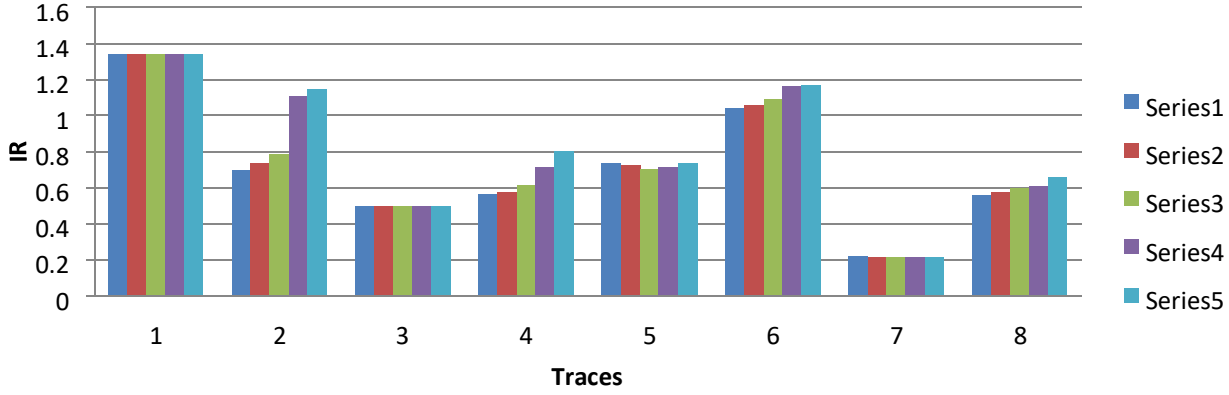



0
Series6
1
2
3
4
5
6
7
8
2000
Series5
Traces Series7

**6.**Pentru configuraţia optimă găsită determinaţi ce algoritm de înlocuire este mai bun în Victim Cache: LRU, Random sau FIFO.

ISSUE RATE

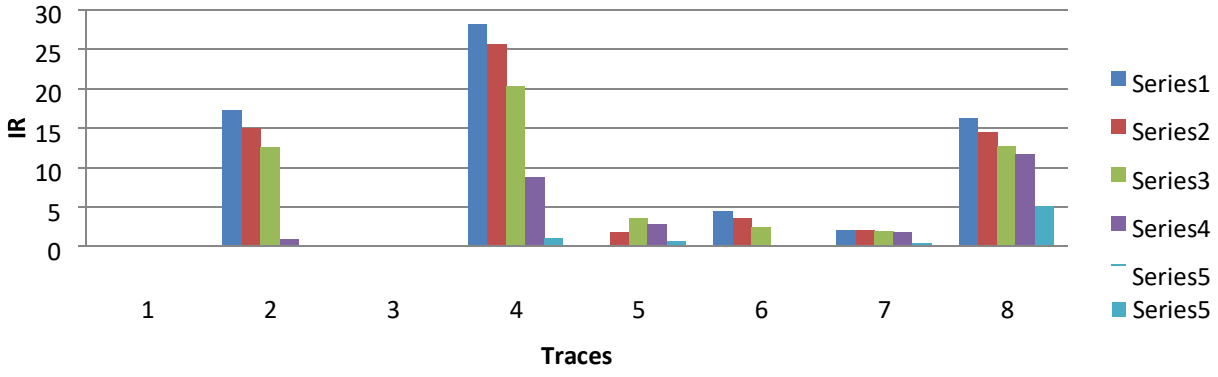
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 1.3394 | 0.6949 | 0.4991 | 0.5606 | 0.7368 | 1.0372 | 0.217 | 0.5586 |
| **FR_size =64** | 1.3394 | 0.7329 | 0.4991 | 0.5766 | 0.7205 | 1.0577 | 0.2107 | 0.5767 |
| **FR_size =128** | 1.3394 | 0.7801 | 0.4991 | 0.6131 | 0.7007 | 1.0907 | 0.2107 | 0.5929 |
| **FR_size =256** | 1.3394 | 1.1072 | 0.4991 | 0.71 | 0.7105 | 1.1594 | 0.2107 | 0.6027 |
| **FR_size =1024** | 1.3394 | 1.1458 | 0.4991 | 0.8009 | 0.7324 | 1.1632 | 0.2108 | 0.6546 |




In cazul algoritmului de inlocuire LRU issue rate(IR) va creste pe masura ce FR creste.

MISS RATE LRU

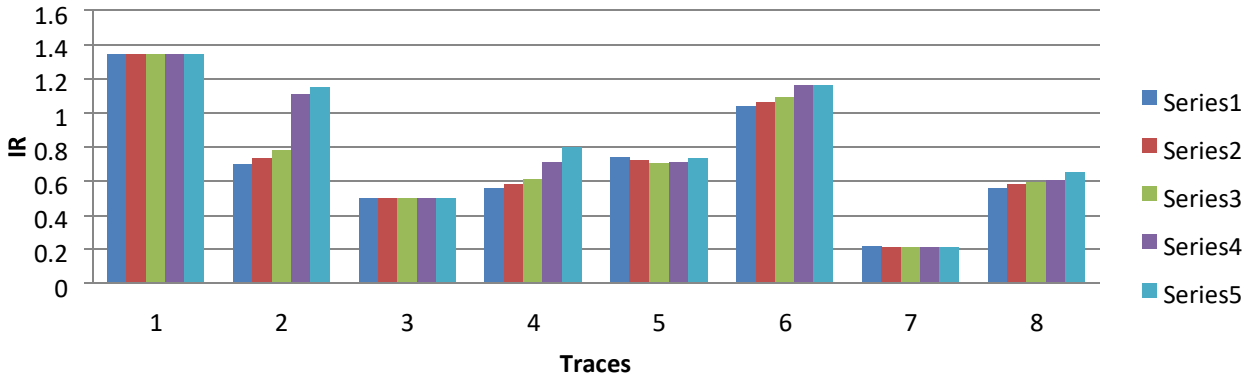
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 0 | 17.2 | 0 | 28.17 | 0.18 | 4.4 | 2.05 | 16.23 |
| **FR_size =64** | 0 | 14.96 | 0 | 25.68 | 1.76 | 3.61 | 2.04 | 14.45 |
| **FR_size =128** | 0 | 12.49 | 0 | 20.32 | 3.62 | 2.45 | 1.93 | 12.69 |
| **FR_size =256** | 0 | 0.95 | 0 | 8.78 | 2.79 | 0.18 | 1.69 | 11.67 |
| **FR_size =1024** | 0 | 0 | 0 | 1.02 | 0.66 | 0 | 0.31 | 5.02 |



In cazul algoritmului LRU, rata de miss va  creste daca Fr este mic.

ISSUE RATE

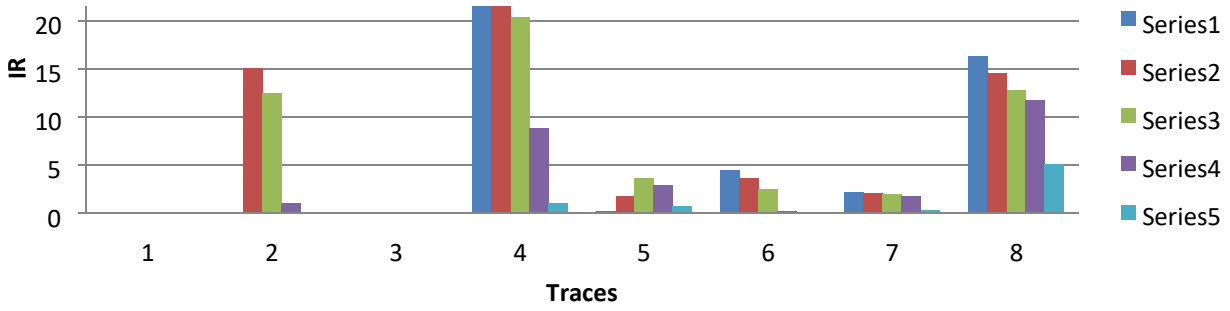
| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 1.3396 | 0.6949 | 0.4991 | 0.5606 | 0.7368 | 1.0372 | 0.217 | 0.5586 |
| **FR_size =64** | 1.3394 | 0.7329 | 0.4991 | 0.5766 | 0.7205 | 1.0577 | 0.2107 | 0.5767 |
| **FR_size =128** | 1.3394 | 0.7801 | 0.4991 | 0.6131 | 0.7007 | 1.0907 | 0.2107 | 0.5929 |
| **FR_size =256** | 1.3394 | 1.1072 | 0.4991 | 0.71 | 0.7105 | 1.1594 | 0.2107 | 0.6027 |
| **FR_size =1024** | 1.3394 | 1.1458 | 0.4991 | 0.8009 | 0.7324 | 1.1632 | 0.2108 | 0.6546 |




In cazul Random, issue rate(IR) va creste pe masura ce FR creste.

MISS RATE

| | Bubble | Matrix | Perm | Puzzle | Queens | Sort | Tower | Tree |
|---|---|---|---|---|---|---|---|---|
| **FR_size =32** | 0 | 0.11 | 0 | 28.17 | 0.18 | 4.4 | 2.05 | 16.23 |
| **FR_size =64** | 0 | 14.96 | 0 | 25.68 | 1.76 | 3.61 | 2.04 | 14.45 |
| **FR_size =128** | 0 | 12.49 | 0 | 20.32 | 3.62 | 2.45 | 1.93 | 12.69 |
| **FR_size =256** | 0 | 0.95 | 0 | 8.78 | 2.79 | 0.18 | 1.69 | 11.67 |
| **FR_size =1024** | 0 | 0 | 0 | 1.02 | 0.66 | 0 | 0.31 | 5.02 |



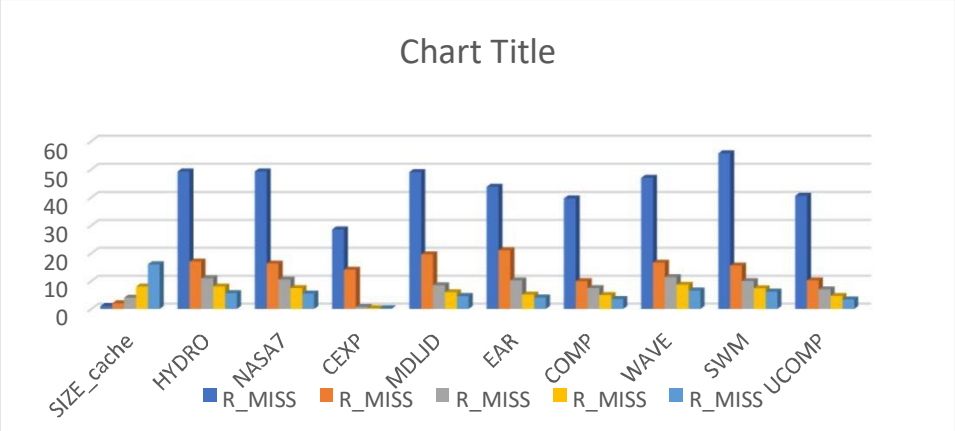

In cazul algoritmului Random, rata de miss va  creste daca Fr este mic.

**Laborator 5.**

**Simularea sistemului ierarhic de memorie in ahitecturi de tip multiprocessor cu memorie partajata**

1)Studiaţi influenţa capacităţii cache-ului de instrucţiuni (în KB) asupra ratei de miss în cache Rmiss(SIZE_Cache).

| | R_MISS | R_MISS | R_MISS | R_MISS | R_MISS |
|---|---|---|---|---|---|
| SIZE_cache | 1 | 2 | 4 | 8 | 16 |
| HYDRO | 49.177 | 16.972 | 11.001 | 8.0395 | 5.6888 |
| NASA7 | 49.218 | 16.28 | 10.566 | 7.4933 | 5.4987 |
| CEXP | 28.535 | 14.05 | 0.7 | 0.235 | 0.215 |
| MDLJD | 48.99 | 19.565 | 8.465 | 5.94 | 4.595 |
| EAR | 43.726 | 21.044 | 10.211 | 5.1432 | 4.107 |
| COMP | 39.58 | 9.945 | 7.449 | 4.9525 | 3.5658 |
| WAVE | 46.922 | 16.603 | 11.409 | 8.6373 | 6.6239 |
| SWM | 55.655 | 15.535 | 10 | 7.375 | 6.22 |
| UCOMP | 40.542 | 10.245 | 6.989 | 4.6469 | 3.4029 |

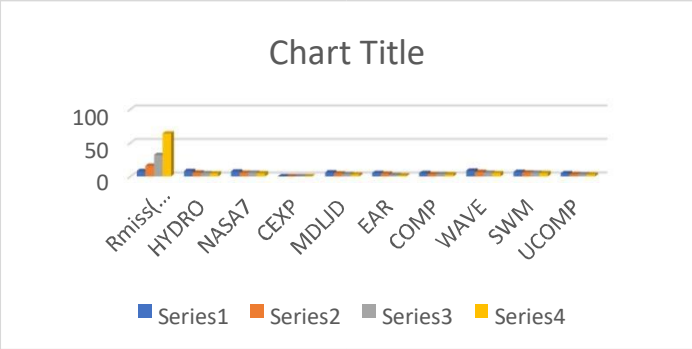


OBS.

Din ce crestem SIZE_cacheul scade rata de miss.

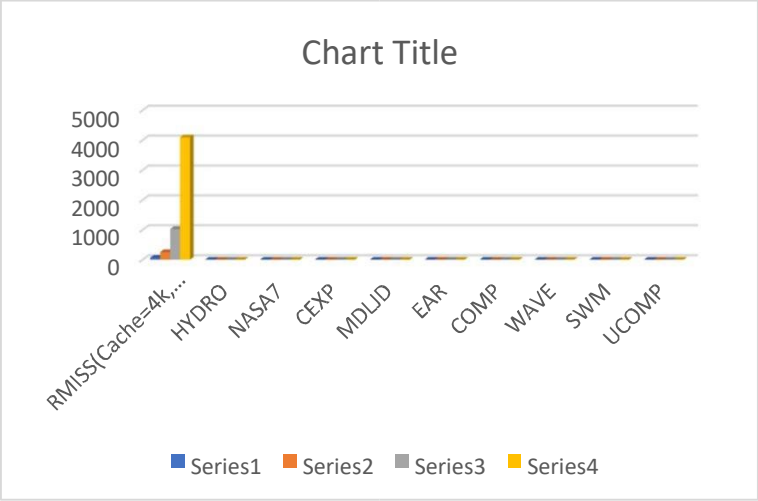
2)Pornind de la configurația inițială generați graficul Rmiss(BLOC_SIZE).

| Rmiss(BL | HYDRO | NASA7 | CEXP | MDLJD | EAR | COMP | WAVE | SWM | UCOMP |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 8.09 | 7.49 | 0.24 | 5.96 | 5.1 | 4.95 | 8.63 | 6.72 | 4.64 |
| 16 | 5.68 | 5.49 | 0.21 | 4.59 | 4.1 | 3.56 | 6.63 | 5.71 | 3.4 |
| 32 | 4.88 | 5.39 | 0.21 | 3.61 | 2.3 | 3.44 | 5.48 | 5.57 | 3.25 |
| 64 | 4.56 | 4.69 | 0.21 | 2.86 | 1.5 | 3.05 | 4.78 | 4.96 | 2.89 |



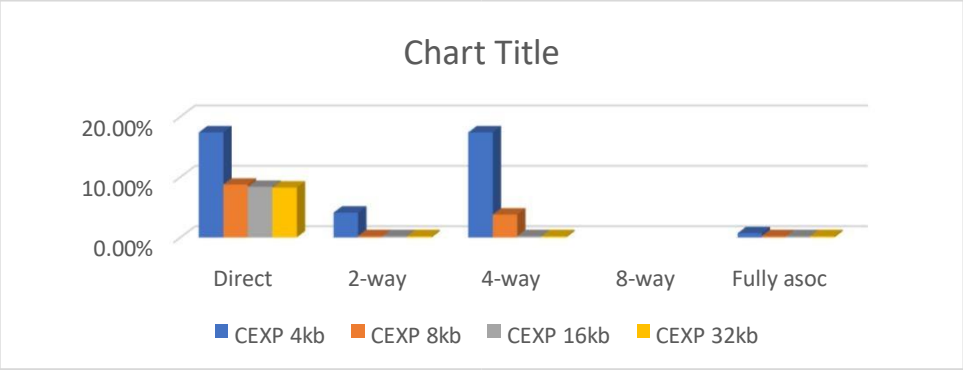
3)Determinați rata de miss variind dimensiunea blocului de date pentru diferite  dimensiuni de cache.

| RMISS(C | HYDRO | NASA7 | CEXP | MDLJD | EAR | COMP | WAVE | SWM | UCOMP |
|---|---|---|---|---|---|---|---|---|---|
| 64 | 25.15% | 25.05% | 1.31% | 25.94% | 26.92% | 29.73% | 29.73% | 33.04% | 22.24% |
| 256 | 14.81% | 13.36% | 0.55% | 11.88% | 10.79% | 12.00% | 17.50% | 11.48% | 14.07% |
| 1024 | 11.00% | 10.56% | 0.70% | 8.46% | 10.21% | 7.44% | 11.40% | 10.00% | 6.98% |
| 4096 | 47.95% | 47.87% | 19.72% | 42.81% | 38.32% | 38.98% | 45.37% | 54.14% | 39.95% |



4)Determinați rata de miss variind gradul de asociativitate pentru diferite dimensiuni de cache.

| | miss rate | Direct | 2-way | 4-way | 8-way | Fully asoc |
|---|---|---|---|---|---|---|
| CEXP | 4kb | 17.39% | 4.11% | 17.39% | | 0.70% |
| | 8kb | 8.76% | 0.24% | 3.79% | | 0.24% |
| | 16kb | 8.38% | 0.22% | 0.22% | | 0.22% |
| | 32kb | 8.26% | 0.21% | 0.21% | | 0.21% |



**Laborator 6.**

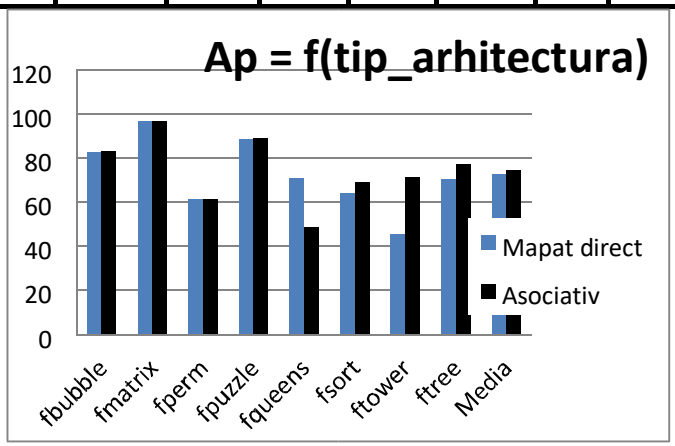
**Implementarea shemelor clasice de predictie in procesoarele superscalare avansate**

**1)**Sa se reprezinte sub forma grafica functiile utilizând implicit automatul de predictie pe doi biti:

a) Ap=f(tip_arhitectura)

| *f(tip_arhitect* | *fbubbleu* | *fmatrix* | *fperm* | *fpuzzle* | *fqueens* | *fsort* | *ftower* | *ftree* | *Media* |
|---|---|---|---|---|---|---|---|---|---|
| **Mapat direct** | 82.43 | 96.58 | 61.15 | 88.51 | 70.54 | 64.2 | 45.4 | 70.15 | 72.37 |
| **Asociativ** | 82.9 | 96.58 | 61.16 | 88.99 | 48.29 | 68.7 | 71 | 76.9 | 74.31 |

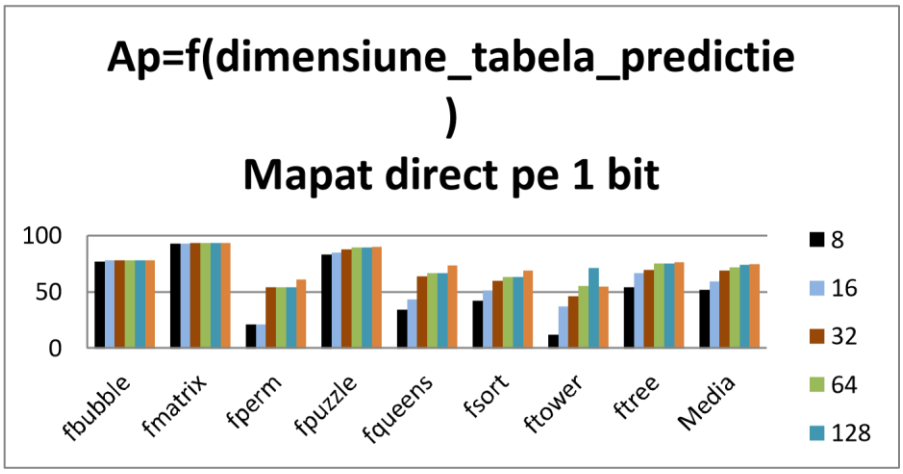
A




B b)Ap=f(dimensiune_tabela_predictie)

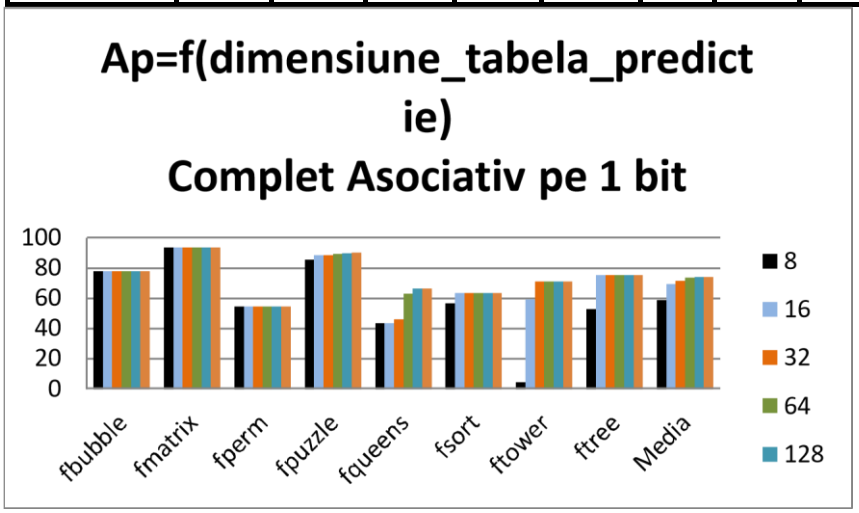
***Mapat direct pe 1 bit***

| *siune_tabela* | *fbubble* | *fmatrix* | *fperm* | *fpuzzle* | *fqueens* | *fsort* | *ftower* | *ftree* | *Media* |
|---|---|---|---|---|---|---|---|---|---|
| **8** | 76.83 | 92.65 | 20.95 | 83.13 | 34.49 | 42.1 | 12.3 | 54.46 | 52.10 |
| **16** | 77.8 | 92.87 | 20.95 | 84.73 | 43.41 | 51.1 | 37.4 | 66.76 | 59.37 |
| **32** | 77.8 | 93.31 | 54.44 | 87.97 | 63.66 | 59.7 | 46.1 | 69.78 | 69.10 |
| **64** | 77.8 | 93.31 | 54.44 | 89.25 | 66.49 | 63.5 | 55 | 75.04 | 71.85 |
| **128** | 77.8 | 93.31 | 54.44 | 89.58 | 66.49 | 63.5 | 71 | 75.04 | 73.89 |
| **256** | 77.8 | 93.31 | 61.15 | 89.86 | 73.28 | 68.7 | 55 | 76.14 | 74.41 |




***Complet asociativ pe 1 bit***

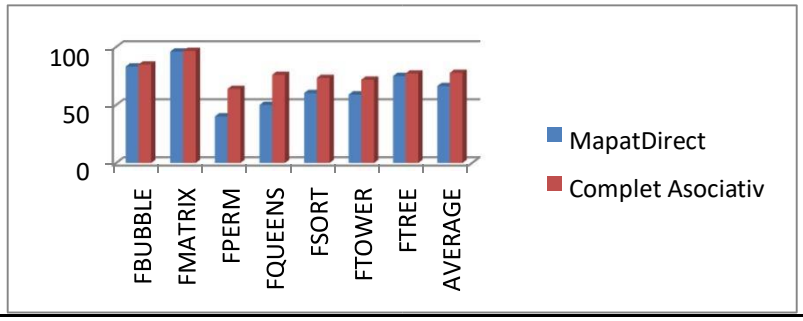
| *nsiune_tabela* | *fbubble* | *fmatrix* | *fperm* | *fpuzzle* | *fqueens* | *fsort* | *ftower* | *ftree* | *Media* |
|---|---|---|---|---|---|---|---|---|---|
| **8** | 77.8 | 93.31 | 54.44 | 85.26 | 43.38 | 56.3 | 4.28 | 52.89 | 58.46 |
| **16** | 77.8 | 93.31 | 54.44 | 88.4 | 43.39 | 63.5 | 59 | 75.04 | 69.36 |
| **32** | 77.8 | 93.31 | 54.44 | 88.12 | 46.05 | 63.5 | 71 | 75.04 | 71.15 |
| **64** | 77.8 | 93.31 | 54.44 | 89.31 | 62.98 | 63.5 | 71 | 75.04 | 73.42 |
| **128** | 77.8 | 93.31 | 54.44 | 89.73 | 66.38 | 63.5 | 71 | 75.04 | 73.89 |
| **256** | 77.8 | 93.31 | 54.44 | 89.99 | 66.46 | 63.5 | 71 | 75.04 | 73.94 |



**Laborator7.** **Predictor de salturi adaptiv,corelat pe doua nivele Gag**

Să se reprezinte sub formă grafică funcţiile utilizând implicit automatul de predicţie pe doi biţi:

**1.** Ap = f (tip_arhitectură)




| **Table = 256, HR = 4, LRU = 0, Arhitectura = MapatDirect, Automat = 2 biti** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Instr. Proc. | 41216 | 21341 | 54819 | 38462 | 12601 | 37930 | 32887 | |
| Ap | 34271 | 20518 | 22023 | 19245 | 7600 | 22396 | 24644 | |
| Raport | 83.15 | 96.1436 | 40.174 | 50.0364 | 60.31 | 59.0456 | 74.94 | 66.2568 |
| **Table = 256, HR = 4, LRU = 2, Arhitectura = CompletAsociativ, Automat = 2 biti** | | | | | | | | |
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
| Instr. Proc. | 41216 | 21341 | 54819 | 38462 | 2601 | 37930 | 32887 | |
| Ap | 34966 | 20613 | 35050 | 29257 | 9251 | 27269 | 25385 | |
| Raport | 84.836 | 96.589 | 63.938 | 76.067 | 73.410 | 71.893 | 77.190 | 77.704 |
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
| MapatDirect | 83.149 | 96.143 | 40.174 | 50.036 | 60.31 | 59.045 | 74.94 | 66.2567 |
| Complet Asociativ | 84.836 | 96.588 | 63.938 | 76.067 | 73.41 | 71.893 | 77.19 | 77.7031 |

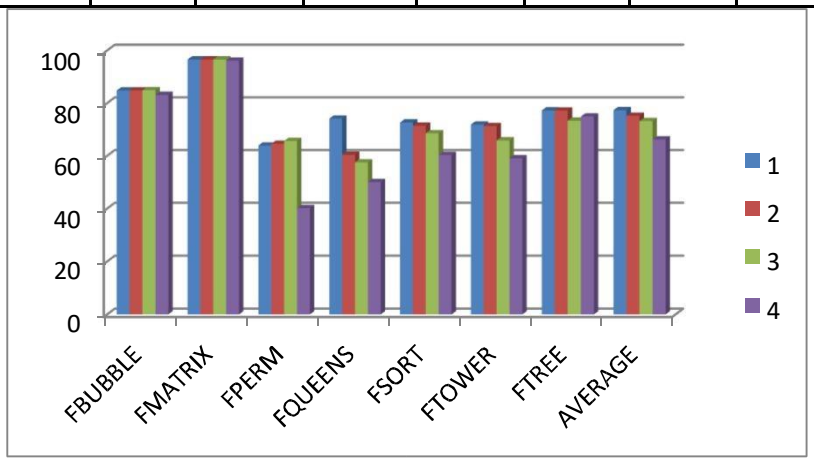
**Table = 256, HR = 4, LRU = 0, Arhitectura = MapatDirect, Automat = 2 biti**

| | FBUBBLE | FMATRIX | FPERM | FQUEENS | FSORT | FTOWER | FTREE | AVERAGE |
|---|---|---|---|---|---|---|---|---|

**2)**Analizaţi influenţa gradului de localizare al saltului asupra acurateţi de predicţie: Ap = f (i) unde i = dim. PClow.

| **Table = 256, HR = 1, LRU = 0, Arhitectura = MapatDirect, Automat = 2 biti** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
| Instr. Proc. | 41216 | 21341 | 54819 | 38462 | 12601 | 37930 | 32887 | |
| Ap | 34965 | 20613 | 35048 | 28508 | 9157 | 27265 | 25401 | |
| Raport | 84.83 | 96.59 | 63.93 | 74.12 | 72.67 | 71.88 | 77.24 | 77.32 |
| **Table = 256, HR = 2, LRU = 0, Arhitectura = MapatDirect, Automat = 2 biti** | | | | | | | | |
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
| Instr. Proc. | 41216 | 21341 | 54819 | 38462 | 12601 | 37930 | 32887 | |
| Ap | 34978 | 20613 | 35388 | 23224 | 9001 | 27037 | 25393 | |
| Raport | 84.865 | 96.588 | 64.554 | 60.381 | 71.430 | 71.281 | 77.212 | 75.187 |
| **Table = 256, HR = 3, LRU = 0, Arhitectura = MapatDirect, Automat = 2 biti** | | | | | | | | |
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
| Instr. Proc. | 41216 | 21341 | 54819 | 38462 | 12601 | 37930 | 32887 | |
| Ap | 34992 | 20613 | 35994 | 22118 | 8642 | 24977 | 24120 | |
| Raport | 84.899 | 96.588 | 65.659 | 57.506 | 68.581 | 65.850 | 73.342 | 73.203 |

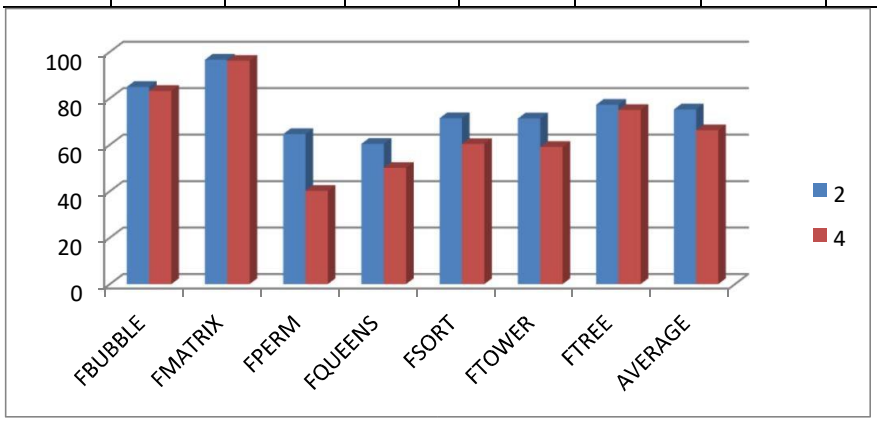
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Instr. Proc. | 41216 | 21341 | 54819 | 38462 | 12601 | 37930 | 32887 | |
| Ap | 34271 | 20518 | 22023 | 19245 | 7600 | 22396 | 24644 | |
| Raport | 83.149 | 96.143 | 40.174 | 50.036 | 60.312 | 59.045 | 74.935 | 66.256 |
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
| 1 | 84.833 | 96.588 | 63.934 | 74.119 | 72.668 | 71.882 | 77.237 | **77.323** |
| 2 | 84.865 | 96.588 | 64.554 | 60.381 | 71.430 | 71.281 | 77.212 | **75.187** |
| 3 | 84.899 | 96.588 | 65.659 | 57.506 | 68.581 | 65.850 | 73.342 | **73.203** |
| 4 | 83.149 | 96.143 | 40.174 | 50.036 | 60.312 | 59.045 | 74.935 | **66.256** |




**3**)Stabiliţi influenţa contextului în care se situează saltul în program: Ap = f (HRglobal).

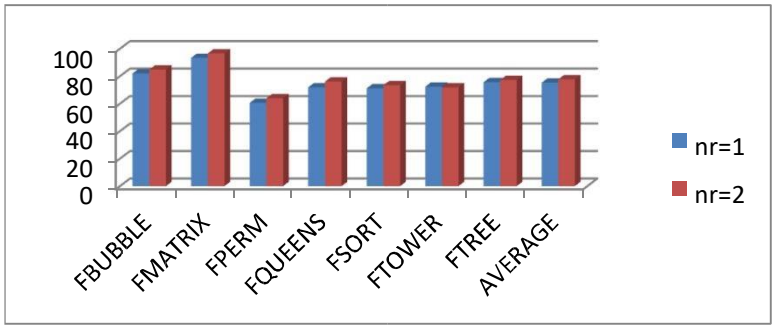
| **Table = 256, HR = 2, LRU = 0, Arhitectura = MapatDirect, Automat = 2 biti** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
| Instr. Proc. | 41216.00 | 21341.00 | 54819.00 | 38462.00 | 12601.00 | 37930.00 | 32887.00 | |
| Ap | 34978.00 | 20613.00 | 35388.00 | 23224.00 | 9001.00 | 27037.00 | 25393.00 | |
| Raport | 84.87 | 96.59 | 64.55 | 60.38 | 71.43 | 71.28 | 77.21 | 75.19 |
| **Table = 256, HR = 4, LRU = 0, Arhitectura = MapatDirect, Automat = 2 biti** | | | | | | | | |

| | FBUBBLE | FMATRIX | FPERM | FQUEENS | FSORT | FTOWER | FTREE | AVERAGE |
|---|---|---|---|---|---|---|---|---|
| Instr. Proc. | 41216.00 | 21341.00 | 54819.00 | 38462.00 | 12601.00 | 37930.00 | 32887.00 | |
| Ap | 34271.00 | 20518.00 | 22023.00 | 19245.00 | 7600.00 | 22396.00 | 24644.00 | |
| Raport | 83.15 | 96.14 | 40.17 | 50.04 | 60.31 | 59.05 | 74.94 | 66.26 |
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
| 2 | 84.87 | 96.59 | 64.55 | 60.38 | 71.43 | 71.28 | 77.21 | 75.19 |
| 4 | 83.15 | 96.14 | 40.17 | 50.04 | 60.31 | 59.05 | 74.94 | 66.26 |




**2.** Reprezentaţi Ap = f (nr_biţi_automat_predicţie) considerând parametrii optimi (PClow, HRglobal) rezultaţi în urma simulării efectuate la 1), 2) şi 3).

| **Table = 256, LRU = 2, Arhitectura = CompletAsociativ, Automat = 1 bit** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
| Instr. Proc. | 41216 | 21341 | 54819 | 38462 | 12601 | 37930 | 32887 | |



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ap | 33798 | 19915 | 33209 | 27659 | 8966 | 27437 | 24864 | |
| Raport | 82.0021 | 93.3180 | 60.5794 | 71.9125 | 71.1531 | 72.3359 | 75.6043 | 75.2722 |

**Table = 256, LRU = 2, Arhitectura = CompletAsociativ, Automat = 2 biti**

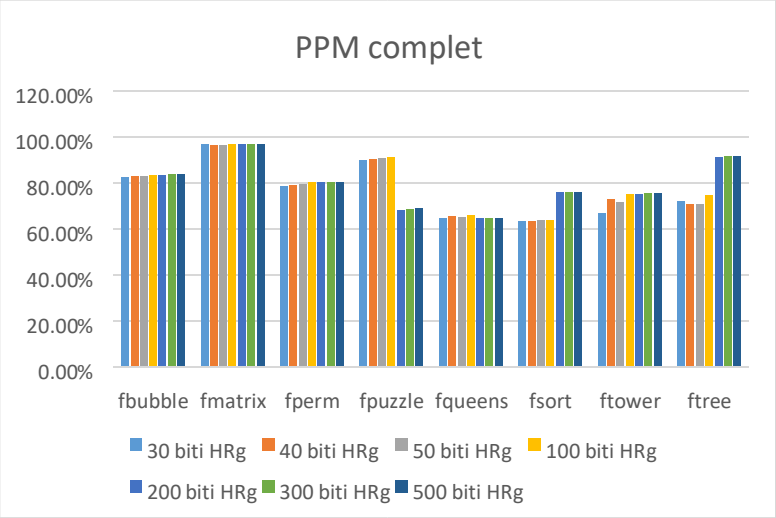
| | **FBUBBLE** | **FMATRIX** | **FPERM** | **FQUEENS** | **FSORT** | **FTOWER** | **FTREE** | **AVERAGE** |
|---|---|---|---|---|---|---|---|---|
| Instr. Proc. | 41216 | 21341 | 54819 | 38462 | 12601 | 37930 | 32887 | |
| Ap | 34966 | 20613 | 35050 | 29257 | 9251 | 27269 | 25385 | |
| Raport | 84.836 | 96.5887 | 63.9377 | 76.0673 | 73.4148 | 71.893 | ###### | 77.7037 |

| | **nr=1** | **nr=2** |
|---|---|---|
| **FBUBBLE** | 82.0021 | 84.836 |
| **FMATRIX** | 93.318 | 96.5887 |
| **FPERM** | 60.5794 | 63.9377 |
| **FQUEENS** | 71.9125 | 76.0673 |
| **FSORT** | 71.1531 | 73.4148 |
| **FTOWER** | 72.3359 | 71.893 |
| **FTREE** | 75.6043 | 77.1886 |
| **AVERAGE** | 75.2722 | 77.7037 |

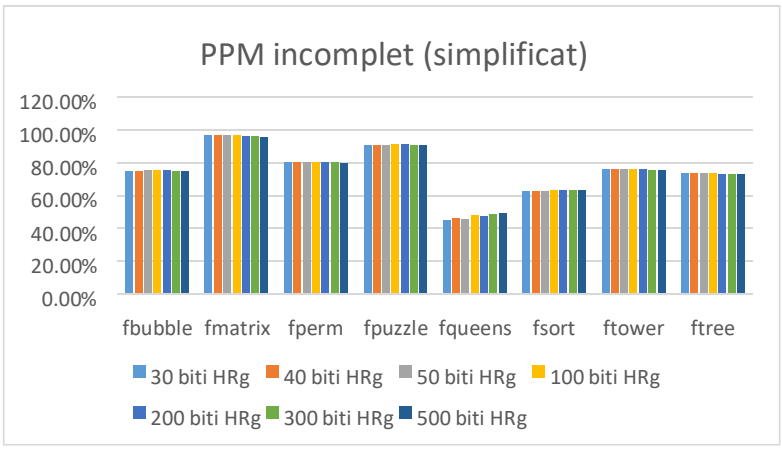
**Laborator 8. Predictor MARKOVIAN de ramificatii de program(Predictor contextual de tip ppm complet)**

a)Sa se determine acuratetea de predictie pentru fiecare din cele doua tipuri de predictoare markov ppm complet sau simplificat in functie de nr de biti de istoriie globala.

| PPM complf | bubble | fmatrix | fperm | fpuzzle | fqueens | fsort | ftower | ftree | average |
|---|---|---|---|---|---|---|---|---|---|
| 30 biti HRg | 82.56% | 96.56% | 78.38% | 89.67% | 64.66% | 63.36% | 66.88% | 72.21% | 76.79% |
| 40 biti HRg | 83.04% | 96.45% | 78.68% | 90.06% | 65.45% | 63.43% | 72.89% | 70.49% | 77.56% |
| 50 biti HRg | 82.93% | 96.45% | 79.38% | 90.46% | 65.01% | 63.75% | 71.34% | 70.68% | 77.50% |
| 100 biti HRg | 83.21% | 96.66% | 80.17% | 90.89% | 66.10% | 63.80% | 74.74% | 74.43% | 78.75% |
| 200 biti HRg | 83.21% | 96.68% | 80.17% | 68.04% | 64.55% | 75.85% | 75.01% | 91.15% | 79.33% |
| 300 biti HRg | 83.66% | 96.69% | 80.17% | 68.44% | 64.52% | 75.85% | 75.17% | 91.46% | 79.50% |
| 500 biti HRg | 83.69% | 96.69% | 80.17% | 68.96% | 64.55% | 75.85% | 75.32% | 91.61% | 79.61% |



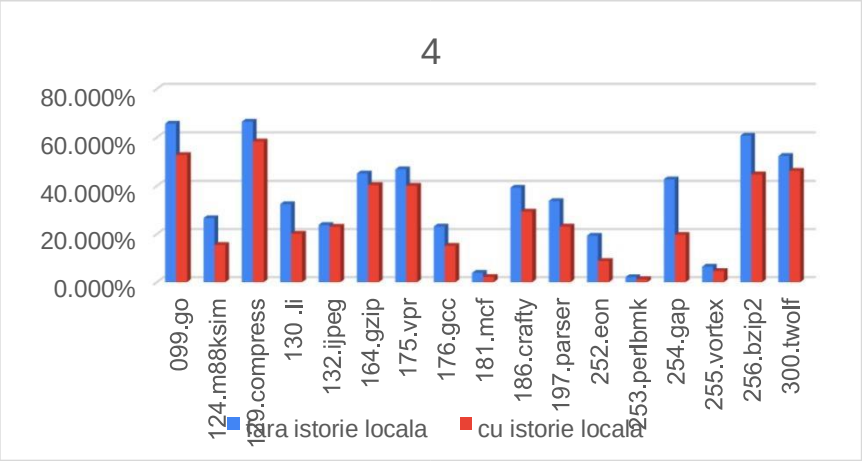

| PPM simplif | bubble | fmatrix | fperm | fpuzzle | fqueens | fsort | ftower | ftree | average |
|---|---|---|---|---|---|---|---|---|---|
| 30 biti HRg | 74.94% | 96.63% | 80.16% | 90.70% | 44.84% | 62.58% | 75.82% | 73.34% | 74.88% |
| 40 biti HRg | 74.99% | 96.60% | 80.16% | 90.74% | 46.19% | 62.33% | 75.81% | 73.42% | 75.03% |
| 50 biti HRg | 75.19% | 96.58% | 80.15% | 90.77% | 45.76% | 62.62% | 75.81% | 73.40% | 75.04% |
| 100 biti HRg | 75.24% | 96.46% | 80.12% | 90.88% | 47.67% | 63.12% | 75.76% | 73.33% | 75.32% |
| 200 biti HRg | 75.15% | 96.23% | 80.05% | 90.86% | 47.23% | 63.29% | 75.69% | 73.18% | 75.21% |
| 300 biti HRg | 75.03% | 96.00% | 79.98% | 90.84% | 48.60% | 63.33% | 75.58% | 73.03% | 75.30% |
| 500 biti HRg | 74.79% | 95.54% | 79.84% | 90.79% | 49.32% | 62.99% | 75.40% | 72.73% | 75.18% |


PPM incomplet (simplificat)
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
fbubble
fmatrix
fperm
fpuzzle
fqueens
fsort
ftower
ftree
30 biti HRg
40 biti HRg
50 biti HRg
100 biti HRg
200 biti HRg
300 biti HRg
500 biti HRg

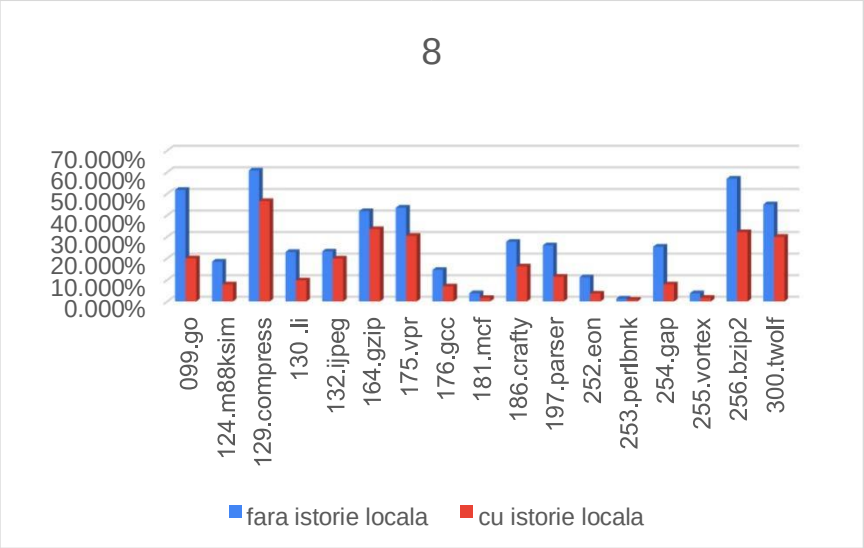
**Laborator 10.**
**Detectia si izolarea salturilor difícil de prezis intr-un anumit context. Predictia acestora prin intermediul unor scheme neurale de tip perceptrón simplu**

Contextele dificil de prezis[%]:
a)fara istorie locala,istoria globala sa varieze intre 4 si 28;
b)cu istorie locala,istoria globala se variaza intre 4 si 28; Realizati o comparatie intre cele doua.

| SPEC2000 | fara istorie locala | cu istorie locala | istorie globala |
|---|---|---|---|
| 099.go | 65.688% | 52.775% | 4 |
| 124.m88ksim | 26.621% | 15.497% | |
| 129.compress | 66.501% | 58.366% | |
| 130 .li | 32.455% | 20.157% | |
| 132.ijpeg | 23.79% | 23.015% | |
| 164.gzip | 45.14% | 40.39% | |
| 175.vpr | 46.827% | 40.048% | |
| 176.gcc | 23.103% | 15.142% | |
| 181.mcf | 3.871% | 2.199% | |
| 186.crafty | 39.249% | 29.338% | |
| 197.parser | 33.728% | 23.144% | |
| 252.eon | 19.329% | 8.827% | |
| 253.perlbmk | 2.049% | 1.282% | |
| 254.gap | 42.739% | 19.625% | |
| 255.vortex | 6.44% | 4.588% | |
| 256.bzip2 | 60.683% | 44.742% | |
| 300.twolf | 52.343% | 46.243% | |

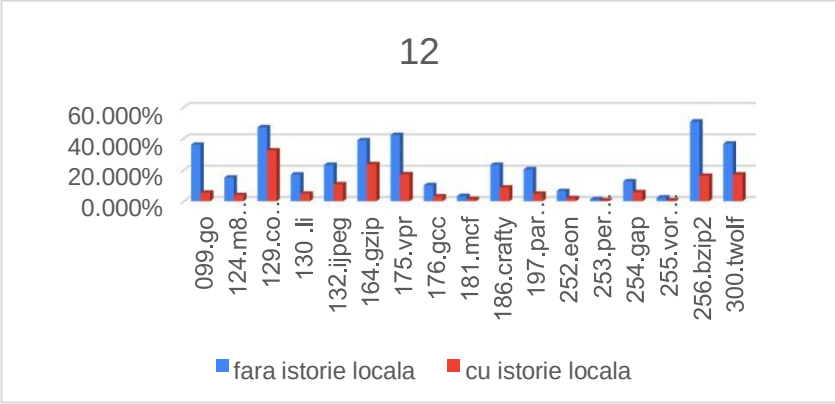


| SPEC2000 | fara istorie locala | cu istorie locala | istorie globala |
|---|---|---|---|
| 099.go | 51.784% | 20.008% | 8 |
| 124.m88ksim | 18.475% | 7.947% | |
| 129.compress | 60.792% | 46.588% | |
| 130 .li | 22.945% | 9.785% | |
| 132.ijpeg | 23.221% | 19.936% | |
| 164.gzip | 41.881% | 33.598% | |
| 175.vpr | 43.496% | 30.423% | |
| 176.gcc | 14.669% | 7.036% | |
| 181.mcf | 3.855% | 1.658% | |
| 186.crafty | 27.674% | 16.253% | |
| 197.parser | 26.036% | 11.515% | |
| 252.eon | 11.236% | 3.684% | |
| 253.perlbmk | 1.360% | 0.834% | |
| 254.gap | 25.411% | 7.958% | |
| 255.vortex | 3.839% | 1.693% | |
| 256.bzip2 | 56.954% | 32.138% | |
| 300.twolf | 45.061% | 29.985% | |



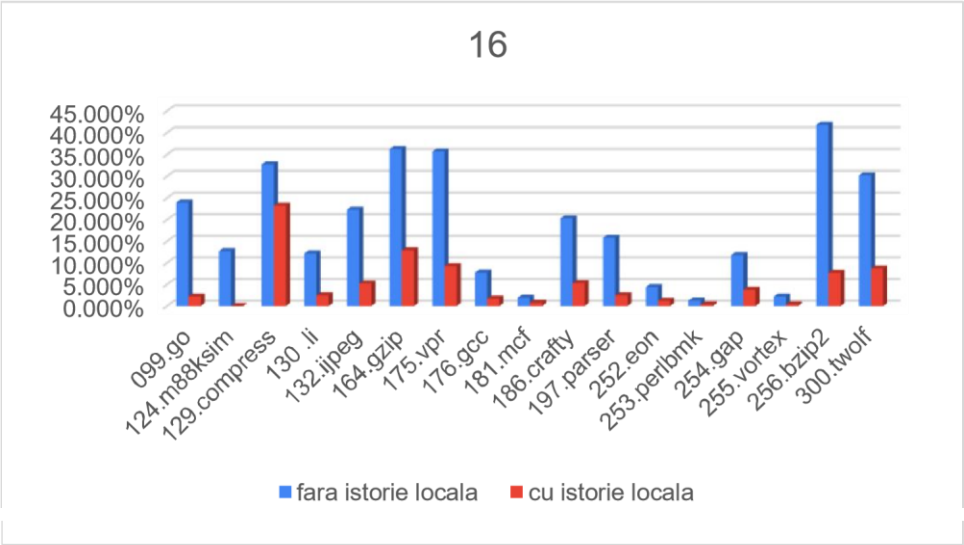

| SPEC2000 | fara istorie locala | cu istorie locala | istorie globala |
|---|---|---|---|
| 099.go | 36.073% | 5.546% | 12 |
| 124.m88ksim | 15.098% | 3.973% | |
| 129.compress | 47.188% | 32.484% | |
| 130 .li | 17.108% | 4.804% | |
| 132.ijpeg | 23.212% | 10.866% | |
| 164.gzip | 38.907% | 23.649% | |

| | | |
|---|---|---|
| 175.vpr | 42.289% | 17.183% |
| 176.gcc | 10.245% | 3.110% |
| 181.mcf | 3.341% | 1.394% |
| 186.crafty | 23.245% | 8.718% |
| 197.parser | 20.395% | 4.771% |
| 252.eon | 6.569% | 1.931% |
| 253.perlbmk | 1.219% | 0.531% |
| 254.gap | 12.770% | 5.746% |
| 255.vortex | 2.395% | 0.590% |
| 256.bzip2 | 50.813% | 16.247% |
| 300.twolf | 36.823% | 17.021% |




| SPEC2000 | fara istorie locala | cu istorie locala | istorie globala |
|---|---|---|---|
| 099.go | 23.965% | 2.180% | 16 |
| 124.m88ksim | 12.714% | 0.000% | |
| 129.compress | 32.693% | 23.233% | |
| 130 .li | 12.171% | 2.469% | |
| 132.ijpeg | 22.332% | 5.180% | |
| 164.gzip | 36.244% | 12.893% | |
| 175.vpr | 35.662% | 9.227% | |
| 176.gcc | 7.737% | 1.711% | |
| 181.mcf | 1.906% | 0.718% | |
| 186.crafty | 20.303% | 5.286% | |
| 197.parser | 15.802% | 2.472% | |
| 252.eon | 4.368% | 1.182% | |
| 253.perlbmk | 1.235% | 0.341% | |

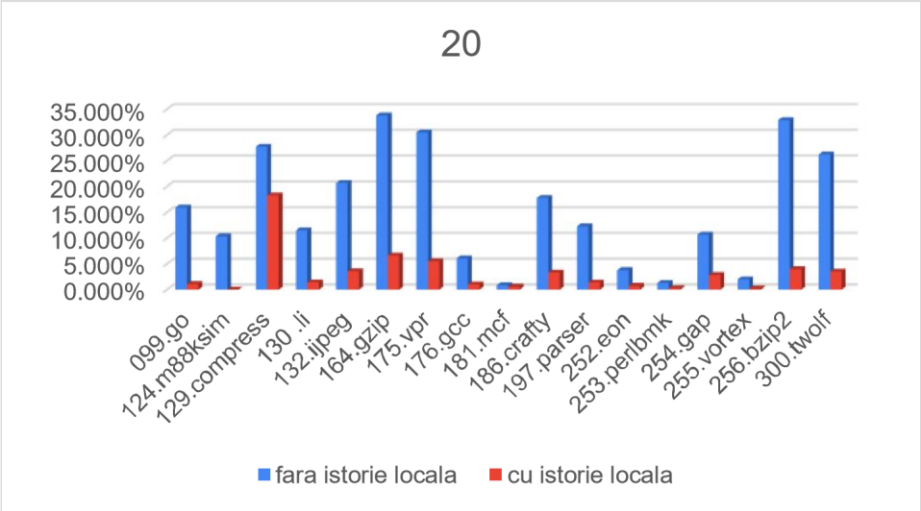
| | | |
|---|---|---|
| 254.gap | 11.785% | 3.731% |
| 255.vortex | 2.192% | 0.362% |
| 256.bzip2 | 41.803% | 7.672% |
| 300.twolf | 30.205% | 8.674% |




| | | | |
|---|---|---|---|
| 099.go | 11.307% | 0.605% | 24 |
| 124.m88ksim | 7.549% | 0.000% | |
| 129.compress | 24.312% | 13.749% | |
| 130 .li | 10.737% | 0.861% | |
| 132.ijpeg | 18.296% | 2.975% | |
| 164.gzip | 31.025% | 3.410% | |

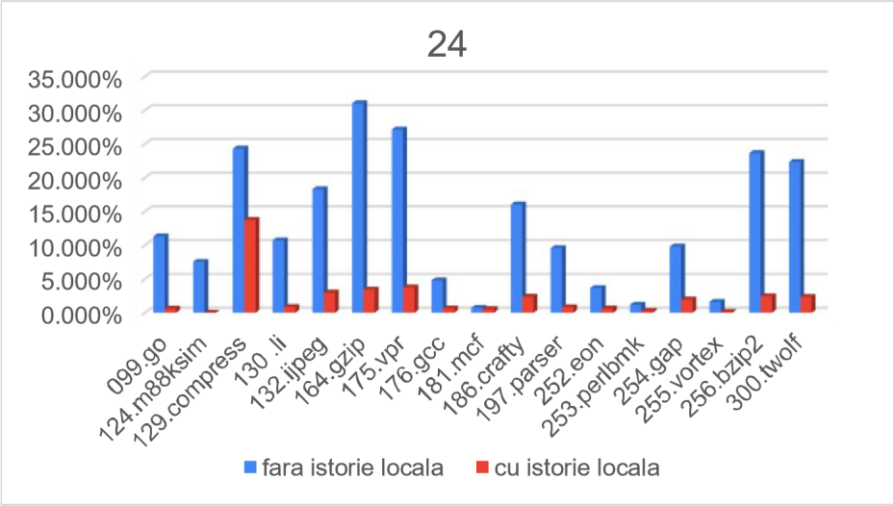
| | | | |
|---|---|---|---|
| 175.vpr | 27.134% | 3.744% | SPEC2000 fara istorie locala cu |
| 176.gcc | 4.791% | 0.640% | |
| 181.mcf | 0.709% | 0.533% | |

| istorie locala | istorie globala | | |
|---|---|---|---|
| 099.go | 15.934% | 1.065% | 20 |
| 124.m88ksim | 10.330% | 0.000% | |
| 129.compress | 27.733% | 18.295% | |
| 130 .li | 11.504% | 1.429% | |
| 132.ijpeg | 20.682% | 3.558% | |
| 164.gzip | 33.799% | 6.635% | |
| 175.vpr | 30.505% | 5.508% | |
| 176.gcc | 6.064% | 1.012% | |
| 181.mcf | 0.853% | 0.550% | |
| 186.crafty | 17.793% | 3.337% | |
| 197.parser | 12.277% | 1.380% | |
| 252.eon | 3.777% | 0.720% | |
| 253.perlbmk | 1.286% | 0.292% | |
| 254.gap | 10.668% | 2.849% | |
| 255.vortex | 2.020% | 0.232% | |
| 256.bzip2 | 32.913% | 3.970% | |
| 300.twolf | 26.224% | 3.499% | |



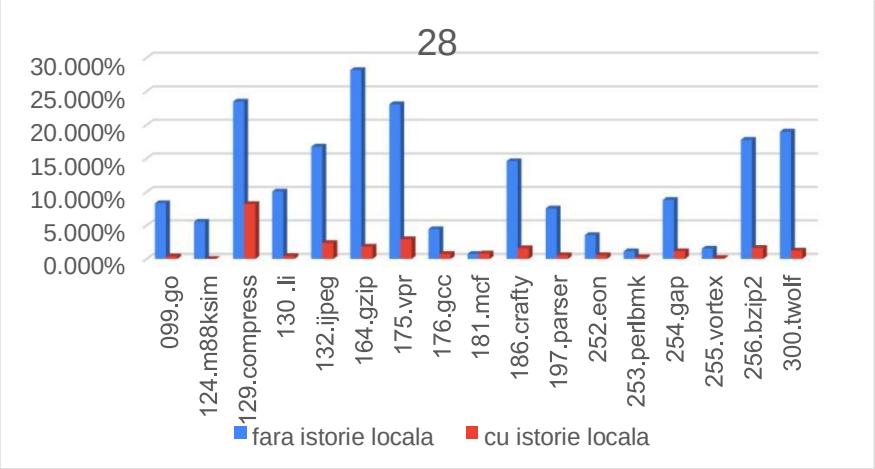

| SPEC2000 | fara istorie locala | cu istorie locala | istorie globala |
|---|---|---|---|
| 186.crafty | 16.060% | 2.369% | |

| | | |
|---|---|---|
| 197.parser | 9.577% | 0.826% |
| 252.eon | 3.678% | 0.619% |
| 253.perlbmk | 1.201% | 0.260% |
| 254.gap | 9.807% | 1.959% |
| 255.vortex | 1.638% | 0.155% |
| 256.bzip2 | 23.657% | 2.438% |
| 300.twolf | 22.327% | 2.332% |




| SPEC2000 | fara istorie locala | cu istorie locala | istorie globala |
|---|---|---|---|
| 099.go | 8.315% | 0.383% | 28 |
| 124.m88ksim | 5.562% | 0.000% | |
| 129.compress | 23.486% | 8.204% | |
| 130 .li | 10.062% | 0.424% | |
| 132.ijpeg | 16.756% | 2.383% | |
| 164.gzip | 28.172% | 1.831% | |
| 175.vpr | 23.071% | 2.940% | |
| 176.gcc | 4.441% | 0.757% | |
| 181.mcf | 0.743% | 0.829% | |
| 186.crafty | 14.599% | 1.607% | |
| 197.parser | 7.523% | 0.550% | |
| 252.eon | 3.557% | 0.558% | |
| 253.perlbmk | 1.149% | 0.267% | |
| 254.gap | 8.821% | 1.146% | |
| 255.vortex | 1.540% | 0.123% | |
| 256.bzip2 | 17.794% | 1.626% | |

| | | |
|---|---|---|
| 300.twolf | 19.003% | 1.242% |




Observatii: -Cu cat creste istoria globala, cu atat scad procentele in ambele cazuri - Procentele cu istorie locala sunt mai mici decat cele fara istorie locala