MO601 - Projeto 4

Wormhole: Wisely Predicting Multidimensional Branches

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Situação que queremos melhorar

Program 1

```
// X is a vector with the position of objects
//    randomly placed in a 3D space
// p is a point in the 3D space
while(true)                          // Loop 1
  for( j=0; j<NumObjects; j++)       // Loop 2
    if( distance(X[j], p) < threshold )    // Branch 1
     { /* do something */ }
```

Program 2: Jacobi1 algorithm

```
// A is the matrix
// B is the right hand side
// X is the current solution estimate
// X0 is the partial solution
 for ( i = 0; i < N; i++ ) {   // Loop 3
   X0[i] = B[i];
   for ( j = 0; j < N; j++ )        // Loop 4
     if ( j != i )                   // Branch 2
       X0[i] = X0[i] - A[i + j*n] * X[j];
   X0[i] = X0[i] /A[i + i*n];
 }
```

Como fazemos isso?

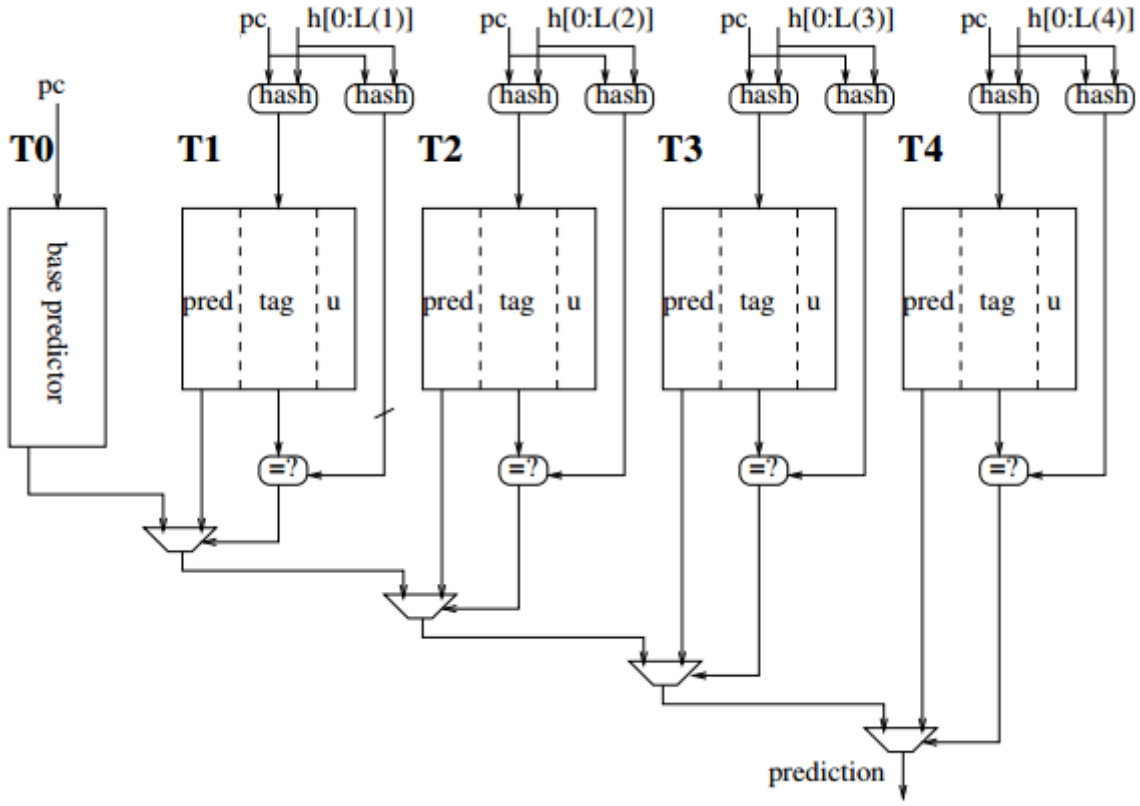
Exemplo para o programa 2.

E os outros Branchs?

ISL-TAGE – “A 64 Kbytes ISL-TAGE branch predictor”, André Seznec INRIA/IRISA

- TAGE predictor.
- Loop predictor
- Statistical Corrector predictor (SC)
- The Immediate Update Mimicker

TAGE predictor



Resultado Autor

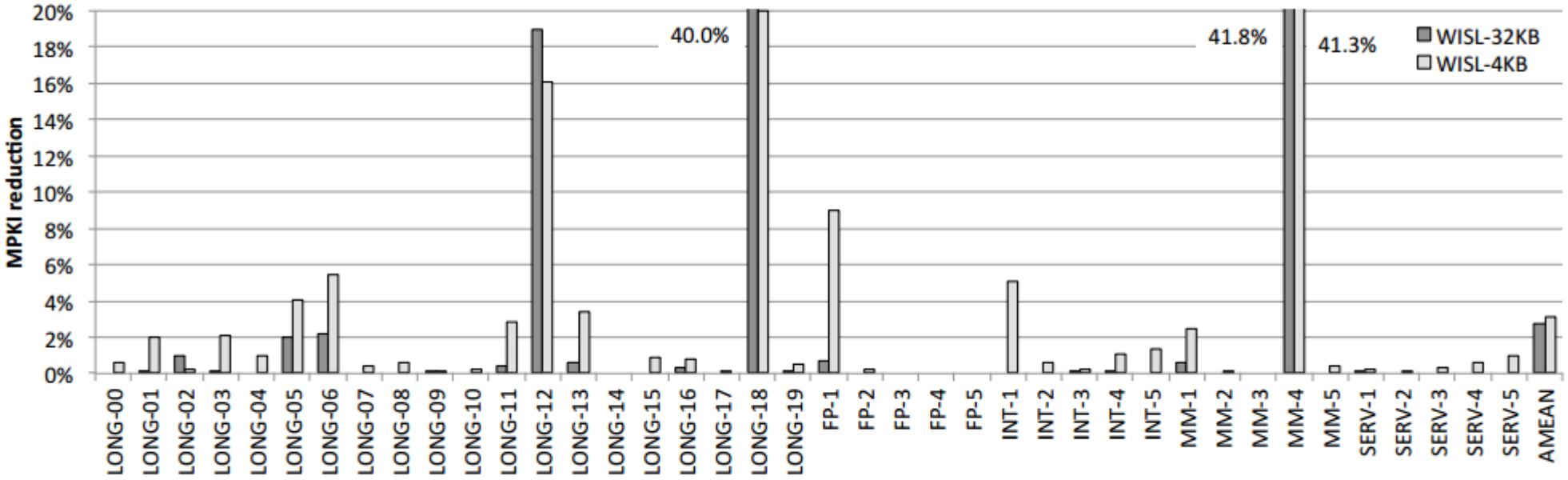
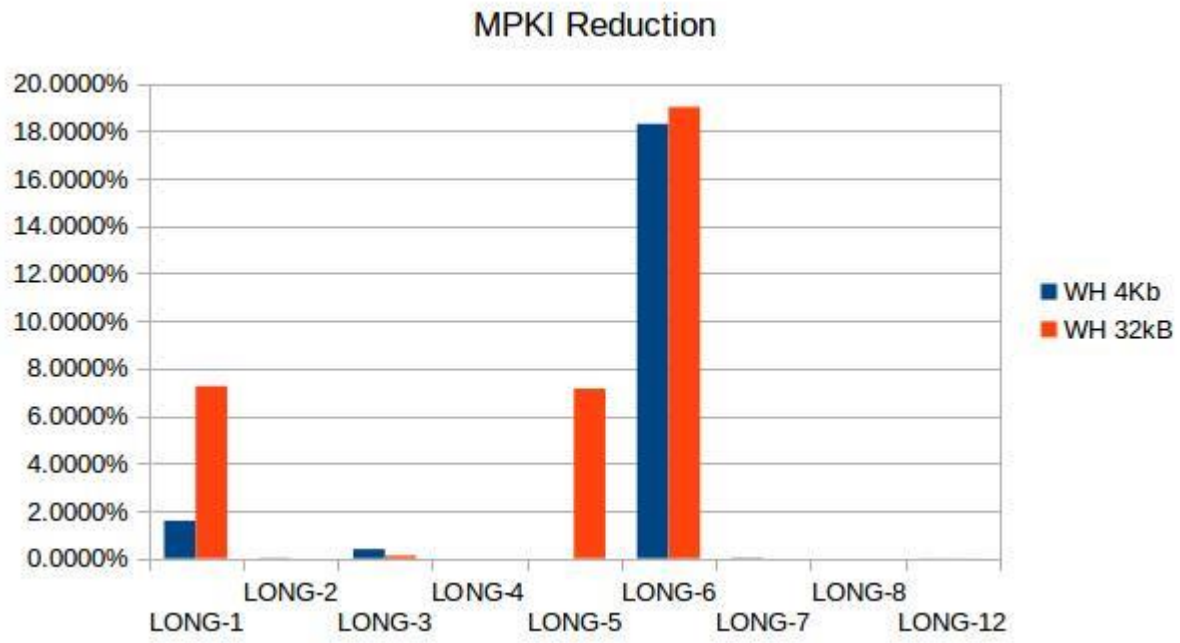
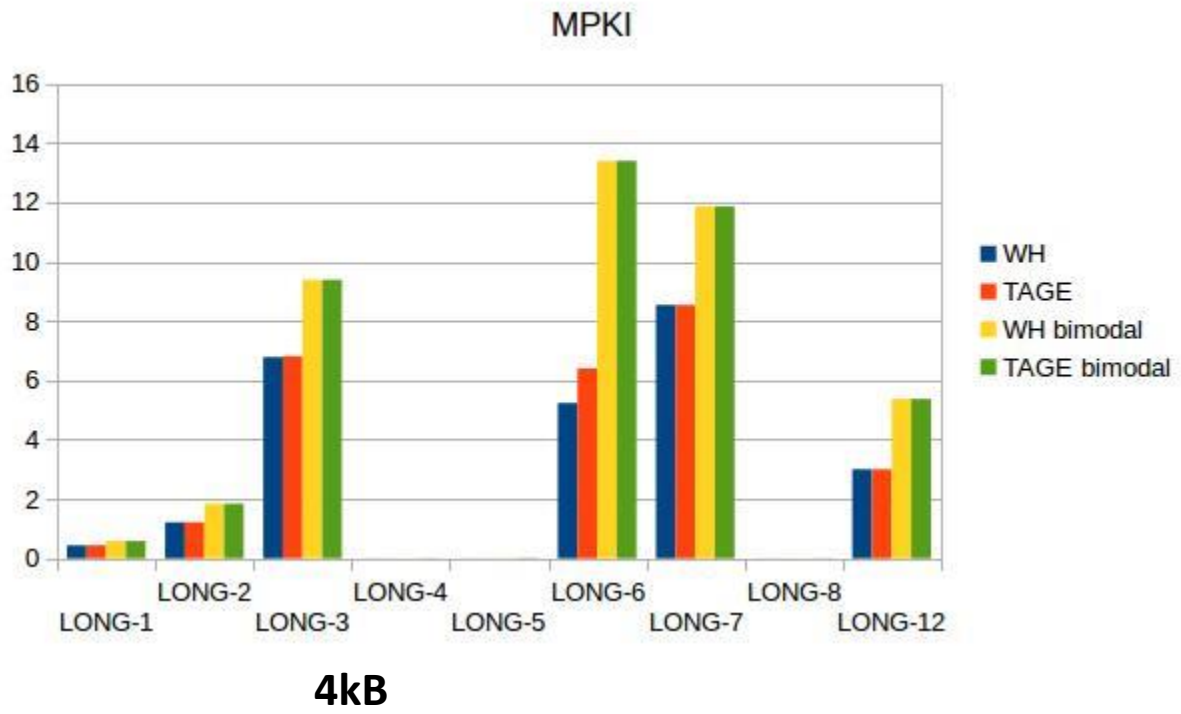


Figure 6: MPKI reductions with respect to ISL-TAGE for the 40 traces, for 4KB and 32KB base predictors.

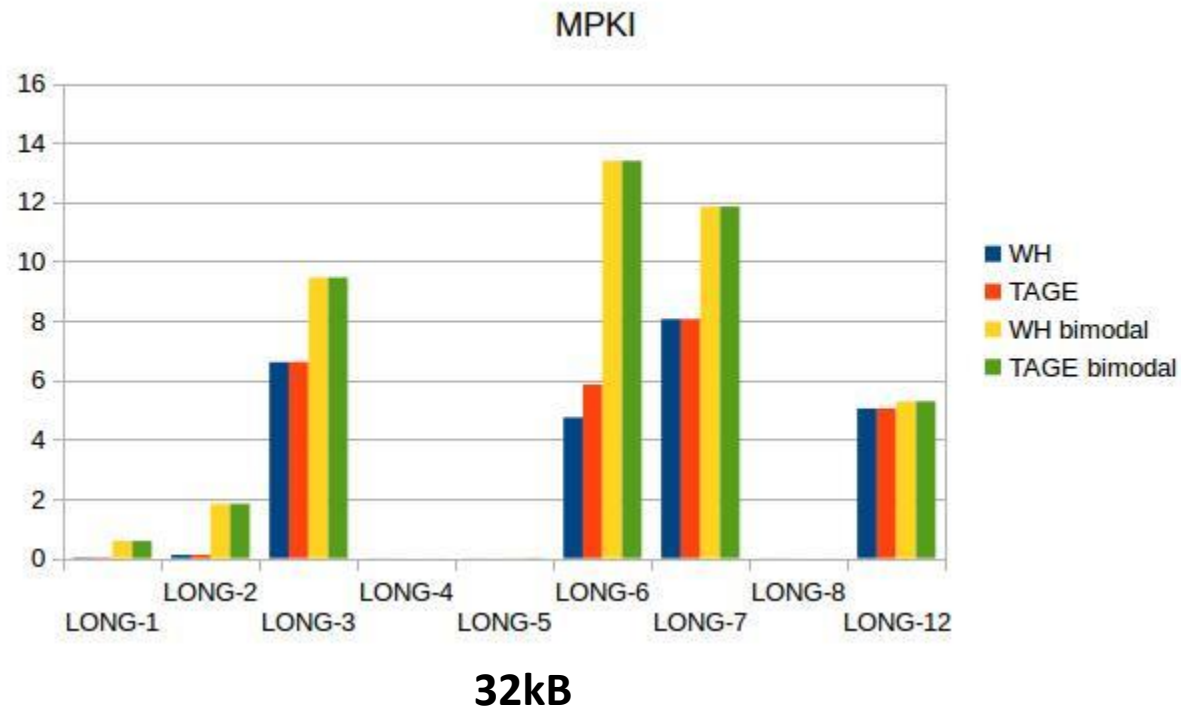
Resultados


MPKI Reduction
20.0000%
18.0000%
16.0000%
14.0000%
12.0000%
10.0000%
8.0000%
6.0000%
4.0000%
2.0000%
0.0000%
LONG-1
LONG-2
LONG-3
LONG-4
LONG-5
LONG-6
LONG-7
LONG-8
LONG-12
WH 4Kb
WH 32kB

Resultados

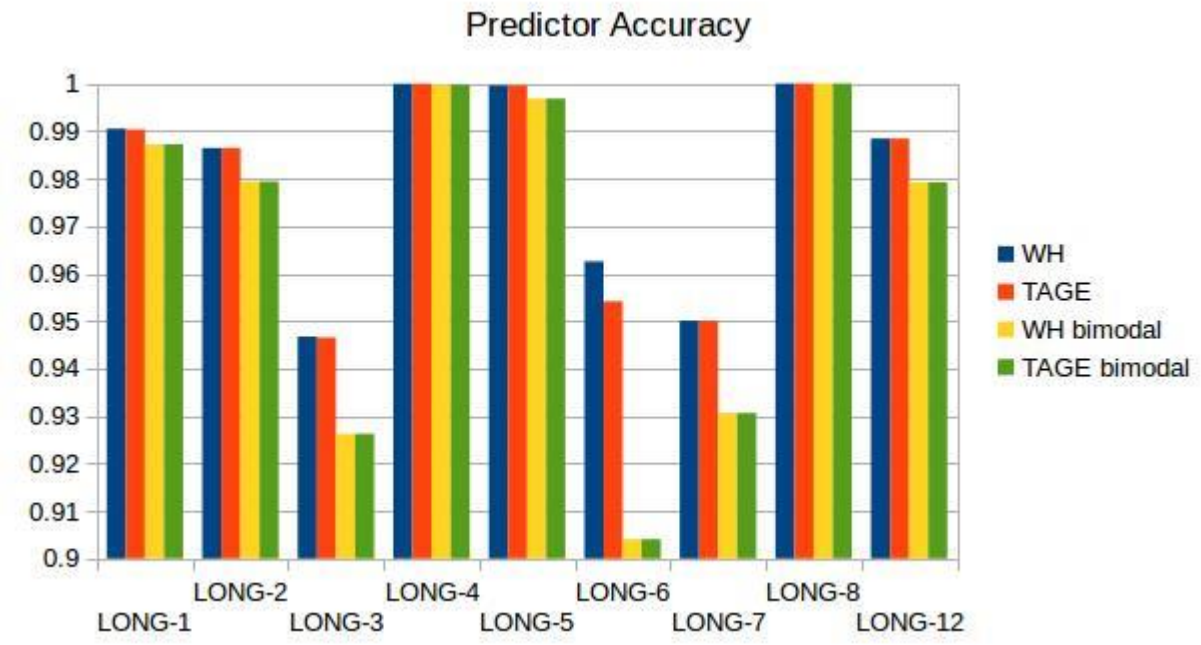


4kB

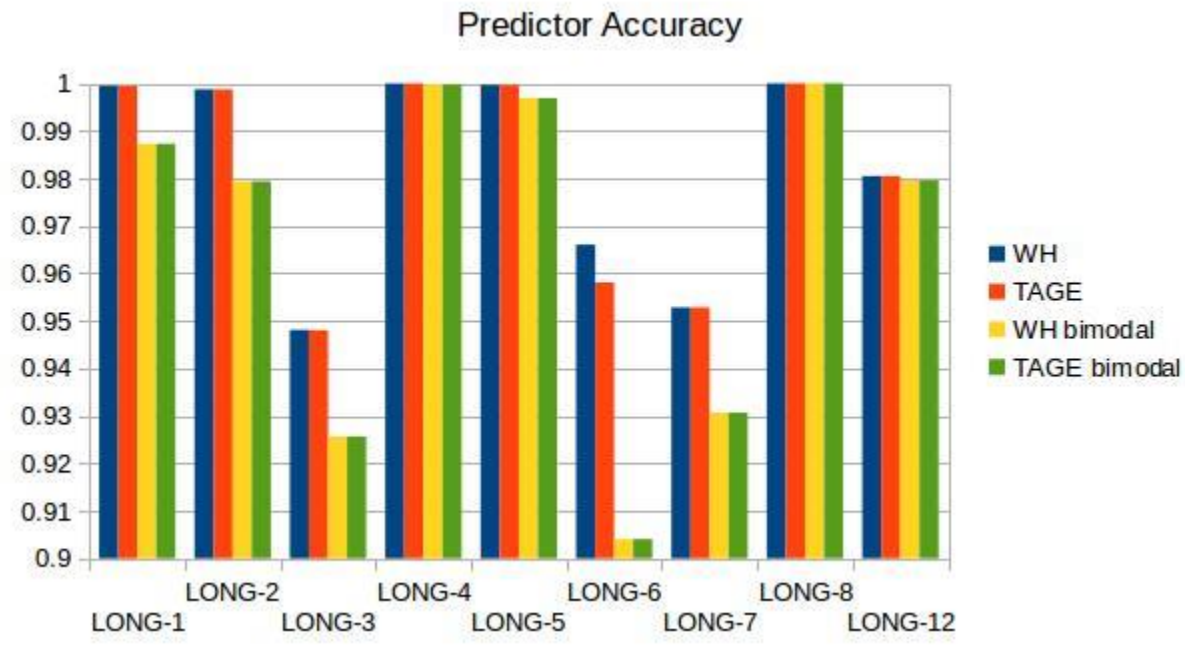


32kB

Resultados



4kB



32kB

Referências

- **Wormhole: Wisely Predicting Multidimensional Branches**:

Jorge Albericio, Joshua San Miguel, Natalie Enright Jerger, and Andreas Moshovos

Edward S. Rogers Sr., Department of Electrical and Computer Engineering, University of Toronto

- **A 64 Kbytes ISL-TAGE branch predictor:**

André Seznec, INRIA/IRISA

- **A case for (partially) TAgged GEometric history length branch prediction:**

André Seznec, Pierre Michaud, IRISA/INRIA/HIPEAC

- **Analysis of the O-GEometric History Length branch predictor**:

André Seznec, IRISA/INRIA/HIPEAC

Obrigado