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Report on "A survey of techniques for dynamic branch prediction"

The main motive of this paper is to research in detail the various techniques of dynamic branch prediction. Branch prediction is important because it can help increase performance and reduce energy usage. Predicting the branch is very important because a misprediction or bad prediction can lead to high latency and increase in energy consumption which are not desirable. The paper also identifies the two security risks posed by Branch Prediction namely "Meltdown" and "Spectre".

The paper describes the various important terms and mentions about the motivation. It then details on the various Branch Predictor designs. The Branch Prediction techniques focused in this section by the author are 1. Two Level Predictors. 2. Using both global history and branch address. 3. Using multiple indexing functions. 4. Leveraging biased branches and 5. Geometric history length Branch Prediction. Though all these techniques endeavour to improve efficiency and reduce the misprediction. They also have few disadvantages which are also discussed in the paper like for example in Two level predictors, aliasing can affect accuracy greatly for small budget Branch Predictors. On the other hand, some of the advantages that were found from study was that the hybrid Branch Predictors provide higher accuracy than component Branch Predictors.

The next concept discussed is the Design and implementation of Neural Branch Predictors. It includes designing of Neural Branch Predictors, Optimising Neural Branch Predictors and Analog implementation of Neural Branch Predictors. The author goes on to extend the survey for hard to predict branches. Five methods were adopted like prediction for loop exit branches, branches inside nested loop, branches with longer period, based on data correlation and based on address correlation. The paper also includes study on Hybrid Branch Predictor and various techniques for improving branch prediction accuracy and reducing latency and energy.

In the conclusion and future work, the author describes Branch Prediction to be speculative and can also waste energy. The author suggests designing Branch Predictors with non-volatile memory or with power gating which works towards reducing energy. The author puts forth that designing techniques which helps in increasing accuracy and reduce energy wastage is an overwhelming task. A concern raised by author is that system performance is considered while reporting Branch Prediction accuracy which is very delusive. I conclude my review saying that the author has researched various techniques for branch Prediction, bringing out the Pros and cons and identifying the future scope along with current problems.

REFRENCE:

[1] Sparsh Mittal, "A survey of techniques for dynamic branch prediction", April 2018 Concurrency and Computation Practice and Experience, DOI: 10.1002/cpe.4s666