Project Idea 1: Evaluating Branch Prediction Strategies

Objective: The objectives of this project are:

- Evaluate different branch prediction strategies.
- Implement a specific branch prediction strategy.

Project Description:
In this project, you will evaluate several branch prediction strategies and propose your own strategy. You will need to implement these strategies in SimpleScalar. Your implementation will be restricted to the bpred.[ch] files. The branch predictor interfaces to sim-outorder.c do not require any modifications.

Specifically, you need to implement two branch prediction strategies from the paper "A Study of Branch Prediction Strategies" by James Smith. You need to compare the branch prediction of these two strategies with the default branch predictor in SimpleScalar. You will use the benchmarks provided by the TA for comparison.

After reporting the branch prediction performance, the next step is to implement your own branch predictor. When you design your predictor, you need to first analyze why the previous predictors fail to capture the branch behavior of certain benchmarks. Only through this analysis will you know what/how to optimize in your design. Finally, you need to report the performance of your own branch predictor.

What to Turn In:
You would need to write a report summarizing the results of your experimental study. Since you shall be exploring a rather large design space, you will need to express your results in a compact and meaningful manner (preferably in the form of graphs). Use the statistics provided by SimpleScalar to perform analysis of the data that you get to explain the results. Comment on the effectiveness of branch predictors in terms of misprediction rate and also the IPC. Please write your report as clearly as possible. Feel free to include any comments on how you think one may improve this scheme. Do NOT cut-and-paste any code into your report.