

2. Discuss **BRANCH PREDICTION**: Why is it Important? How does it work? What are some of the most important issues?

branch prediction techniques:

1. say all branches taken or not taken
2. say forward not taken and backward taken
3. static predict (TSAs)
4. dynamic prediction

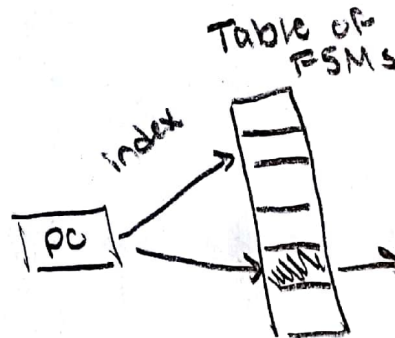
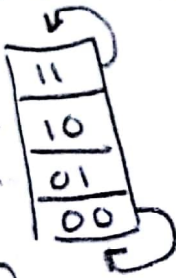
issue w/ branch prediction:
if you predict wrong you must stomp out instructions and load correct ones

Jim Smith's dynamic, adaptive prediction (1981)

→ predicts branch direction

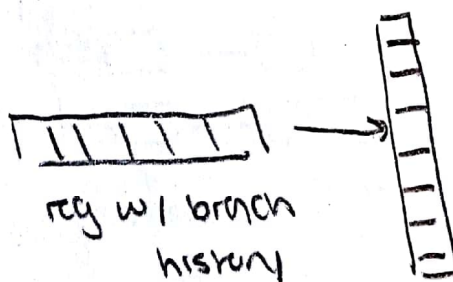
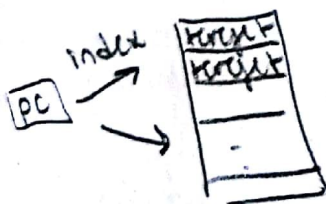
Finite State Machine
(2-bit saturating counter)

strongly taken
weakly taken
weakly not taken
strongly not taken



Lee + Alan J. Smith → predict target

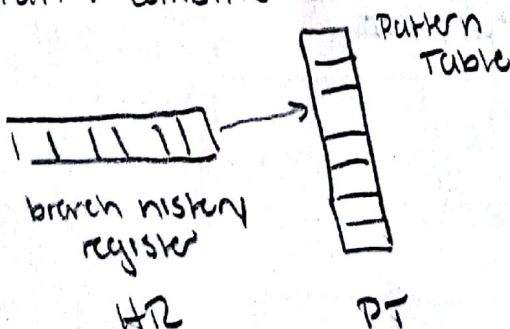
BTB - branch target buffer



1-bit statically determined

missed 6/6

Yee + Patt: combine both ideas



different combos possible:

PACT: per-address HR, global PT

GA-GT: global HR, global PT

PATP: per-address HR, per-address PT

GAP: they didn't consider this option even though it turns out to be the best