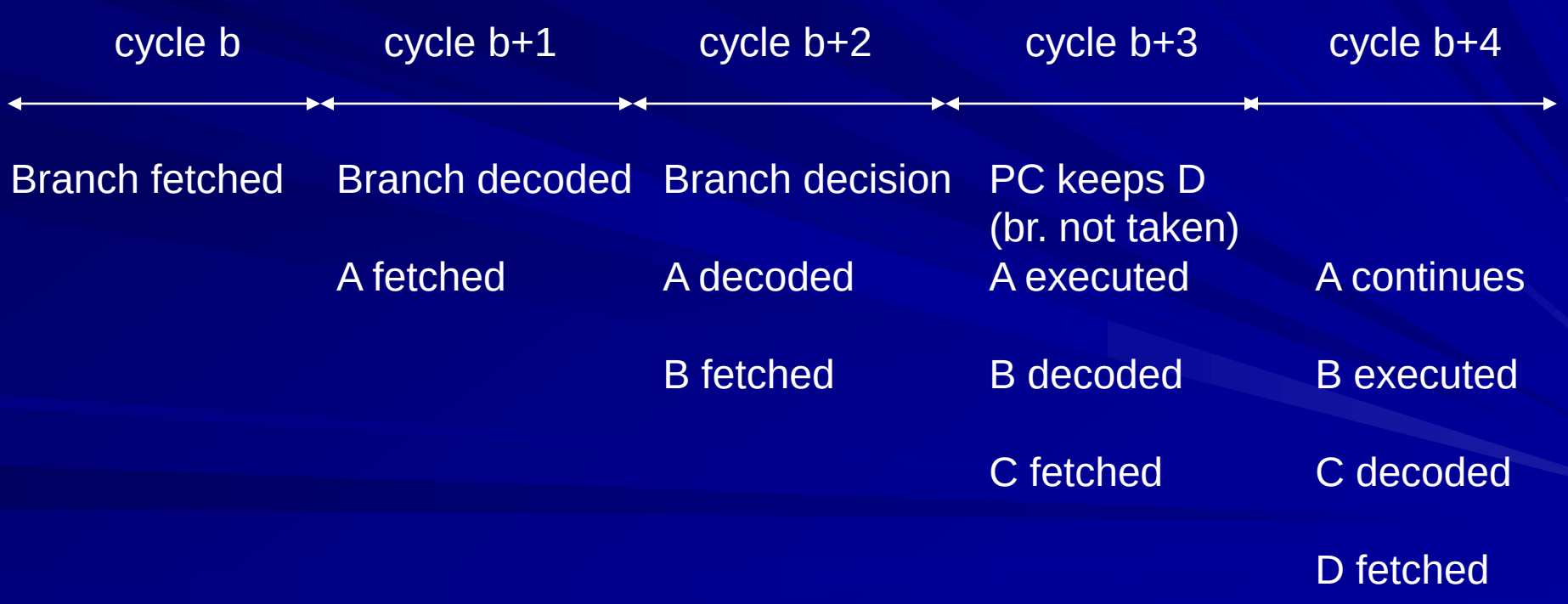
Selection from
MIT:Computer Architecture and Organization
FEL:Architektury počítačů

Version: 1.0

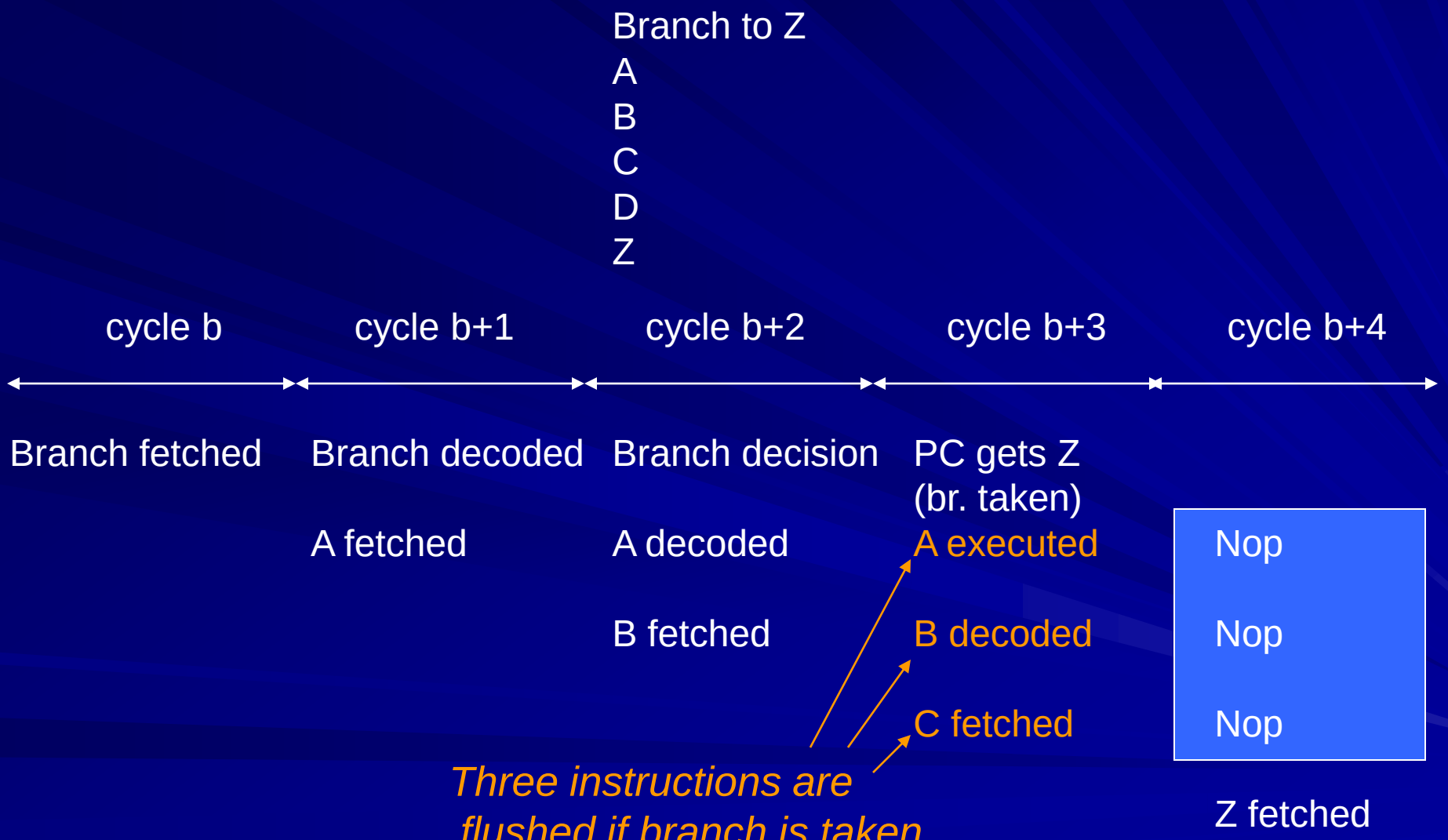
Practical exercise 7

Branch Not Taken

Branch to Z
A
B
C
D
Z

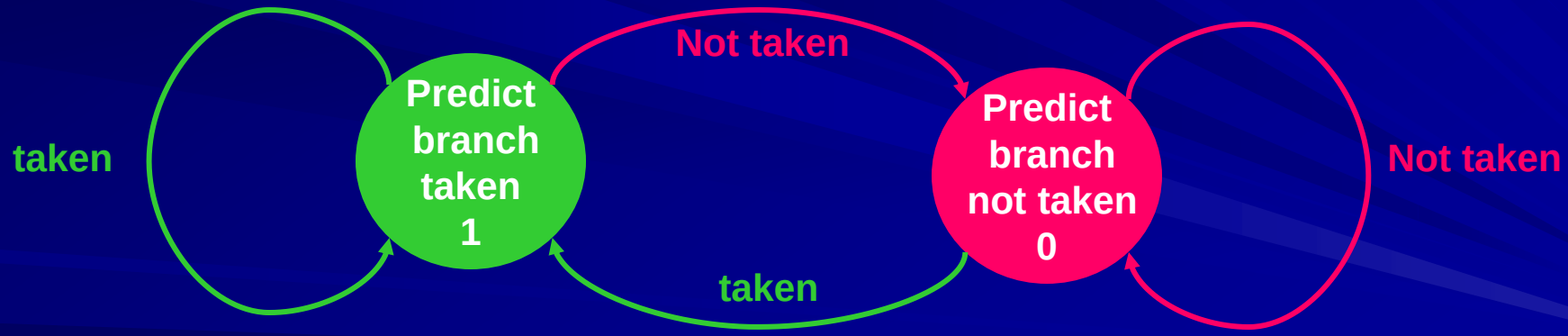


Branch Taken

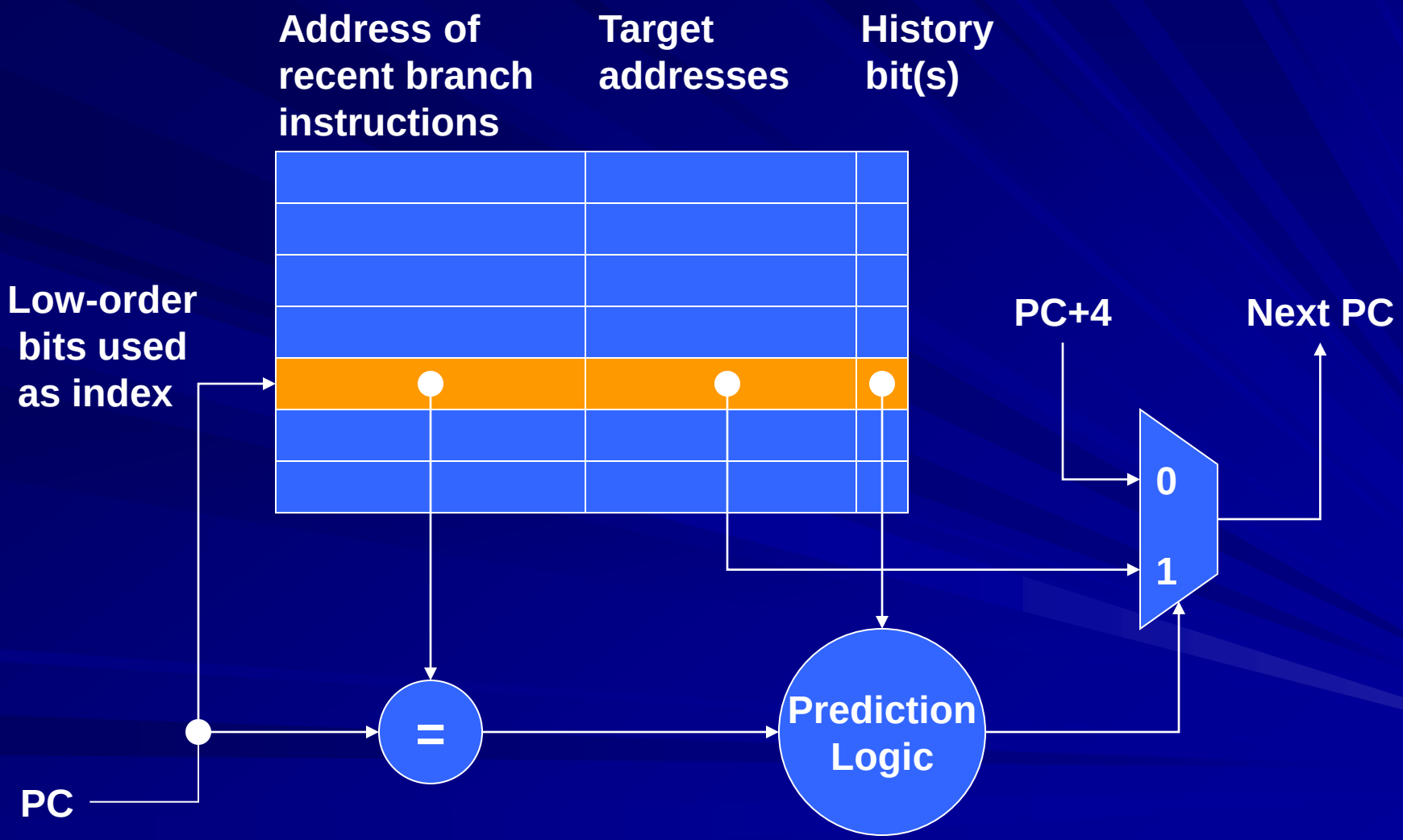


Branch Prediction

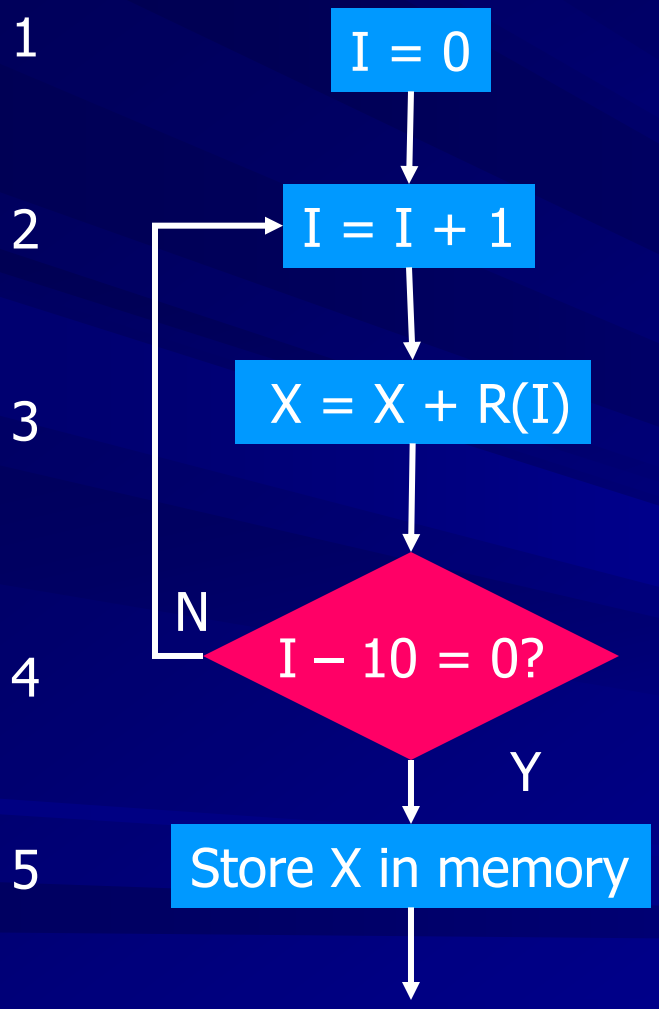
- Useful for program loops.
- A one-bit prediction scheme: a one-bit buffer carries a “history bit” that tells what happened on the last branch instruction
  - History bit = 1, branch was taken
  - History bit = 0, branch was not taken



Branch Prediction



Branch Prediction for a Loop



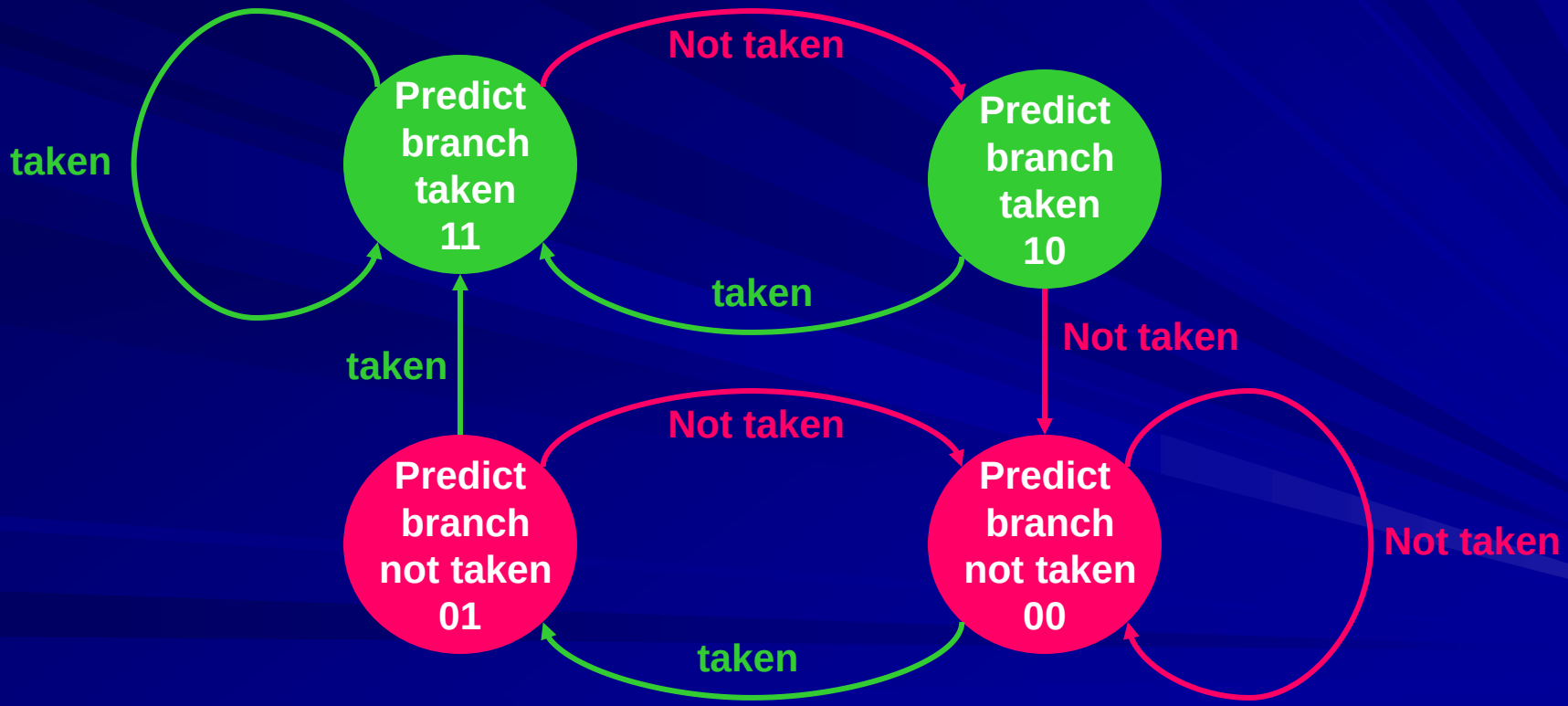
Execution of Instruction 4

Execu-tion seq.	Old hist. bit	Next instr.			New hist. bit	Predi ction
		Pred.	I	Act.		
1	0	5	1	2	1	Bad
2	1	2	2	2	1	Good
3	1	2	3	2	1	Good
4	1	2	4	2	1	Good
5	1	2	5	2	1	Good
6	1	2	6	2	1	Good
7	1	2	7	2	1	Good
8	1	2	8	2	1	Good
9	1	2	9	2	1	Good
10	1	2	10	5	0	Bad

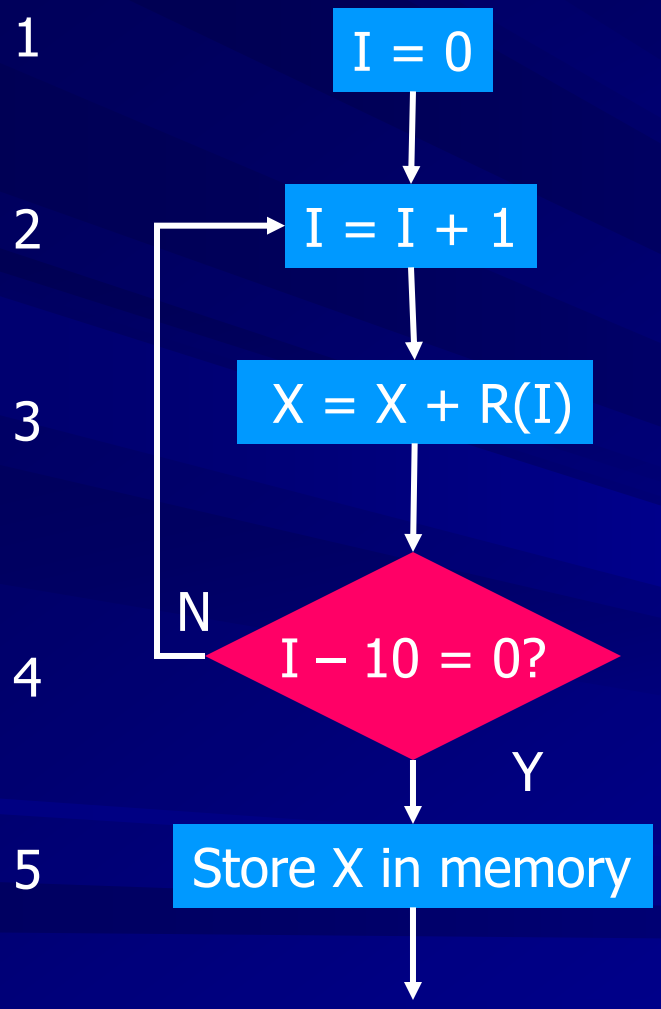
h.bit = 0 *branch not taken*, h.bit = 1 *branch taken*.

Two-Bit Prediction Buffer

- Can improve correct prediction statistics.



Branch Prediction for a Loop



Execution of Instruction 4

Execu-tion seq.	Old Pred. Buf	Next instr.			New pred. Buf	Predi ction
		Pred.	I	Act.		
1	10	2	1	2	11	Good
2	11	2	2	2	11	Good
3	11	2	3	2	11	Good
4	11	2	4	2	11	Good
5	11	2	5	2	11	Good
6	11	2	6	2	11	Good
7	11	2	7	2	11	Good
8	11	2	8	2	11	Good
9	11	2	9	2	11	Good
10	11	2	10	5	10	Bad