

Tournament Predictors

Assignment Project Exam Help

Example
<https://powcoder.com>

Add WeChat powcoder

Jiayi Huang

jiyhuang@cse.tamu.edu

Tournament Predictors

- Features:

- Combine global and local predictors
- Use a selector to select the prediction outcome from one of them
- Update both predictors as well as the selector for each branch

Assignment Project Exam Help

<https://powcoder.com>

- Selector Update

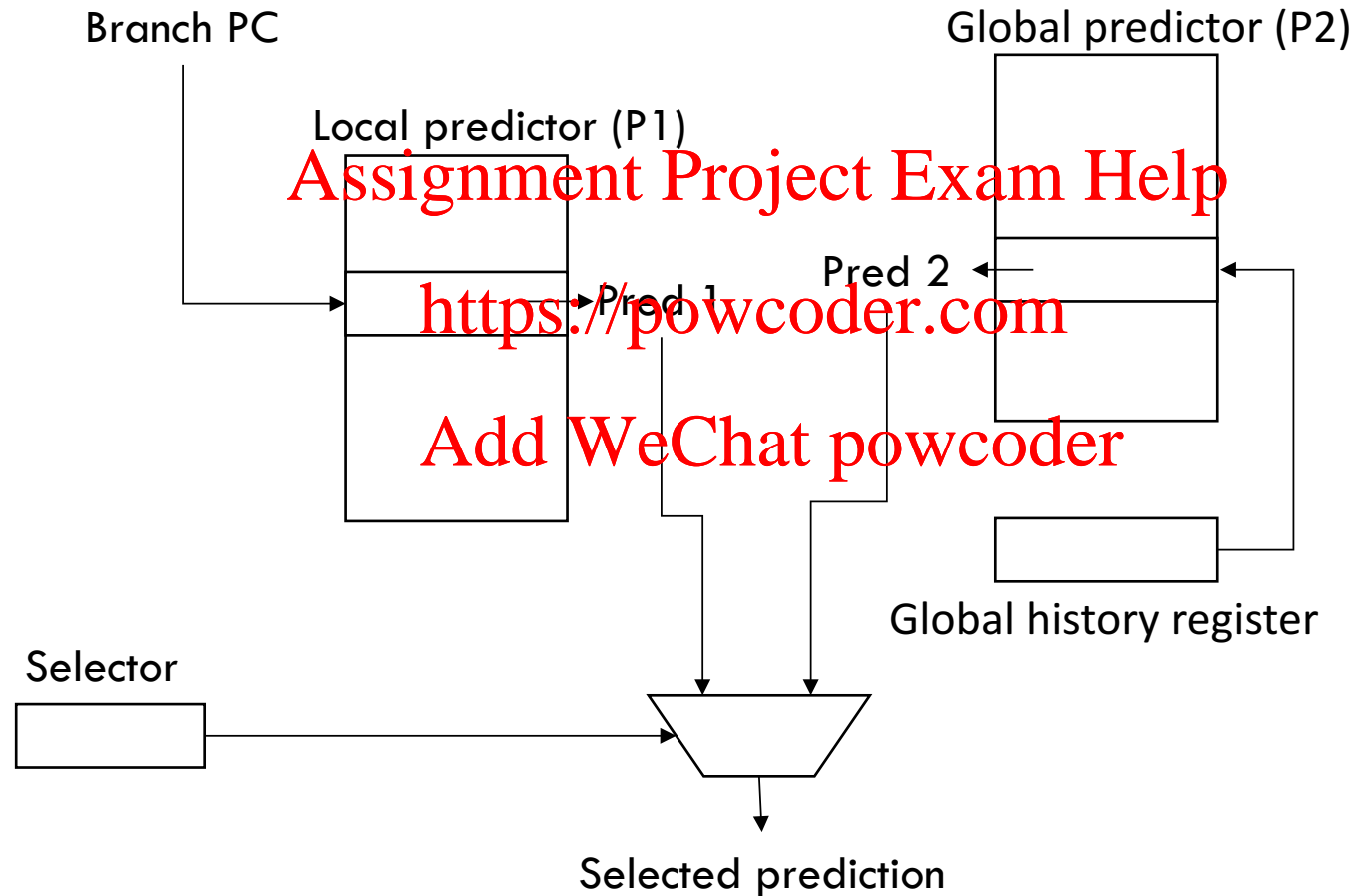
Add WeChat powcoder

- Update selector based on the prediction correctness of two predictors

- Predictor Indexing

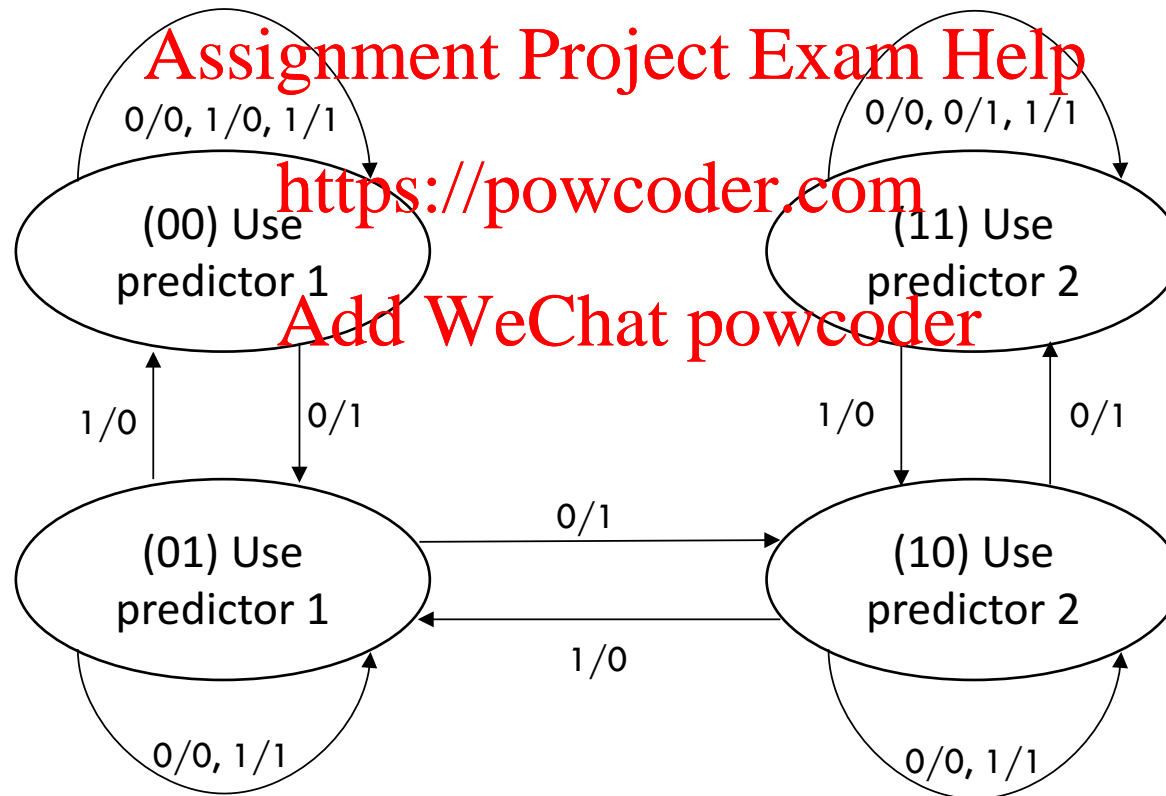
- Global predictor: indexed by history register
- Local predictor: indexed by LSBs of branch PC

Tournament Predictor Diagram

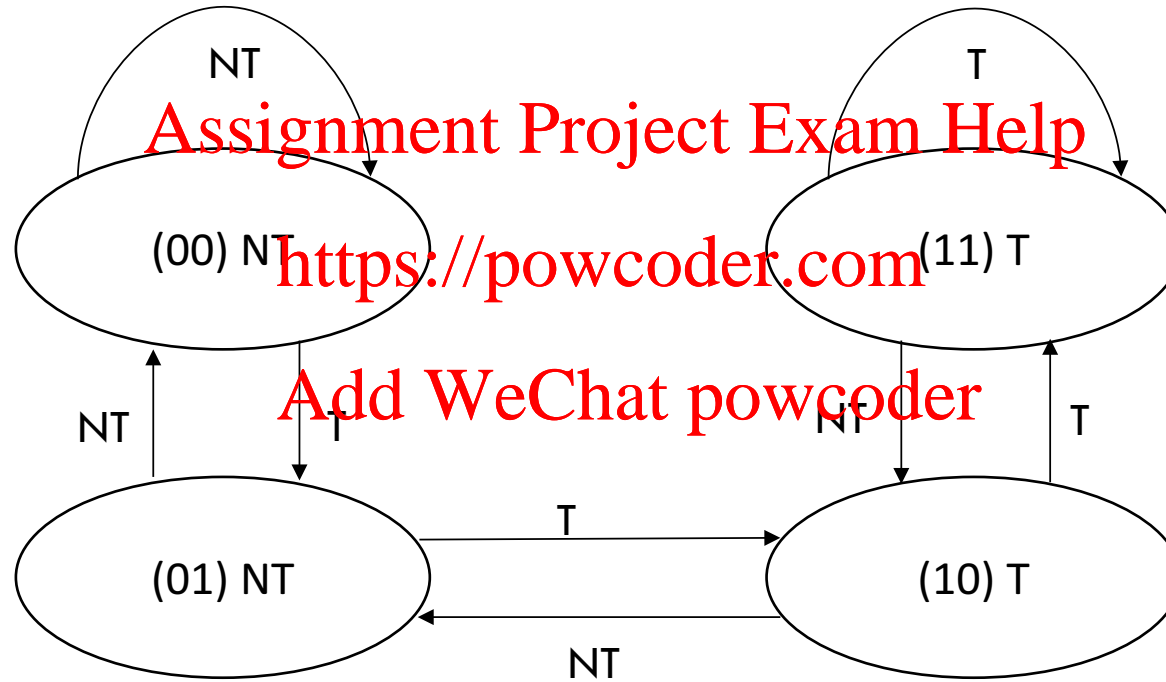


Selector State Transition Machine

- Transition condition is the **correctness** of predictors ($P1_correctness/P2_correctness$)



Two-bit saturation predictor



Example

Branch PC	Action	P1	P2	Prediction	P1_correct/P2_correct
B1: ...100	T				
B2: ...011	T				
B3: ...010	NT				

Add WeChat powcoder

- One Selector Entry
- P1: two entry local predictor
- P2: two-bit global history register (shift register), meaning four entries
- All predictor are two-bit saturation counter

Example: Initial states

Branch PC	Action	P1	P2	Prediction	P1_correct/P2_correct
B1: ...100	T				
B2: ...011	T				
B3: ...010	NT				

P1: local predictor P2: global predictor

0	00
1	00

00	11
01	11
10	11
11	11

Selector

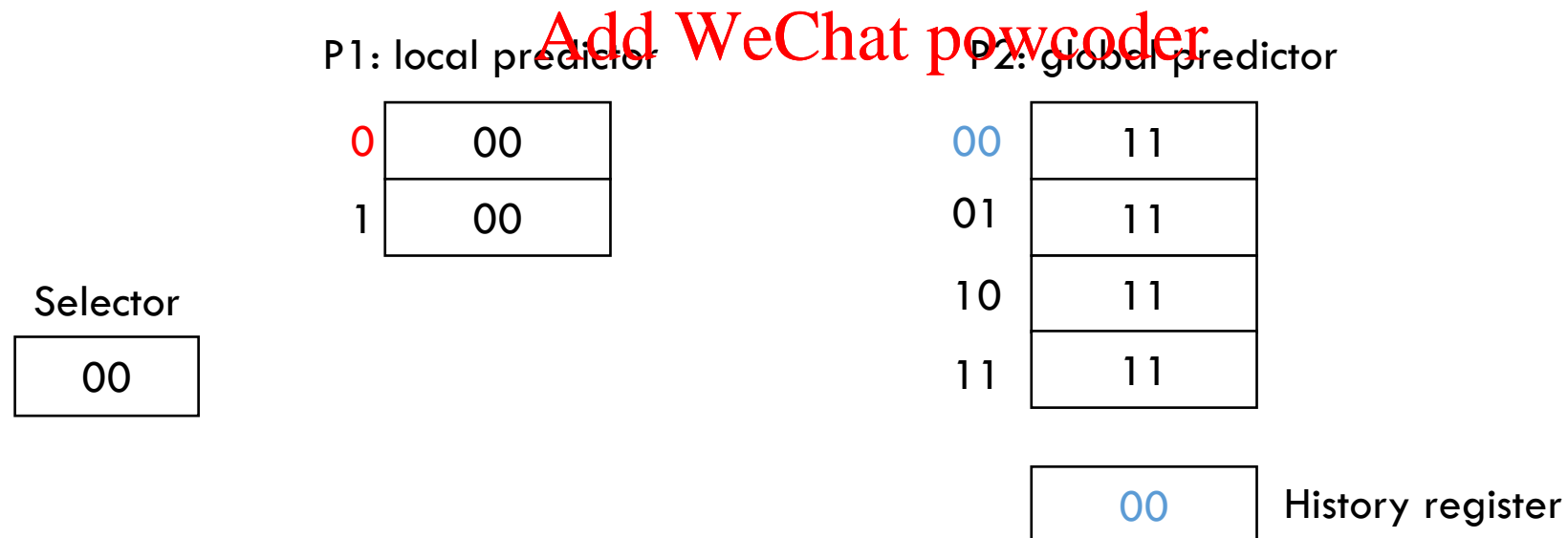
00

00

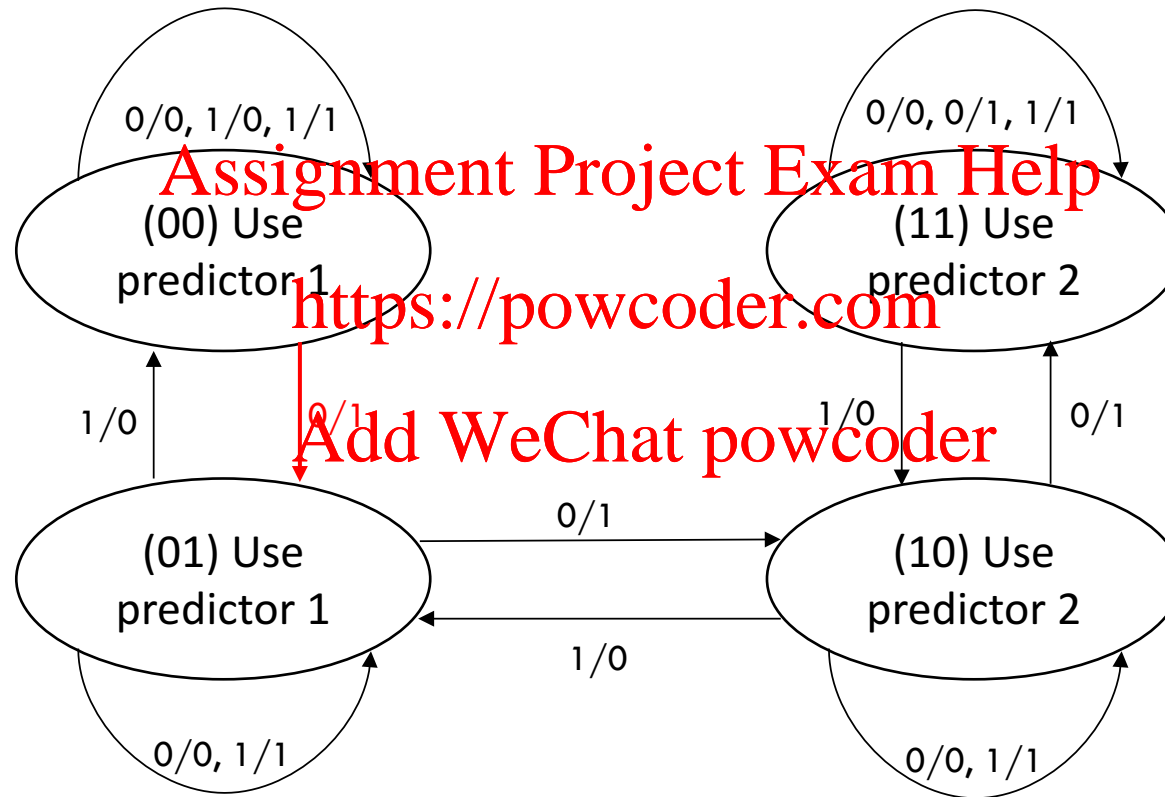
History register

Example: B1 (states not updated yet)

Branch PC	Action	P1	P2	Prediction	P1_correct/P2_correct
B1: ...100 ⁰	T	NT	T	NT(P1)	0/1
B2: ...011	T				
B3: ...010	NT				

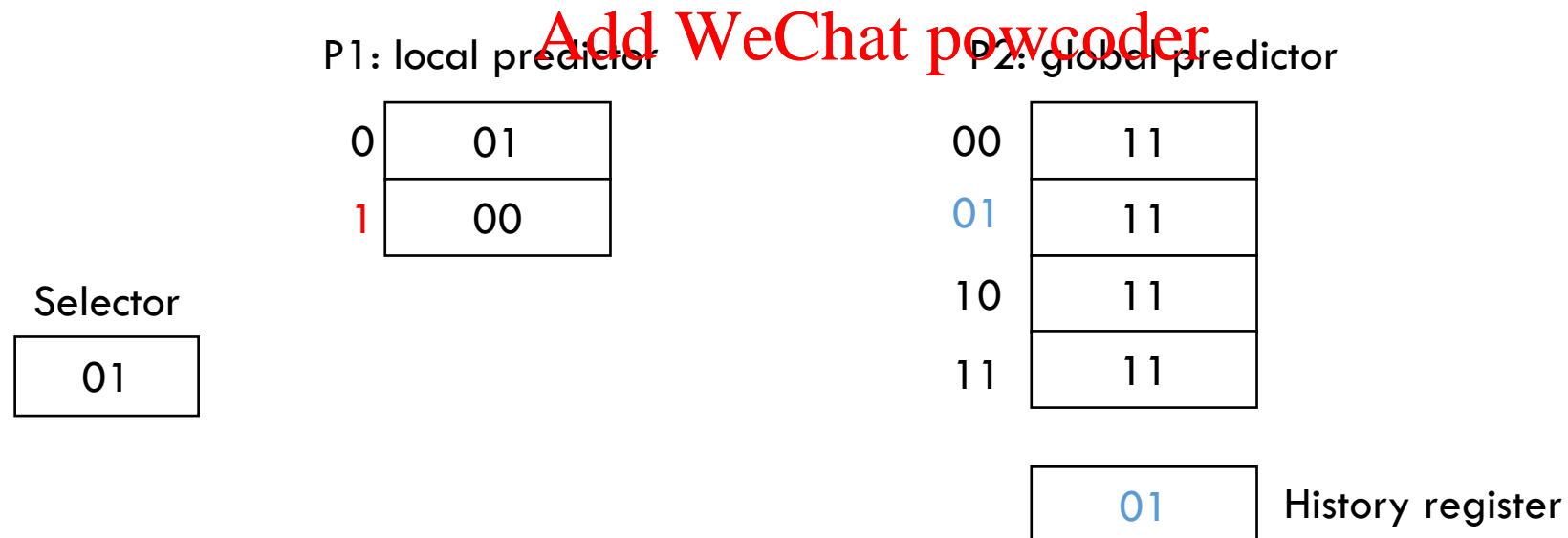


Selector State Transition: B1

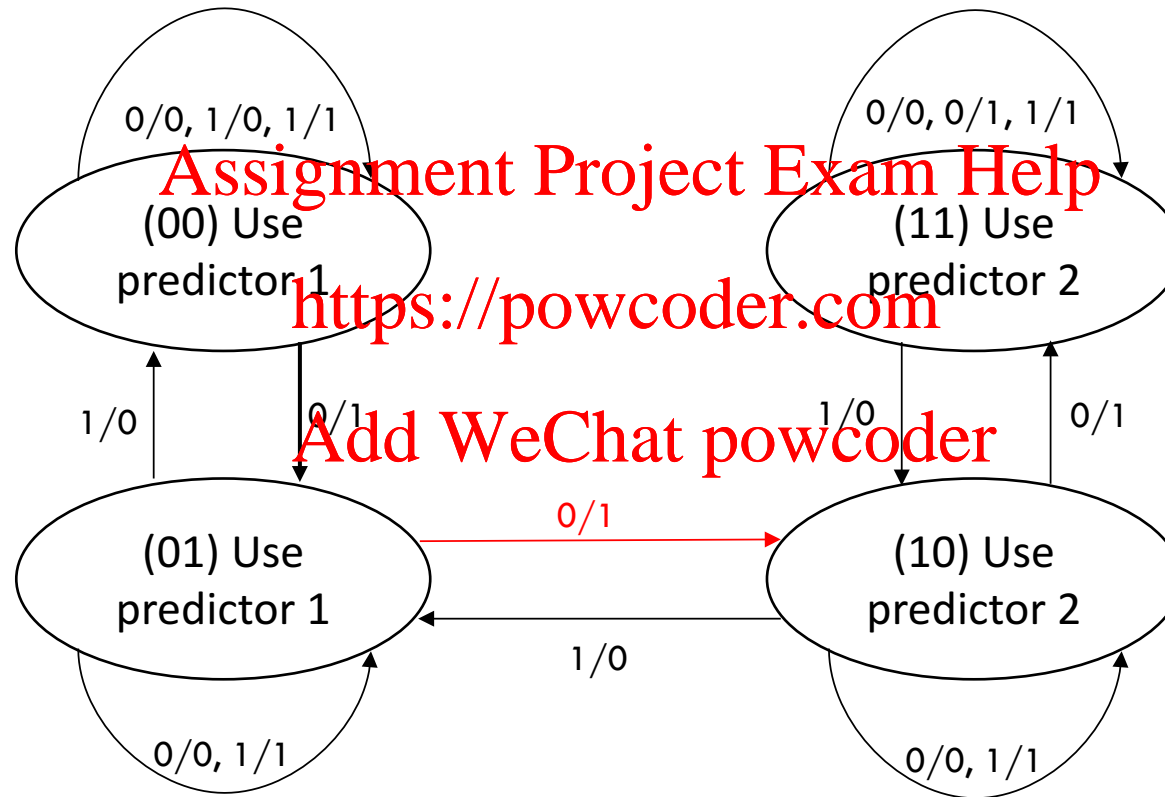


Example: B2 (updated states after B1)

Branch PC	Action	P1	P2	Prediction	P1_correct/P2_correct
B1: ...100	T	NT	T	NT(P1)	0/1
B2: ...011	T	NT	T	NT(P1)	0/1
B3: ...010	NT				



Selector State Transition: B2



Example: B3 (states updated after B2)

Branch PC	Action	P1	P2	Prediction	P1_correct/P2_correct
B1: ...100	T	NT	T	NT(P1)	0/1
B2: ...011	T	NT	T	NT(P1)	0/1
B3: ...010	NT	NT	T	T(P2)	1/0

P1: local predictor P2: global predictor

0	01
1	01

00	11
01	11
10	11
11	11

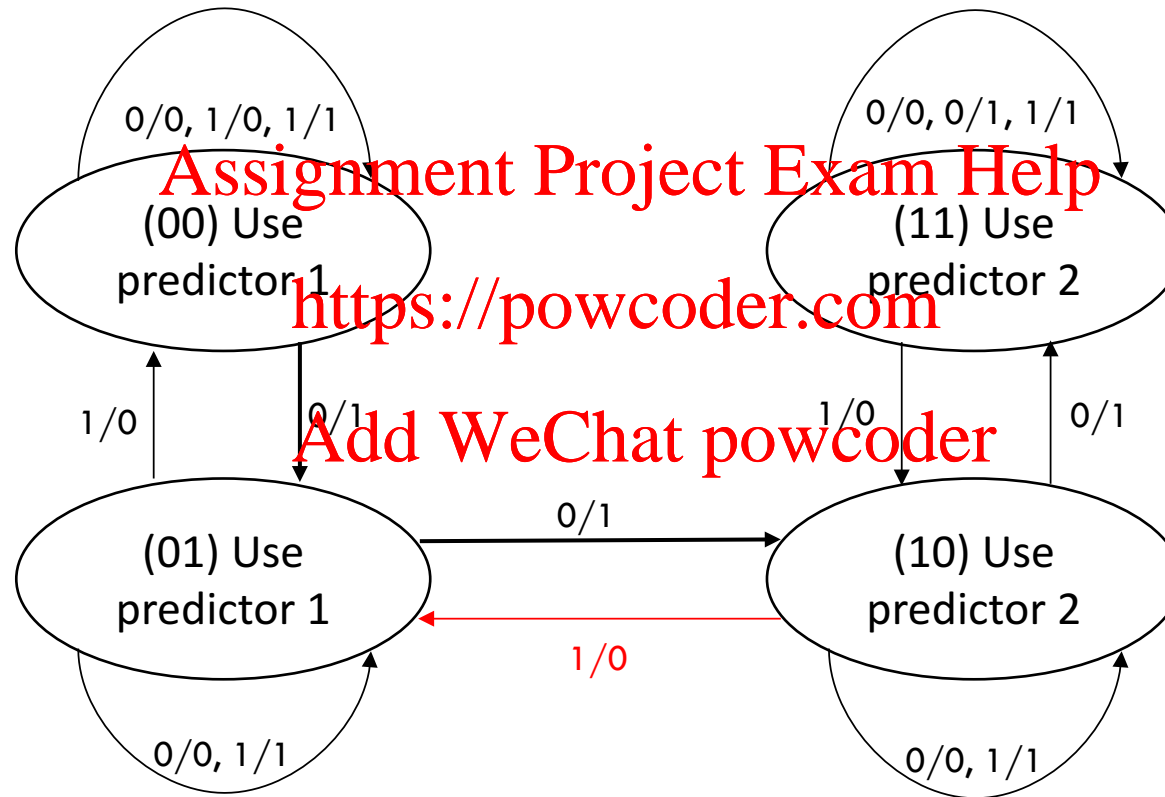
Selector

10

11

History register

Selector State Transition: B3



Example: Final states

Branch PC	Action	P1	P2	Prediction	P1_correct/P2_correct
B1: ...100	T	NT	T	NT(P1)	0/1
B2: ...011	T	NT	T	NT(P1)	0/1
B3: ...010	NT	NT	T	T(P2)	1/0

