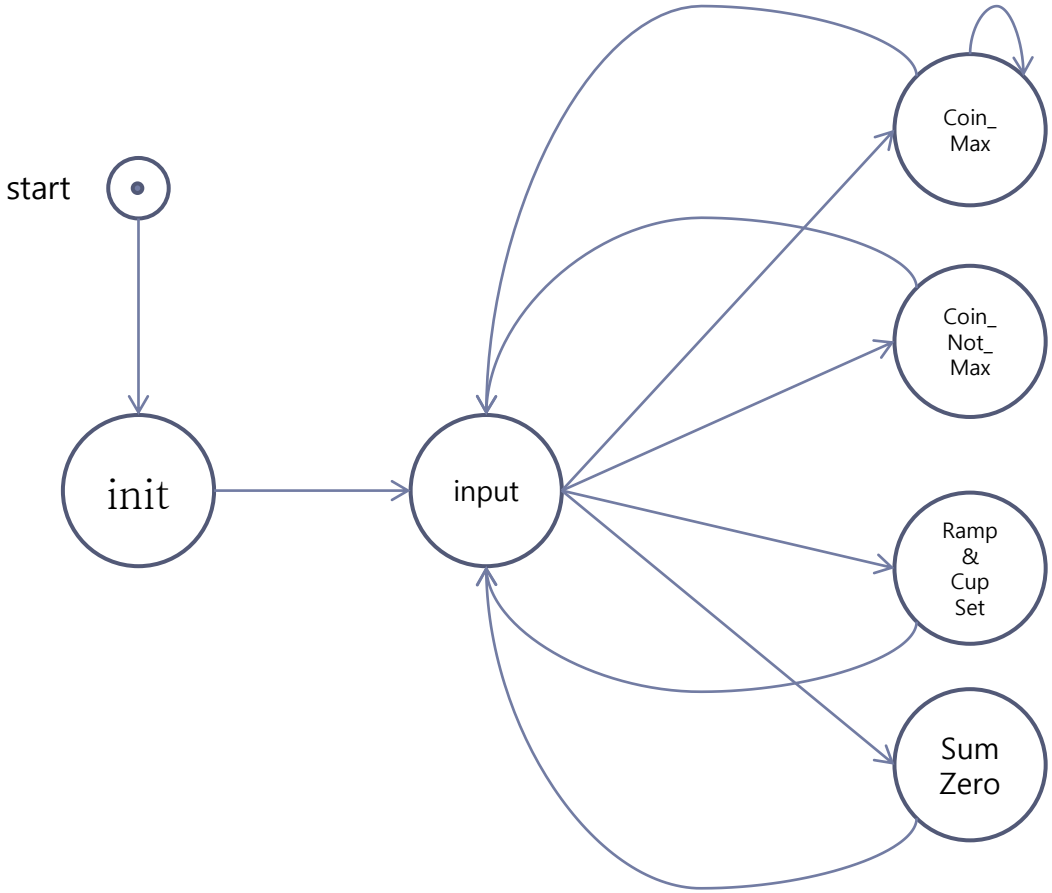
Coffee Machine SMV

서영주

변수 설정

- Input
  - Coin : {1, 5, 10}
  - Button_0, Button_1, Button_2, Button_3, Refund : boolean
- Output
  - Ramp, Button_0_Ramp, Button_1_Ramp, Button_2_Ramp, Button_3_Ramp, Cup : boolean
  - Display, Change : 0..100

Automata

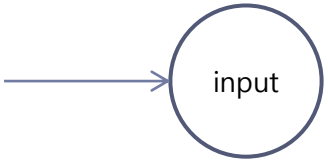


Time은 input이 들어올 때마다 + 10

내부변수

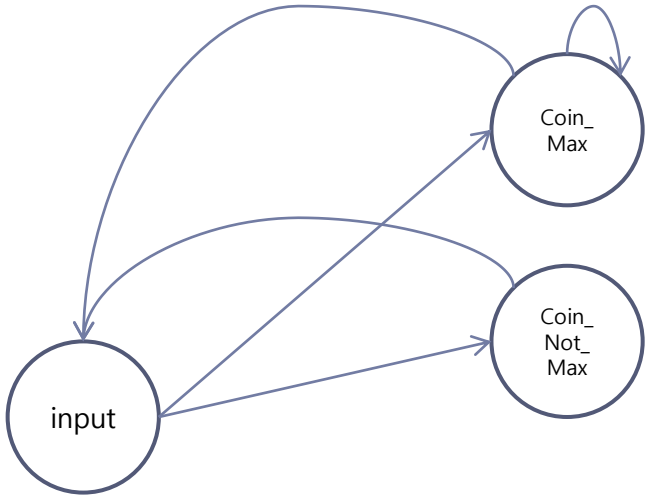
Sum

Automata



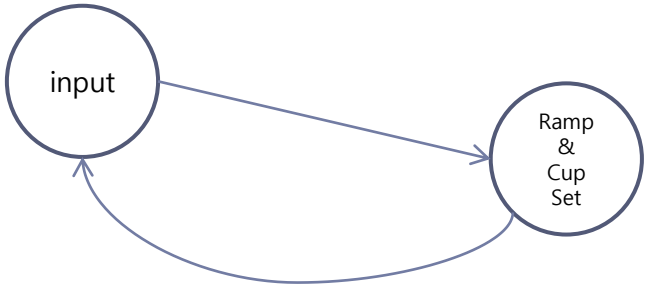
- 입력값
  - Coin, Button_N, Refund
- 처리
  - 연산을 통해서 동시에 들어올 수 있는 입력의 값을 우선순서를 매겨 준다.
  - 입력값이 들어오는 것과 동일한 시점에 CoinAck, Button_N_Ack, Refund_Ack를 세팅

Automata



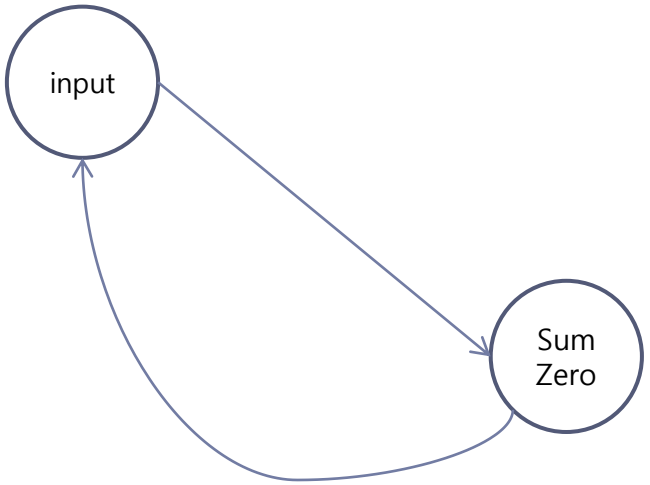
- 입력값
  - CoinAck = 1
- 처리
  - CoinAck가 1일 경우 Sum + Coin의 값에 따라 Sum 변경

Automata



- 입력값
  - Button_N_Ack = 1
- 처리
  - Sum의 값이 Button_N_Value를 넘었을 경우 Button_N_Ack의 값에 따라서 Sum의 값을 빼고 Cup과 Ramp를 1로 세팅

Automata



- 입력값
  - Refund_Ack = 1
- 처리
  - Sum의 값을 0으로 변경하고 Change를 세팅

CTL

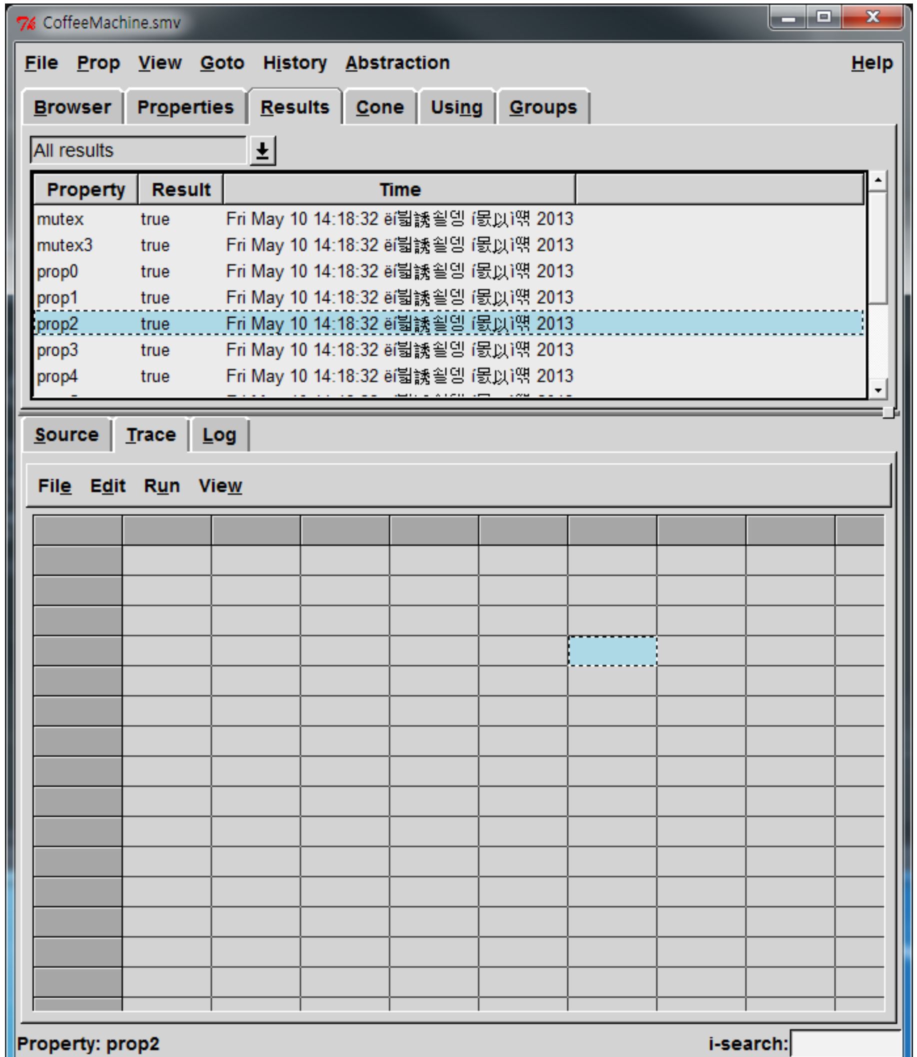
- Path quantifier A, E와
  Temporal Combinator X, F, G, U를 연결해서 사용한다.
- Path Quantifier뒤에 Temporal Combinator가 오는 형태가 된다.
- AX, AF, AG, AU, EX, EF, EG, EU와 같이 8개의 조합이 있을 수 있다.
- Specifying with Temporal Logic에서 CTL의 대표적인 Temporal Logic
  - Reachability property : EF
  - Safety property : AG ~(Not)

Property

- prop0 : SPEC AG ~(CoinAck & Button_0_Ack & Button_1_Ack & Button_2_Ack & Button_3_Ack & Refund_Ack);
- prop1 : SPEC AG (((Coin > 0) | Button_0 | Button_1 | Button_2 | Button_3 | Refund) -> ~(CoinAck & Button_0_Ack & Button_1_Ack & Button_2_Ack & Button_3_Ack & Refund_Ack));

- prop2 : SPEC AG (CoinAck = 1) -> AX (Sum > 0);
- prop3 : SPEC AG ((Refund_Ack = 1) -> AX (Sum = 0));
- prop4 : SPEC AG ((Button_0_Ack = 1 | Button_1_Ack = 1 | Button_2_Ack = 1 | Button_3_Ack = 1) -> AX Cup);
- prop5 : SPEC AG (Button_0_Ack = 1) -> AX Sum <= Sum;
- prop6 : SPEC AG ((Cup = 1) -> AX (~Cup));
- prop7 : SPEC AG ((Coin > 0) & (Refund = 1)) -> AX (Sum > 0);
- prop8 : SPEC AG ~(Sum > 100);
- prop9 : SPEC (Refund_Ack = 1) -> EF ((Change > Sum) | (Change < Sum));

실행결과


CoffeeMachine.smv
File Prop View Goto History Abstraction Help
Browser Properties Results Cone Using Groups
All results
Property Result Time
mutex true Fri May 10 14:18:32
mutex3 true Fri May 10 14:18:32
prop0 true Fri May 10 14:18:32
prop1 true Fri May 10 14:18:32
prop2 true Fri May 10 14:18:32
prop3 true Fri May 10 14:18:32
prop4 true Fri May 10 14:18:32
Source Trace Log
File Edit Run View
Property: prop2
i-search:

문제점

- True가 나오는 경우를 false가 나오게 바꿔도 SMV 에서 잡지 못함.