

LAB 1: SPECIFICATION DESIGN – GROUP 4 - L04

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1. Interface

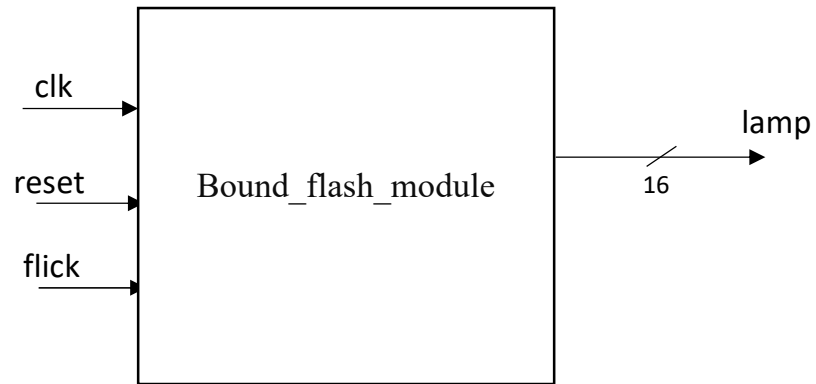


Figure 1: The figure of Bound Flasher System

Signal	Width	In/Out	Description
clk	1	In	Clock signal – Active HIGH (Positive edge)
reset	1	In	Reset signal – Active LOW
flick	1	In	Special input for controlling state transfer.
lamp	16	Out	Output – 16 Lamps

Table 1: Description of signals in Bound Flasher

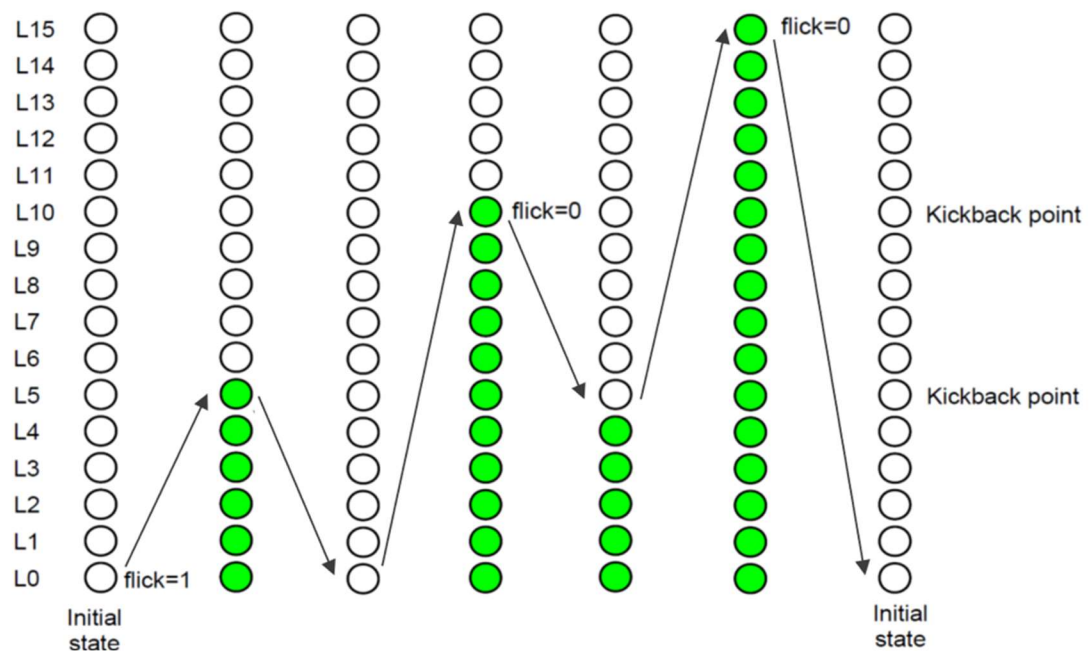
2. Functional implementation.

- Implement a 16-bits LEDs system
- System's Operation base on three input signal
 - reset
 - clock
 - flick
- The system specification
 - Clock signal is provided for system inspire of function status. The function operate state's transition at positive edge of the clock signal.
 - Reset signal:
 - LOW-ACTIVE Reset = 0: System is restarted to Initial State.
 - HIGH-ACTIVE Reset = 1: System is started with initial state.
- Flick signal: special input for controlling state transfer.
- At the initial state, all lamps are OFF. If flick signal is ACTIVE, the flasher start operating:
 - The lamps are turned ON gradually from LEDs [0] to LEDs [5].
 - The LEDSs are turned OFF gradually from LEDs [5] to LEDs [0].
 - The LEDSs are turned ON gradually from LEDs [0] to LEDs [10].
 - The LEDSs are turned OFF gradually from LEDs [10] to LEDs [5].
 - The LEDSs are turned ON gradually from LEDs [5] to LEDs [15].
 - Finally, the LEDs are turned OFF gradually from LEDSSs [15] to LEDs[0], return to initial state.
- Additional condition: At each kickback point (LEDs [5] and LEDs [10]), if flick signal is ACTIVE, the LEDs will go back and repeat that STATE. For simple, kickback point is considered only when the LEDs s are turned OFF gradually, except first state.

– Some insulations:

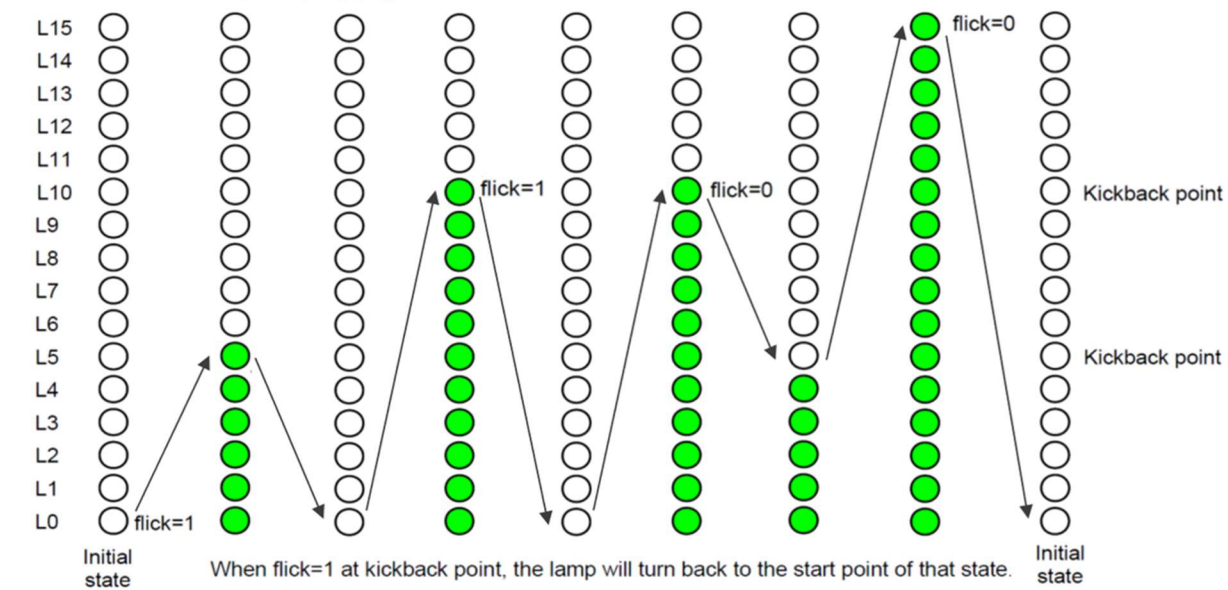
- When flick = 0 at kickback points

When flick = 0 at kickback points



- When flick = 1 at kickback points (lamp[10])

When flick=1 at kickback points (lamp[10])



3. Internal implementation.

3.1. Overall.

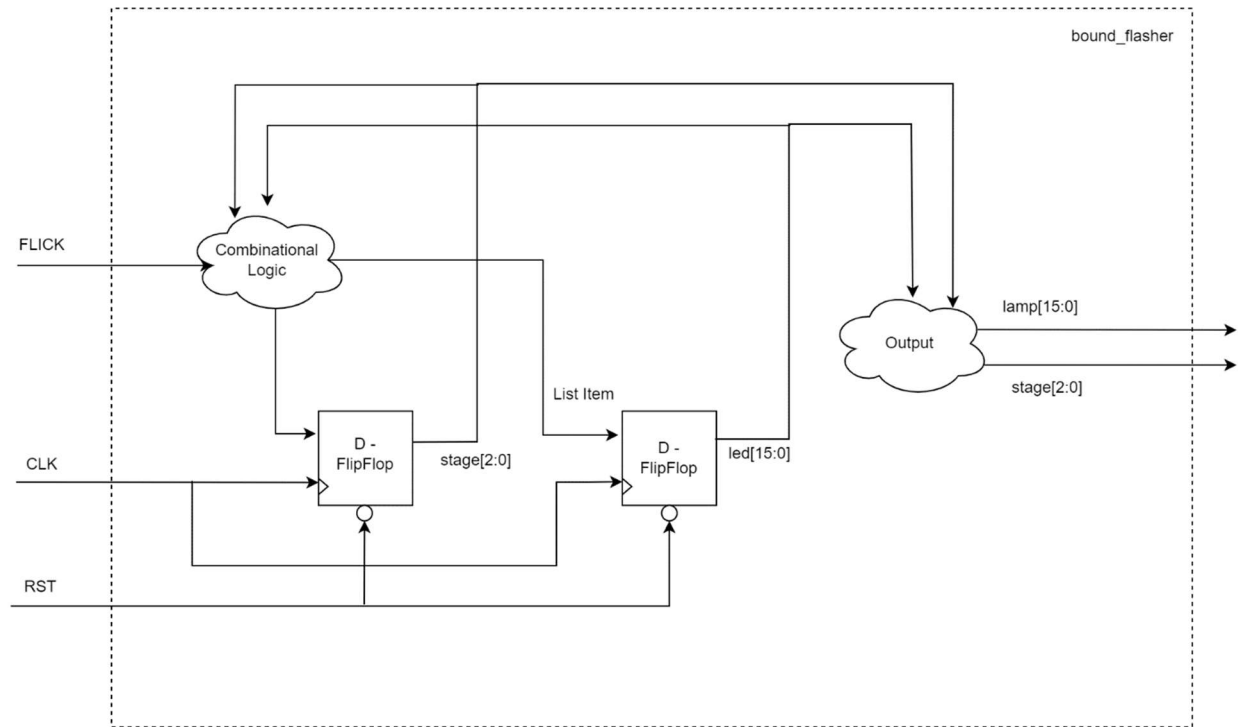


Figure 3.1: Block diagram of Bound Flasher

Block	Description
COMBINATIONAL LOGIC	Control the states, the lamps ON/OFF status, which are triggered by the flick signals, reset signals or the changes of the lamps
OUTPUT	Assignment of values for the output lamps and stage

Table 3.1: Block diagram of Bound Flasher Description

3.2. State Machine

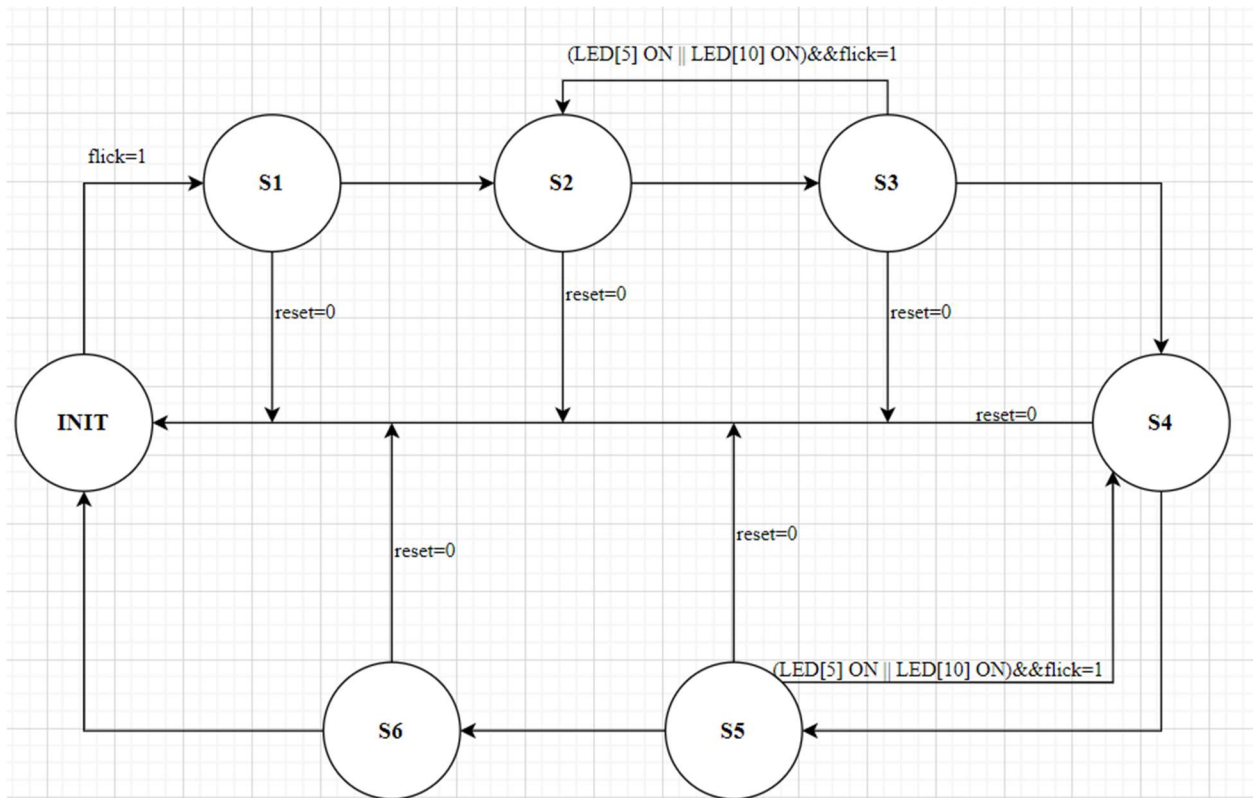


Figure 3.2: State Machine of Bound Flasher

Variable name	Description
state	Hold the current state
reset	Input signal
flick	Input signal
led	Hold the value determine which lamp is ON/OFF

Table 3.2: variable name of State machine

State	Description
Init	Initial state, all lamps are off. Only change state when flick =1.
S1	First state, the lamp turned ON gradually from LEDs[0] to LEDs[5]. If reset = 0, return to the Init state, else change to S2.
S2	Second state, the lamps are turned OFF gradually from LEDs[5] to LEDs[0]. If reset = 0, return to the Init state, else when LEDs[0] OFF, change to S3.
S3	Third state, the lamps are turned ON gradually from LEDs[0] to LEDs[10]. If reset = 0 return to the Init state. If click = 1 at kickback point(LEDs[5] or LEDs[10] ON), the lamp will return back to the state S2, else, when LEDs[10] ON, change to S4.
S4	Fourth state, the lamps are turned OFF gradually from LEDs[10] to LEDs[5]. If reset = 0 return to the Init state, else when LEDs[5] OFF, change to S5.
S5	Fifth state, the lamps are turned ON gradually from LEDs[5] to LEDs[15]. If reset = 0 return to the Init state. When click = 1 at kickback point(LEDs[5] or LEDs[10]), the lamp will return back to

	the state S4, else, when lamp[15] ON then change to S6.
S6	Finally, the lamps are turned OFF gradually from LEDs[15] to LEDs[0], when LEDs[0] OFF, change to Init. If reset=0 return to the Init state.

Table 3.3: state name of State machine

4. History

Date	Author	Modified part	Description
2023/03/04	Nguyen Anh Tuan and Ngo Quang Hai	3.2	New creation
2023/03/06	Trinh Cao Thang	3.1	New creation
2023/03/07	Trinh Cao Thang	All	Modified