# **NCTU-CS Digital System Lab**

#### FPGA LAB 02

Design: Button, Knob, and Keyboard

#### **Data Preparation**

Extract LAB data from the Course Website.

The extracted LAB directory contains:

FPGA\_Lab02/: top.v, top.ucf, keyboard.v

#### **Design Description**

You have to design LED with following three modes.

(A) Button Mode: (SW==0)

(B) Knob Mode: (SW==1)

(C) Keyboard Mode: (SW==2)

EC634 54795

### **Button Mode (SW==0)**

Control	LEDs	Operation
RESET	Initial	All LEDs are reset to <b>OFF</b> .
BTN_1	Right	Only Right half of the LEDs are ON
		(i.e. LED0~LED3)
BTN_2	Left	Only Left half of the LEDs are ON
		(i.e. LED4~LED7)
BTN_3	Shining	LEDs are shining from previous Mode
		to its relative 1's complement one.

NOTICE: If your finger leaves buttons, the LEDs should always keep in the current State. For example, Press BTN\_3 to enter Shining state. If your finger leaves buttons, the LEDs should always keep in the Shining state.

### Knob Mode (SW==1)

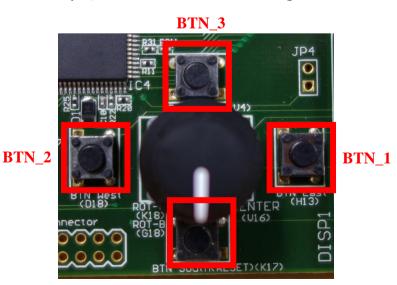
Control	LEDs	Operation
Clockwise	8'b10000000	Light the LEDs from left to right.
	8'b11000000	
	8'b11100000	
	8'b11111111	
	8'b10000000	
Counterclockwise	8'b00000001	Light the LEDs from right to left
	8'b00000001	
	8'b00000011	
	8'b11111111	
	8'b00000001	
ROT_CENTER	8'b11111111	All LEDs are ON.

NOTICE: When you changed from clockwise to counterclockwise, the LED will start form 8'b0000\_0001.

## Keyboard Mode (SW==2)

Key	LEDs
Number 1~9	Light the LEDs corresponding to the number in binary
	format.
Number 0	All LEDs are ON.
Others	All LEDs are OFF.

e.g.: If you press the key 9, the LED\_3 and LED\_0 will light.



RESET