CS 2104-01 Hardware Lab

Lab 10 May 5, 2015

Digital Lock

Lab report (upload to iLMS before 5/12 3:30p.m.)

Your report should include the following:

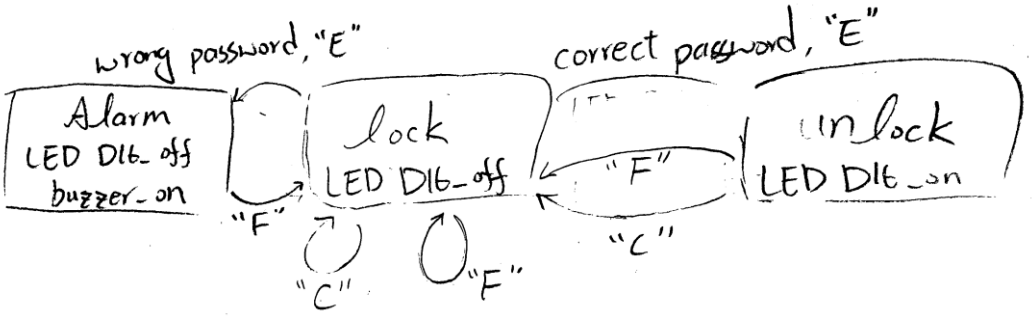
- description and explanation of your work (including answers to all questions in the pre-lab)

  藉由前幾次學過的 keypad scanner 以及 buzzer，結合 14 segment diplay 的控制，即可做出此次的密碼鎖，我直接在 keypad_scanner.v 裏頭修改按下按鍵後的反應，藉此控制密碼的顯示和是否啟動警鈴，或者讓它回到最初始化的狀態。

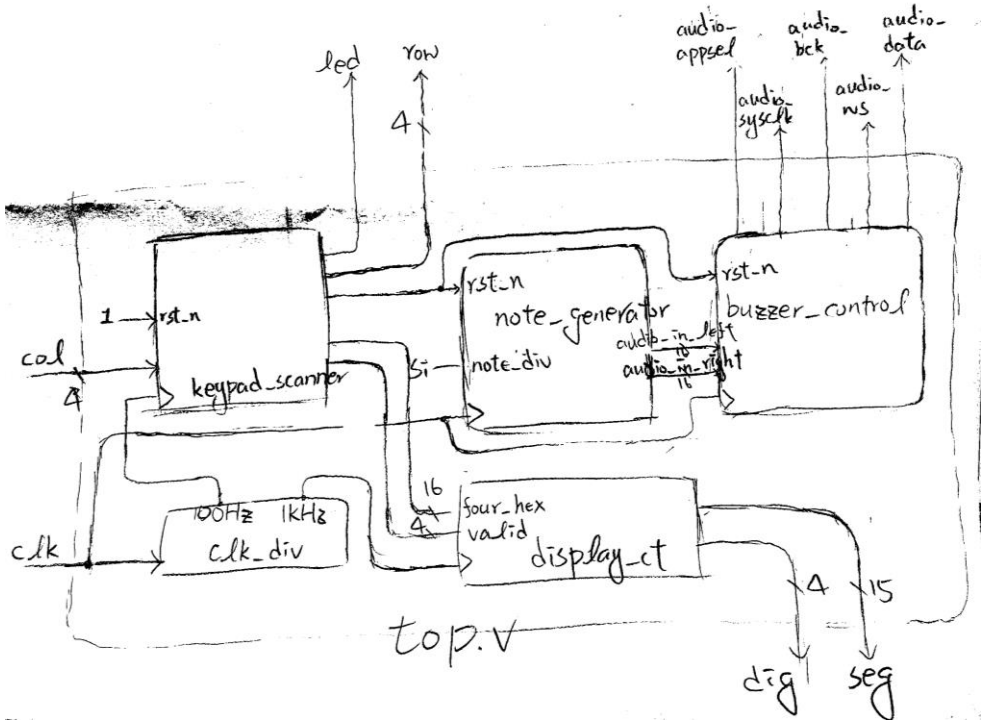
Pre-lab (Finish it before coming to the class)

Prepare the following before class so you may complete this lab smoothly.

1. Draw a state transition diagram or algorithmic state machine chart for the digital lock.



2. Draw a block diagram for the complete design by re-using existing modules introduced in the class previously and defining any new module.



3. Prepare a UCF file for the input/output pin assignment.

```
# output pins association
NET "seg[0]" LOC = P6;
NET "seg[1]" LOC = N4;
NET "seg[2]" LOC = V5;
NET "seg[3]" LOC = T5;
NET "seg[4]" LOC = U7;
NET "seg[5]" LOC = R3;
NET "seg[6]" LOC = N5;
NET "seg[7]" LOC = R5;
NET "seg[8]" LOC = T3;
NET "seg[9]" LOC = T4;
NET "seg[10]" LOC = V4;
NET "seg[11]" LOC = V7;
NET "seg[12]" LOC = R7;
NET "seg[13]" LOC = T7;
NET "seg[14]" LOC = U5 ;
NET "dig[0]" LOC = T6;
NET "dig[1]" LOC = V6;
NET "dig[2]" LOC = U8;
NET "dig[3]" LOC = V8;
NET "audio_appsel" LOC = H18;
NET "audio_sysclk" LOC = H17;
NET "audio_bck" LOC = K16;
NET "audio_ws" LOC = L15;
NET "audio_data" LOC = L16;
NET "led" LOC = H5;

# input pins association
NET "clk" LOC = R10;
#NET "dip[0]" LOC = T1;
#NET "dip[1]" LOC = P2;
#NET "push[0]" LOC = N3;
#NET "push[1]" LOC = P4;
NET "row[0]" LOC = L3;
NET "row[1]" LOC = L4;
NET "row[2]" LOC = K1;
NET "row[3]" LOC = K2;
NET "col[0]" LOC = H1;
NET "col[1]" LOC = H2;
```

```
40. NET "col[2]" LOC = J1;
41. NET "col[3]" LOC = J3;
```

- discussion of any issue or problem worthy of note (yes, even mistakes that you made)

  這次遇到的問題是，一開始想要特別寫一個 module 來控制所有東西，所以寫在 keypad_scanner module 的後面，但是這樣就必須記住前一個狀態的 valid 和 four_hex 狀態，甚至在 buzzer 響起時，避免使用者繼續輸入密碼做嘗試，還要另外接出一條控制線，所以後來決定直接寫在 scanner 裡面，而且助教已經把各個 state 分好，只要把判斷寫進去就行了。

- optional: any extra feature you added or any suggestion

  這次的 bonus 要讓這個密碼鎖可以更改密碼，雖然感覺很簡單，但是實際進去改 keypad scanner 會發現很多地方都需要修改，因此在 lab demo 結束之後才做功能的新增。