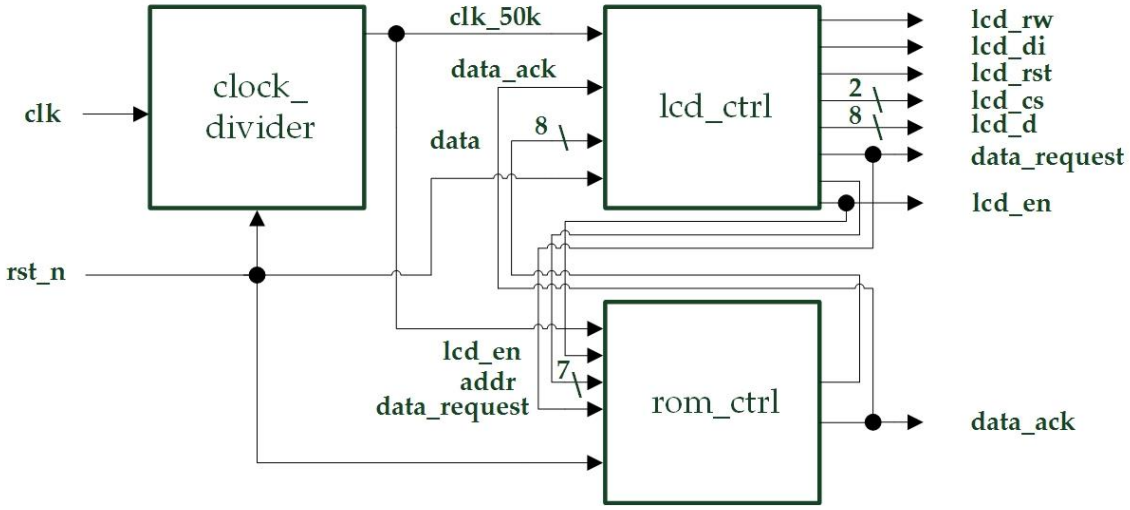
Lab 11: LCD Display (1)

103061207 徐安廷 An-Ting Hsu

Design Specification

1. LCD Display (Animation)

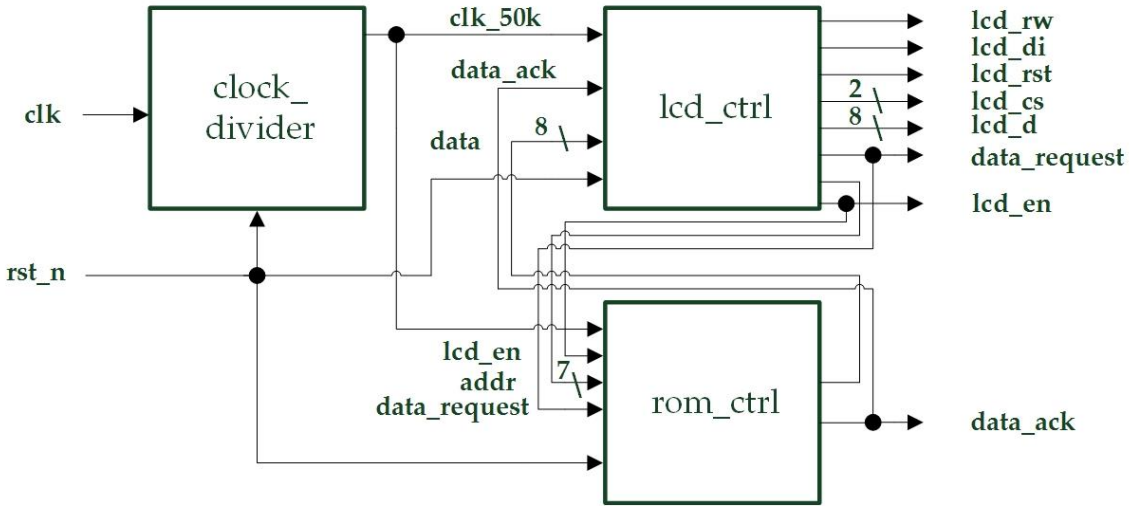
- ✓ Experiment Goal:
  Let the LCD display play the animation in "picture.coe" which is given by teacher.
- ✓ Block Diagram:



- ✓ I/Os:
  Inputs: clk, rst_n.
  Outputs: lcd_rst, lcd_rw, lcd_di, lcd_e, data_ack, data_request, [1:0] lcd_cd, [7:0] lcd_d.

2. (Bonus) LCD Display (Animation with Name)

- ✓ Experiment Goal:
  Add my name into the animation in experiment 1.
- ✓ Block Diagram:



- ✓ I/Os:
  Inputs: clk, rst_n.
  Outputs: lcd_rst, lcd_rw, lcd_di, lcd_e, data_ack, data_request, [1:0] lcd_cd, [7:0] lcd_d.

Design Implementation

1. LCD Display (Animation)

- ✓ First, download the example codes in ilms. Second, understand the codes. Third, add an additional state and a pause counter in LCD controller to play the animation repeatly as request.
- ✓ I/O Pin Assignments:

Port Name	Assignment	Function
clk	R10	FPGA board oscillator input
rst_n	N3	Active low reset input button
lcd_rst	E3	LCD reset output
lcd_e	F5	LCD enable output
lcd_rw	C2	LCD read/write control output
lcd_di	C1	LCD data/instruction output
data_request	H5	request for the memory data output
data_ack	H6	data re-arrangement buffer ready indicator output
lcd_cs[0]~lcd_cs[1]	F4, E1	LCD frame selection output
lcd_d[0]~lcd_d[7]	F6, D3, E4, G6, H7, D1, D2, F3	LCD data output

2. (Bonus) LCD Display (Animation with Name)

- ✓ Design my name to show on the LCD and add it into picture.coe file.
- ✓ I/O Pin Assignments:

Port Name	Assignment	Function
clk	R10	FPGA board oscillator input
rst_n	N3	Active low reset input button
lcd_rst	E3	LCD reset output
lcd_e	F5	LCD enable output
lcd_rw	C2	LCD read/write control output
lcd_di	C1	LCD data/instruction output
data_request	H5	request for the memory data output
data_ack	H6	data re-arrangement buffer ready indicator output
lcd_cs[0]~lcd_cs[1]	F4, E1	LCD frame selection output
lcd_d[0]~lcd_d[7]	F6, D3, E4, G6, H7, D1, D2, F3	LCD data output

Discussion

- ✓ It was my first time to use the LCD display. The codes which teacher gave to us are really complicated, and I spent lots of time on understanding it. Though the codes is hard to understand, but once I find out that I only need to add an additional state and a pause counter, I finished the experiment in a short time.

Conclusion

- ✓ The LCD display is a main part in my final project. So, I need to know its working principle very well, and try to make the best use of it.

References

- ✓ Teaching Handouts <LCD Display (1)> p.2~22
  →Helps me to understand how the states work in LCD controller and ROM controller.