Welcome to The Hardware Lab!

Fall 2018

Lab 6: VGA and Mouse Modules

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Agenda

- Lab 6 Outline
- Lab 6 Basic Questions
- Lab 6 Advanced Questions

Lab 6 Outline

- Basic questions (2%)
  - Individual assignment
  - Due on 11/29/2018. Demonstration on your FPGA board (In class)
  - Only demonstration is necessary. Nothing to submit.

- Advanced questions (5%)
  - Group assignment
  - ILMS submission due on 12/13/2018. 23:59:59.
  - Demonstration on your FPGA board (In class)
  - Assignment submission (Submit to ILMS)
    - Source codes and testbenches
    - Lab report in PDF

Lab 6 Rules

- You can use **ANY** modeling techniques
- If not specifically mentioned, we assume the following SPEC
  - **CLK** is **positive edge triggered**
  - Synchronously reset the Flip-Flops when **RESET == 1'b0**

Lab 6 Submission Requirements

- Source codes and testbenches
  - Please follow the templates EXACTLY
  - We will test your codes by TAs' testbenches
- Lab 6 report
  - Please submit your report in a single PDF file
  - Please draw the **block diagrams** and **state transition diagrams** of your designs
  - Please explain your designs in detail
  - Please list the contributions of each team member clearly
  - Please explain how you test your design
  - What you have learned from Lab 6

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Basic Questions

- Individual assignment
- FPGA demonstration (due on 11/29/2018. In class.)
  - VGA sample code
  - Mouse sample code
- Demonstrate your work by FPGA

Basic FPGA Demonstration 1

- **VGA sample codes**
  - Please implement the keyboard sample codes 1 & 2 released on ILMS

- **Mouse sample codes**
  - Please implement the mouse sample code released on ILMS

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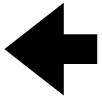
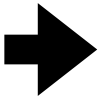
Advanced Questions

- Group assignment
- FPGA demonstration (due on 12/13/2018. In class.)
  - Mixing keyboard and VGA together

Mixing Keyboard and VGA

- Use the keyboard to control your VGA display
- Control the image displayed on the screen according to the following commands
- If you press P right after Reset, the image starts scrolling up

	Image scrolling up	P	Pause scrolling / Start scrolling
	Image scrolling down	V	Flip vertically
	Image scrolling left	H	Flip horizontally
	Image scrolling right	Mid-Button 	Reset 1. Stop scrolling (Pause) 2. Image sets back to origin (No flip)

Thank you for your attention!

*Schloß Neuschwanstein, Germany
This picture is taken by Chun-Yi Lee himself, who is also a fan of photography