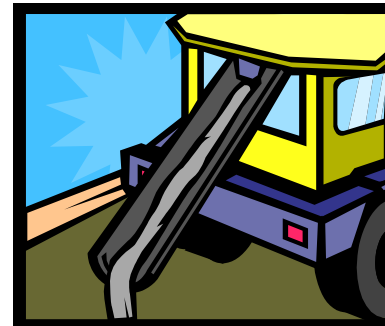
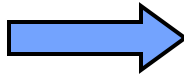
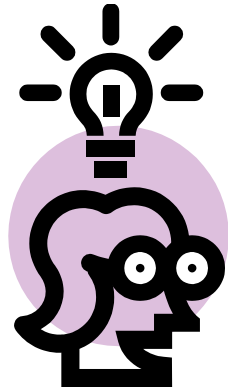

ECE 241 Digital Systems Project 2013

Motivation, Scope, Timeline and Report

Projects

- Are great things!
- They are where you put together the pieces of knowledge that you have learned in labs & lectures
- They are what real engineers do:
 - Take fuzzy ideas, and make them into concrete reality!



When You Are Interviewed for a Job

- A common question will be:
Describe some project you worked on
- Followed by:
 - What was the goal?
 - How did the work go? - Did it work?
- Employers look to see the following from the interview candidate:
 - Do they speak about it with passion?
 - Do they understand the technical details of the project?
 - Do the understand the bigger picture in which the project sits?

The Project in This Course

- Done in groups of 2 – the same group as in the labs
- All industrial work is done in groups; as a team!

Choosing Your Topic

You must select your own unique topic

- A chance to start coming up with your own ideas
- Getting away from “cookbook” labs where we tell you what to do

- **We want each project to be different!**
- **One purpose of today’s presentation is to help you think about topics**

Project Topic Selection Process

Allow only one project for a topic

Once you have your project idea, check out which ideas have been taken already:

<https://docs.google.com/spreadsheet/ccc?key=0AIUbLv6dacAsdHpZQ3RJcWlqWI80bzM0c0IyVGg1T3c&usp=sharing#gid=0>

If your idea is unique, enter it here (please be concise!):

https://docs.google.com/forms/d/1IDnpVHIEBST8_Xv3UC3THpbjL42YYozlUnx3KiEovGE/viewform

The Head TA, Xander Chin, may contact you and ask you to choose a different topic.

You may contact him at: xan@eecg.toronto.edu

**Deadline to submit your project idea:
November 2, 11:59pm**

Mentoring TA Selection Process

Once you have a topic, you must work out the details

- Work with your ECE 241 TA; who you must **select** during lab 7 to determine a reasonable amount of work for the project
- This TA will mentor you throughout the project
- The same topic could be too simple or too much
 - depending on the details
 - e.g. a “computer” could be
 - an adder
 - or a super-computer

■ **You must arrange a separate time with your mentoring TA to meet and discuss the scope of your project**

Meeting with the TA

- When meeting with TA, **YOU MUST PREPARE a single sheet of paper which contains:**
 1. The names of the 2 team members
 2. A point form description of project
 3. A block diagram of the hardware of the project
 4. A list of weekly milestones
 - to be done by the end of each ECE 241 lab period
 - there are 3 of these (the third milestone being the actual demo)

The Big Question

What is a reasonable “scope” for the project?

- A hard question,
 - Very difficult to estimate how long a project takes
 - Basic method: break into pieces, estimate each piece
- This is difficult, even for experienced engineers,
 - often they’ll say: make a guess and multiply by 2
- However, they do learn, to make good estimates
 - The only way to learn, is to try and fail.
 - Here, you’ll be trying and failing, but learning!
 - Your TA will help you make guesses as to what is reasonable
- We will show you projects from previous years so you get an idea of what’s reasonable.

Key Part of Project: Inputs and Outputs



- One of the key questions in your project is finding interesting ways to:
 - get inputs into your system and
 - to see outputs
- Lab uses switches as inputs, and LEDs & 7-Seg as outputs; sound and keyboard.
- Interesting projects often use other methods;
 - See examples in the slides ahead.

Popular/Available Output: VGA Display

- i.e. a computer monitor
- Use digital hardware to draw pictures on the display
- Handout on course webpage will show you HOW
- An example of a good project is to use a VGA display & have stuff move in some intelligent way in response to inputs
- You'll learn more about it in Lab #7 including how to use the VGA controller “core”



Resources

- Several more input/output cores for the DE2
- See: http://www.eecg.utoronto.ca/~jayar/ece241_08F/AudioVideoCores/

List of New Cores

PS/2 Controller: to Keyboard and Mouse

Audio Core: **Audio input and output**

Video-in Core: **video input**

Voice recorder Demo

Example Projects

Almost everyone's first idea:

- Clock
- Alarm Clock
- Elevator controller
- Calculator

- After that, people start thinking harder,
 - often based on interesting input & output devices
 - you will be spending a lot of time at it – make it fun!

Videos of Previous Projects

WARNING:

The projects you are about to see
were all designed in hardware,
NOT SOFTWARE

- They just sort of look like software.

Video Demonstrations

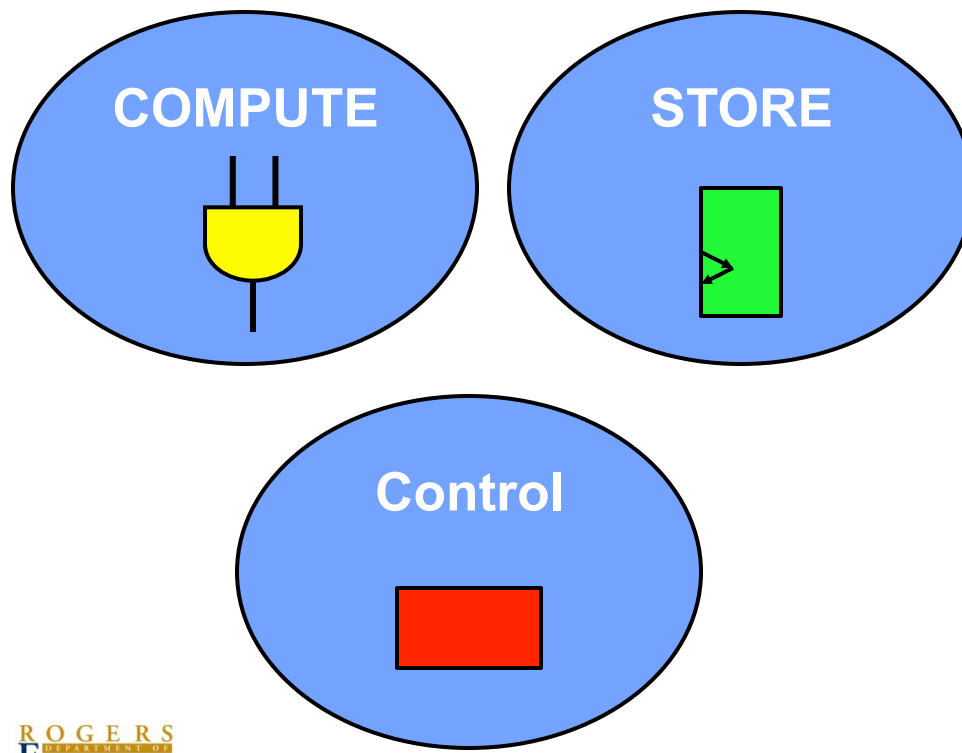
- http://janders.eecg.toronto.edu/ECE241_2012/
- http://www.eecg.toronto.edu/~janders/241_2011/
- http://www.eecg.toronto.edu/~janders/241_2009/

Summary of Good Advice

1. Build small things that work first
 - Debug before moving on
 - “Spiral Model”
 - Assume that something does not work until proven otherwise
2. Simulate the small parts
3. Ask Questions
 - Friends, TA, bulletin board, instructors
 - Why? Building systems is hard, lots of little things to figure out.

What is Really Happening in Project

- First, we teach you the basics of digital circuits:



- Then we show you these pictures & videos:



Then We Ask You To Think of a Project

- Your own idea, but like these ones
- THEN
- **FROM** your knowledge of the pieces of digital logic
- **YOU** put them together - build the system you thought of

- In this process, you become an engineer!

**An Engineer is someone who can take a fuzzy idea
and make it a reality**

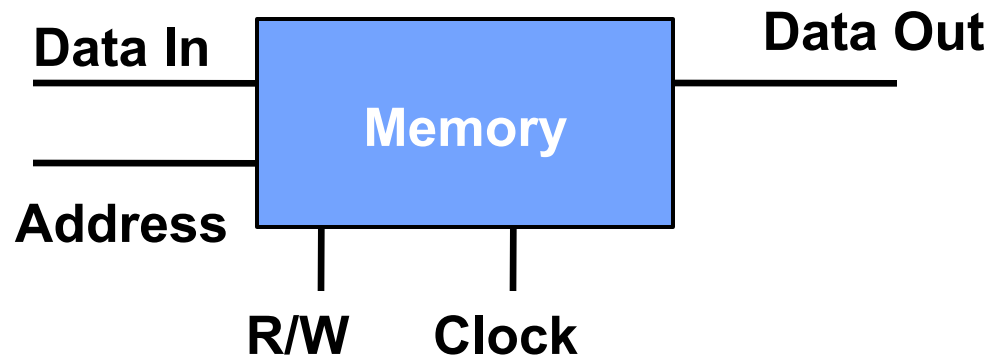
Useful Topics

1. How the VGA Display works

- See Lab #7

2. Memory

- You likely want larger memory to store things
- The VGA display sort of works like a memory



3. “Debouncing Switches”

- If you want to make your own input switches, this deals with the problem that simple switches create noisy inputs

Time Line for 2013

Week	Work
NOW	Think/request project topic
Nov 2, 11:59pm	Uniqueness approval DUE
Nov 4	Should meet with mentoring TA during the week of Nov 4 for discussion on “Scope”.
Nov 11	Project Week 1; must come to lab with portion of project simulating to test it. 12.5% of grade assigned here
Nov 18	Project Week 2; must have second portion working; 12.5% of grade here
Nov 25	Week 3- should demonstrate full working project to TA
Monday December 2	Final Report Due your TA at 4pm (hand-in paper or PDF by email)

Final Report

- Maximum 5 pages; not including schematics and Verilog Code
- Use these Sections:
 1. Introduction
 - English description of goals of project; motivation
 2. The Design
 - Block Diagram of the major parts, and perhaps of sub-parts
 - English description of the function of each part
 - Be sure to start from top and go down. (not bottom up!)
 3. Report on Success
 - Did it work – show pictures or describe
 - For parts that didn't work – speculate as to why
 4. What would you do differently
 - If you were going to start all over again
- Appendix: All Verilog Code and Schematics
- Report Due Monday December 2th at 4pm
 - Send to your TA (hand-in paper, or PDF by email).

Grading

- Worth 10% of your ECE 241 Grade
- Total of 40 Marks
 - 5 for First Project Week
 - 5 for Second Project week
 - 25 for overall technical content as shown in final report and in DEMO
 - 5 for quality of writing
- Bonus marks for top projects.

Summary

- Projects are Good! – they’re real engineering
 - Start thinking about your topic now
1. Get “Uniqueness” Approval
 2. Arrange to discuss scope with mentoring TA
 3. Work on project – before (prepare!) and during labs
 4. Write Report
 5. Become an Engineer!

Good Luck

- Projects are crucial to your engineering education!

