Day 9
Projects
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Proposals due in 3 weeks
Can get approved before, earlier is better…
Scope

• Important to get scope right

• 3 weeks total to have a working circuit

• Building something from scratch takes lots of time

• Don’t plan on a final product, plan for a breadboarded demonstration that the circuit works.

• Custom chips or µProcessors can make certain tasks trivial, discrete logic can make other tasks very very hard

How you propose to do something is as important as what you propose to do
Inspiration

• Fine to copy ideas
  • Resources on web, magazines, Make, Nuts and Volts, Hackaday, Instructables
  • Beware, these are usually the result of many many hours of work
• Must have independent work
  • Not just wire up somebody else’s circuit
  • Will need to explain to me how the circuit works in person
• Something that inspires you is best
Project Grading

- Idea
  - Well defined goal
  - Neat idea, good scope, creative within reason
- Design
  - Your work on a clear design to achieve the goal
- Execution
  - Did the circuit work, how well was the original idea implemented
- Writeup
  - Design documented, discussion of challenges
Proposal

- One or two pages (max) describing what you want to do

- Contains: overall idea, conceptual (block-level) design, proposed parts (especially custom parts), potential fallbacks and descoping

- I will not grade the proposal on content, just that you turned this in and contains all of the above elements

- I may ask for an update and/or iterate if I think your proposal isn’t realistic or at the right scope

The earlier I sign off, the earlier you can get to work!
Proposal Errata

- Complex projects need fallback/descoping plans
  - Start with core part, add extras if you have time
  - Clocks can come from FCN generators, use simple LEDs as indicators, etc.
- Group effort can be OK, but need to make sure project factorizes into specific tasks for each person
  - Must be able to demonstrate your task even if your partner’s piece doesn’t work…
- Special parts very possible, but need ~1 week to order these
General Project Ideas

• Interfacing
  • Read data in or write data out to some device
  • Inputs: sensors, buttons, keypads, joystick, accelerometer
  • Outputs: 7-seg displays, LED arrays, LCD displays, RGB LEDs

• Clocks
  • Something that takes pulses and turns this into some interesting display, alarm clock, stopwatch, reaction timer

• Games
  • Must be simple

• Analog/Digital conversion
  • Will explore one type in 2 weeks, many others that are quite interesting
Displays

LED array, must sequence columns and light rows sequentially.

Persistence of Vision

VFD display

Bargraphs

14-seg alphanumeric

LCD Display

How easy/hard this is depends a lot on how you want to implement the interface.
Inputs

Analog sensor
(this one is magnetic field)
Need ADC

MagStripe reader

Keypad

Digital sensor
(this is a 9-axis gyro)
Most suitable for prog. logic

IR Receiver/Transmitter
(custom remote)

Analog joystick
Random Ideas

Electronic Dice

Stopwatch/reaction timer

Driving stepper motors (these are intrinsically digital)

Servo motors

Traffic light (with simulated road sensors)

Electronic Lock
Comment on µProc

- Microprocessors can make projects trivially easy
  - Arduino have libraries to do many many things
  - A bit outside the scope of this class
  - Will allow this, if you have some experience (or want to learn on your own) but must demonstrate interface at bit-level first
  - Don’t want to just have you do a programming exercise
- Next week we will explore FPGAs that allow for very complicated synchronous logic
- Can also try simpler µProc (single chip) like the PIC, do more low-level programming (used to do this in class in assembly!, can give examples)
Analog

- Analog projects are also fine!
  - Audio amplifiers
  - PID feedback circuits with op-amps
- Some projects will naturally have some analog component
- Can use A/D convertor chip, don’t need to build your own ADC (unless that is the goal of the project)
- D/A conversion also interesting (e.g. synthesizer)
Final Thoughts

• Discuss with me early if you have crazy ideas

• Start to explore parts and how you could interface with them

• A suitable project is more about how you do it, rather than what you do. Digital interfaces with discrete logic can be very challenging…

• Using state machines (start discussing this week) is a very common design goal