3/7/2016

Digital Input

CSE 132

Today’s Outline

• Digital Inputs
• Midterm Exam

Arduino Input/Output

• 20 pins on physical chip can be configured to do
digital input, digital output, analog input, analog
output (not all pins can do each function)
• We first configure pins at startup, then use them
  const int myPin = 13;
  void setup() {
    pinMode(myPin, OUTPUT);
  }
  void loop() {
    digitalWrite(myPin, LOW);
    digitalWrite(myPin, HIGH);
  }

Simplest Digital Input

• Push-button switch
  — Pressed = 1, HIGH, TRUE
  — Not-pressed = 0, LOW, FALSE
• Electro-mechanical device
  — When button is pressed, electrical contacts conduct
  — When make/break contact, the contacts can bounce
  — This bouncing can happen over milliseconds
  — But software operates at microsecond scales
  — Even a simple push-button isn’t so simple!

Push-button Schematic

↩ Push here
↩ Voltage here goes high

Software

• Switch between input pin and +5V
  — Input goes HIGH when switch is pressed
  — Input goes LOW when switch is not pressed
  
setup() {
  pinMode(pin, INPUT);
}

loop() {
  inputVal = digitalRead(pin);
}
Watch out for signaling convention!

- Switch between input pin and GND
  - Input LOW when switch is pressed
- Why would one do this?
  - Because the resistor is available, built into the processor

```c
setup() {
  pinMode(pin, INPUT_PULLUP);
}
```

Let’s See What Happens

Switch “Debouncing”

Read switch state
Wait enough time for switch to quit bouncing
Read switch state again
if two switch states agree
  Done
else
  Start over

What about many switches?

Digital Inputs from Physical World

- Example use case
  - Proximity detector
  - Garage door safety beam
- Sensing technologies
  - Capacitive
  - Inductive
  - Optical
  - Radar
  - Hall-effect (magnetic)

Midterm Exam

- Exams will be available in studio
- OK to ask TAs questions that focus on understanding the material – not your grade
- Regrade policy
  - Must request in writing (attached to front page)
  - Must wait at least until tomorrow (think about it)
  - Watch piazza for submission instructions
Midterm Scores

- Average – 85
- Std. Dev. – 10.9
- Median – 88
- Distribution
  - 90 to 100: 88
  - 80 to 89: 83
  - 70 to 79: 32
  - below 70: 22

Hardware Notes

- If having problems with ‘\r’:
  - Bottom right of monitor set to “Carriage Return”

- If having problems with uploads:
  - Add 5 sec delay in setup() before setting pins to OUTPUT in pinMode()
  - Press reset (SW5) prior to upload