

Digital Input

CSE 132

Today's Outline

- Digital Inputs
- Midterm Exam

Arduino Input/Output

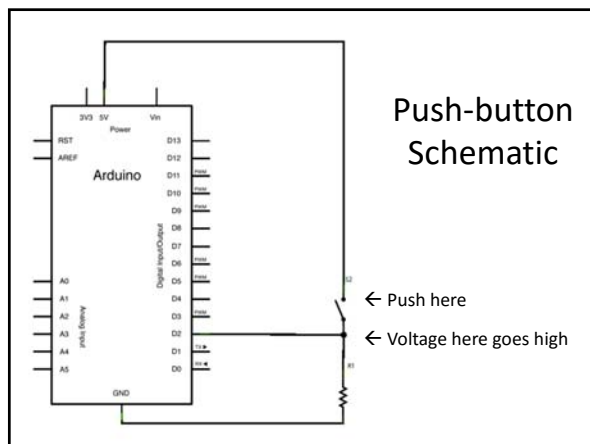
- 20 pins on physical chip can be configured to do digital input, digital output, analog input, analog output (not all pins can do each function)
- We first configure pins at startup, then use them


```
const int myPin = 13;
void setup() {
  pinMode(myPin, OUTPUT);
}
void loop() {
  digitalWrite(myPin, LOW);
  digitalWrite(myPin, HIGH);
}
```

 //generates square wave

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!



Software

- Switch between input pin and +5V
 - Input goes HIGH when switch is pressed
 - Input goes LOW when switch is not pressed

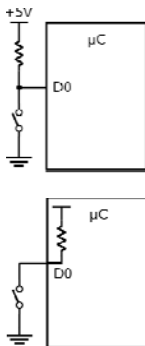
```
setup() {
  pinMode(pin, INPUT);
}

loop() {
  inputVal = digitalRead(pin);
}
```

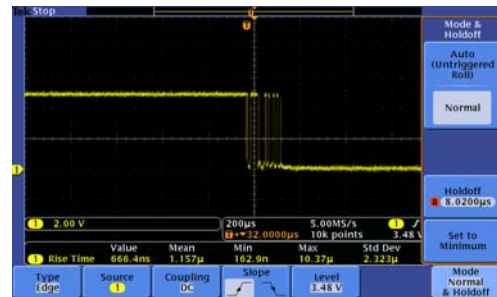
Watch out for signaling convention!

- 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

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



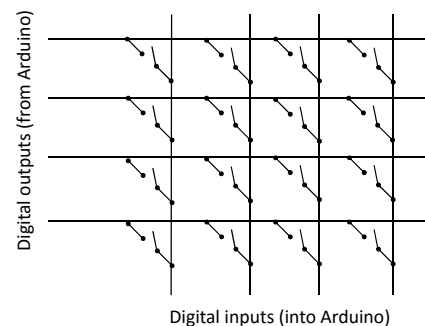
Let's See What Happens



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