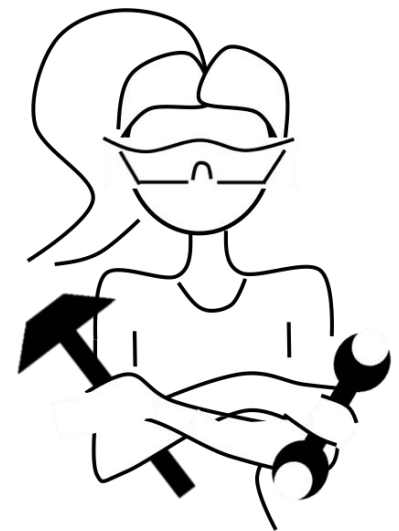


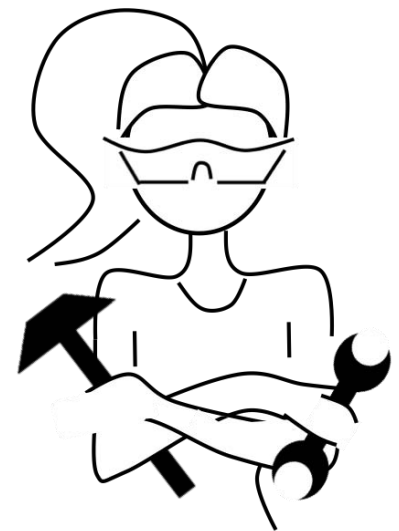
Intro to Programming and Circuit Building



Today's challenge

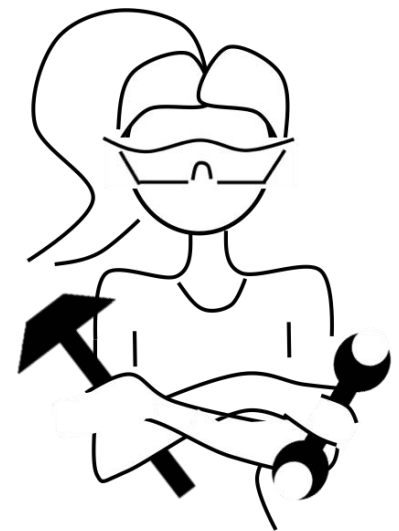
- LED Firewalker Shoes

<https://www.youtube.com/watch?v=gWZi71JkPAA>



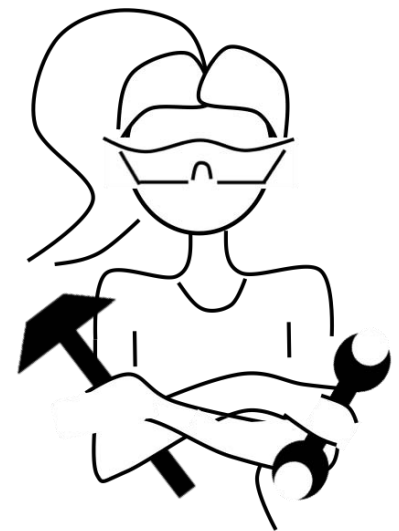
Intro to Circuit Building: Components

- Closed loop circuit
- Battery to power the LEDs (the lights)
- Arduino, “the brain,” to tell you shows to light up when you walk
- Pressure sensor to detect your steps



What is electricity?

- Flow of electrons, an electric charge, through conductive material to create an electric circuit
- Electric current provides energy to things like cars, refrigerators, etc.



What is computer programming?

- A program is step-by-step instructions for a computer
- Each instruction is processed one at a time, *exactly* as written.
- For the Firewalker circuit:
 - Instructions to light up when the pressure sensor detects a step

```
// necessarily start and end at the heel or toe. These constants
// the strip and shoe sizes, and the positions of the front- and
// Becky's shoes: 39 LEDs total, 20 LEDs long, LED #5 at back.
// Phil's shoes: 43 LEDs total, 22 LEDs long, LED #6 at back.
#define N_LEDS 39 // TOTAL number of LEDs in strip
#define SHOE_LEN_LEDS 20 // Number of LEDs down ONE SIDE of shoe
#define SHOE_LED_BACK 5 // Index of REAR-MOST LED on shoe
#define STEP_PIN A9 // Analog input for footstep
#define LED_PIN 6 // NeoPixel strip is connected here
#define MAXSTEPS 3 // Process (up to) this many concurrent

Adafruit_NeoPixel strip = Adafruit_NeoPixel(N_LEDS, LED_PIN, NEO_GRB + NEO_DMA_ENABLE);

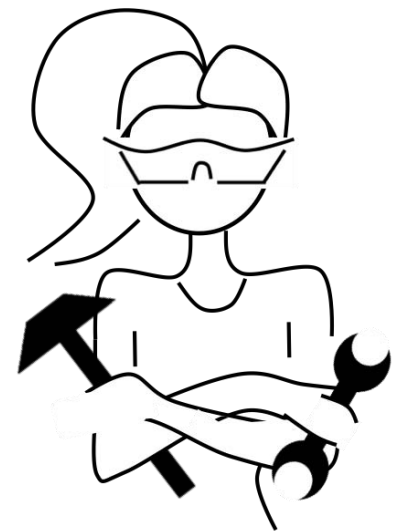
// The readings from the sensors are usually around 250-350 when
// then dip below 100 when the heel is standing on it (for Phil
// don't dip quite as low because she's smaller).
#define STEP_TRIGGER 150 // Reading must be below this to trigger
#define STEP_HYSTERESIS 200 // After trigger, must return to this

int
stepMag[MAXSTEPS], // Magnitude of steps
stepX[MAXSTEPS], // Position of 'step wave' along strip
mag[SHOE_LEN_LEDS], // Brightness buffer (one side of shoe)
stepFiltered, // Current filtered pressure reading
stepCount, // Number of 'frames' current step has lasted
```



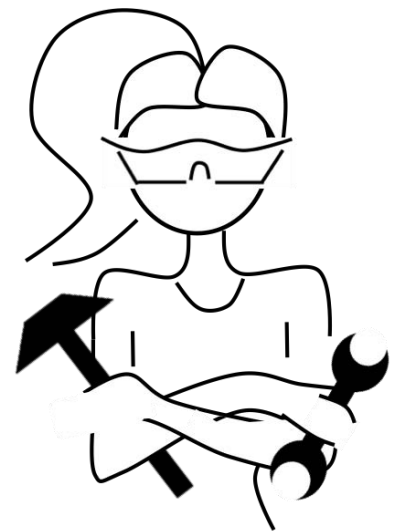
How to write a program:

- Write out or draw what you want to do, like you're explaining it to a friend.
- Break down complicated steps into small ones for a robot to understand
- This is called *pseudocode*.
- Finally use your pseudocode as a guide to write your actual program on the computer.



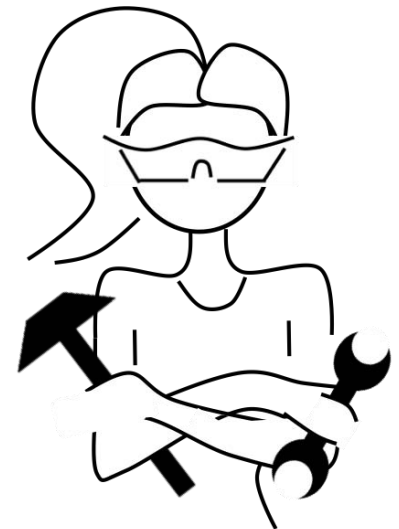
Sensors

- Sensors observe information about the world
- Touch, color, distance, rotations, acceleration, and sound pressure



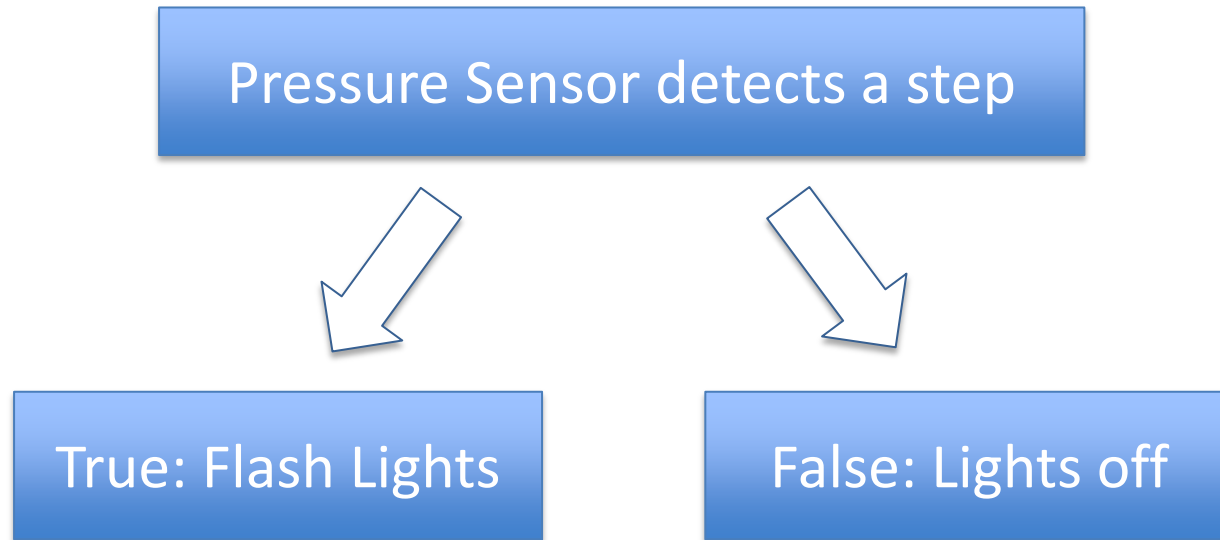
Loops

- Loops allow you to repeat a section of code
- Loops can be set to exit after a certain amount of time, number of runs, or when a condition is set (like a sensor triggered)



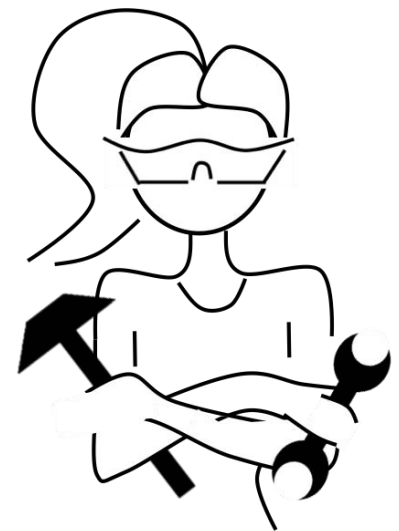
Logic Statements with “IF”

- Computer reads an “IF” statement and evaluates if it is true or not. Follows steps accordingly



Let's go!

- Task 1: Build your test circuit
- Task 2: Pseudo code for test circuit
- Task 3: Pseudo code for actual circuit
- Task 4: Implement!



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