

Senior Citizen Monitor System

Team: IOSenior

Members

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Objective

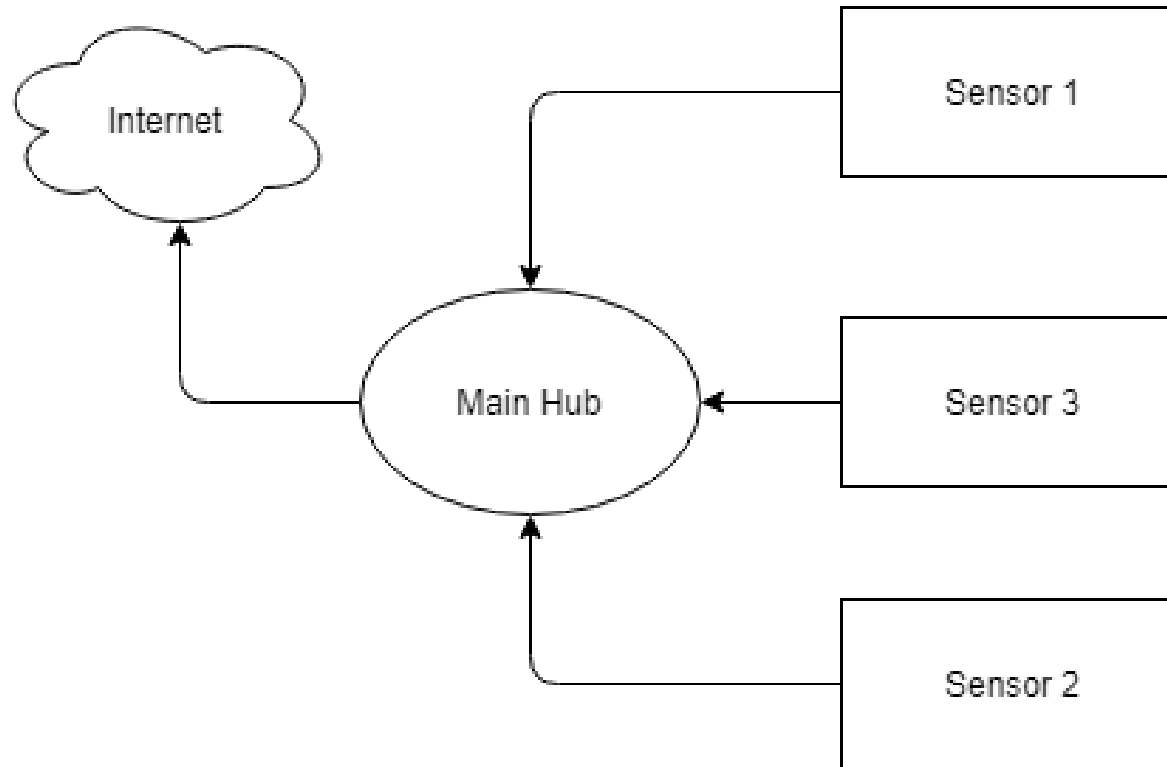
- ▶ Develop a system to help people remotely monitor elderly family in a non intrusive fashion

Scope/Specifications

- ▶ Remote accessible data
- ▶ Work for those who live:
 - ▶ Alone
 - ▶ Multi floor home
 - ▶ Apartment
- ▶ General public use
- ▶ Discrete
- ▶ Multiple sensing methods
- ▶ Potential expansion
- ▶ Budget friendly

End Goal

- ▶ Create a concept design
- ▶ < \$500
- ▶ Prototype



Overall Idea

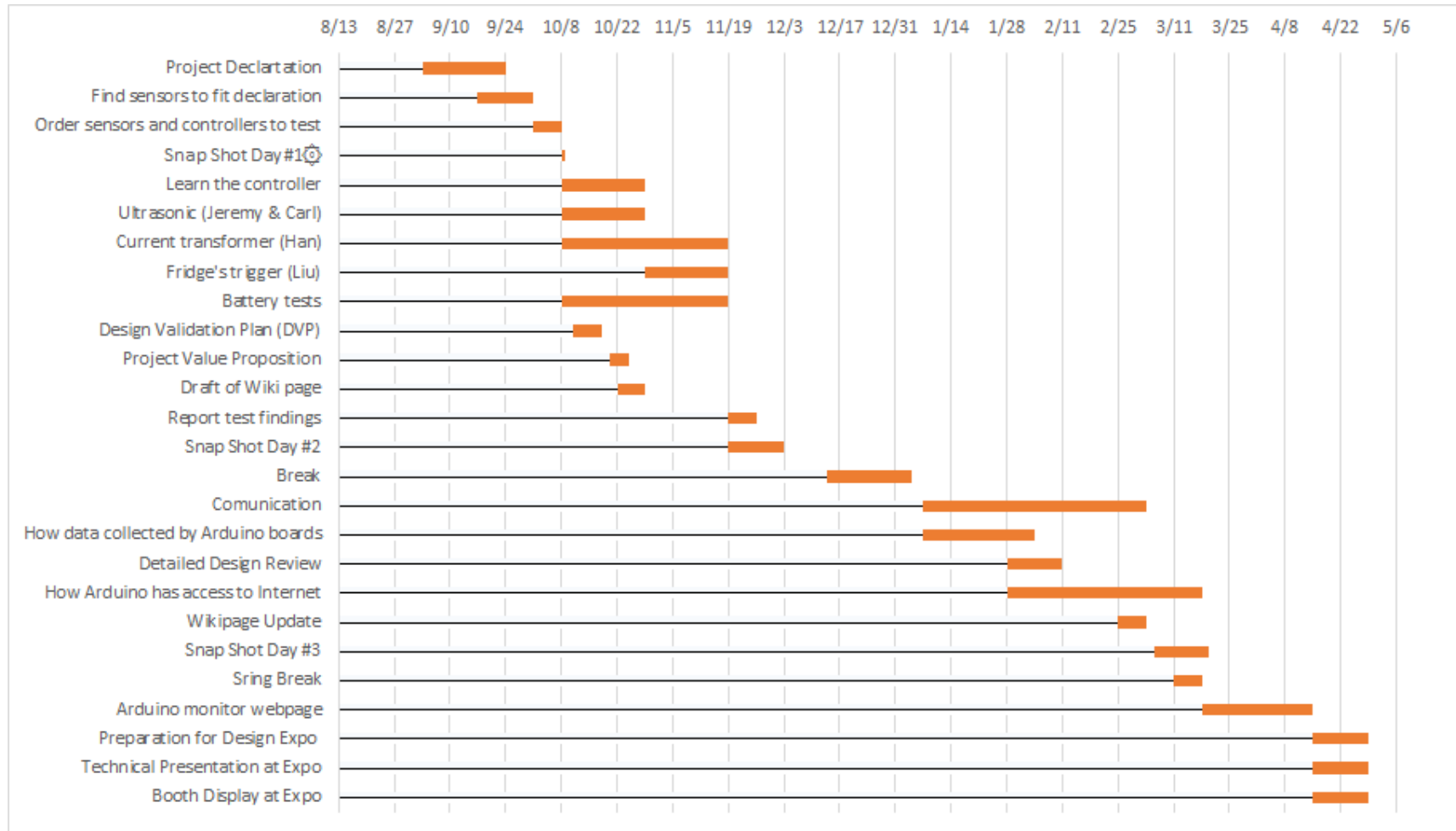
Brainstorming

- ▶ Home Vs. Away
 - ▶ Car there?
- ▶ Stairs
 - ▶ Safely make it up/down
- ▶ Moving around
 - ▶ Wake up
 - ▶ Different rooms
 - ▶ Sitting on couch
- ▶ Devices
 - ▶ Which specific
 - ▶ Utility placement
 - ▶ Washing machine
 - ▶ Microwave

Potential Solutions

- ▶ Controllers:
 - ▶ Arduino Nano
 - ▶ Arduino mega2560
- ▶ Ultrasonic Sensor
 - ▶ Are they home?
 - ▶ Which room they are in?
- ▶ Temperature Sensor
 - ▶ Asleep
 - ▶ Fire
- ▶ Current transformer (CT)
 - ▶ Power usage
 - ▶ Device on or off
- ▶ Force Sensitive Resistor (FSR)
 - ▶ Door open
- ▶ Load cell
 - ▶ Sitting down?
 - ▶ Step on

Current Schedule



Budget

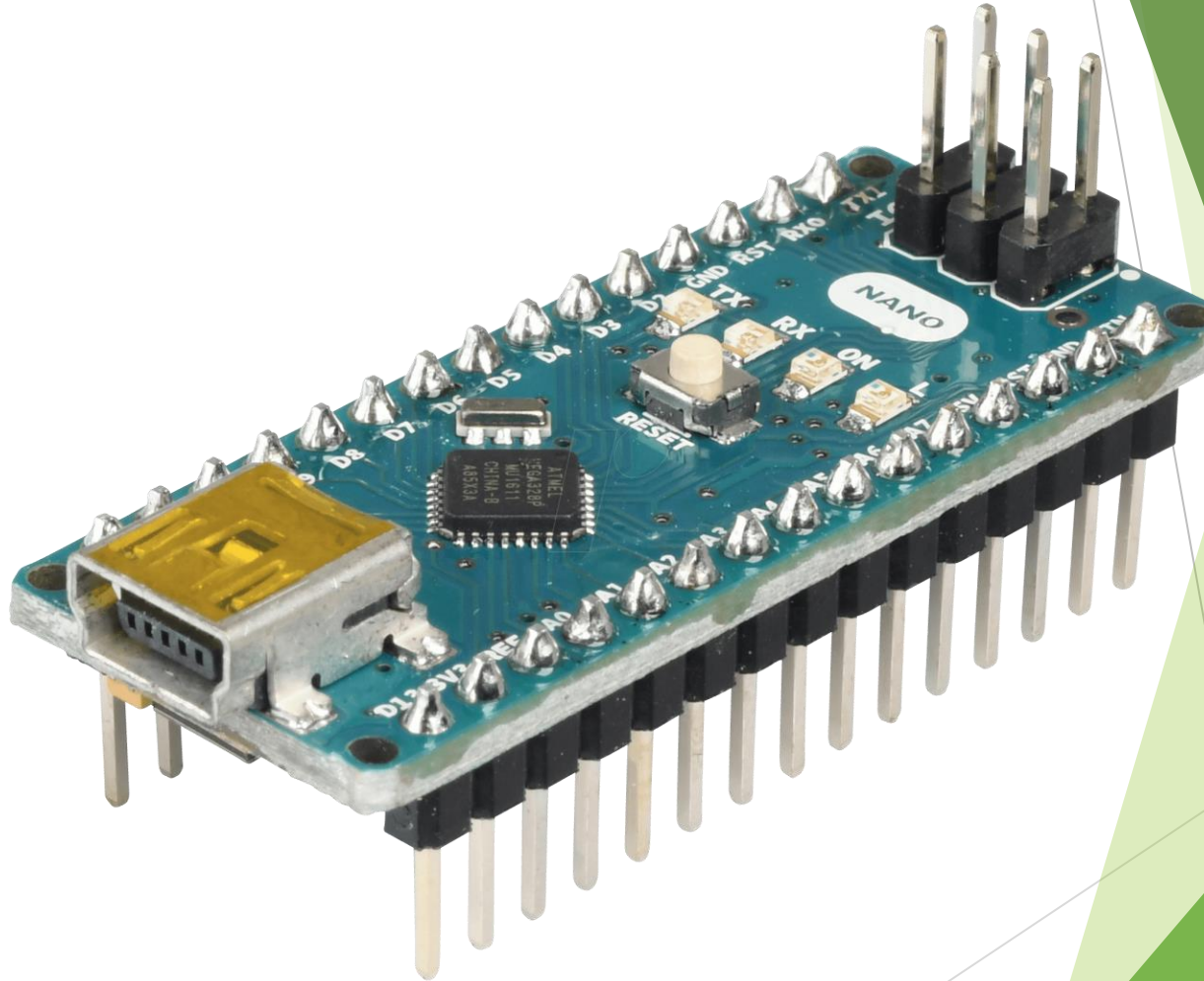
Item	Quantity	Individual Cost	Cost Total
Arduino Nano	2	22	44
Jumper Wires	2	1.95	3.9
Current Transformer	1	8.3	8.3
Total thus far	-	-	56.2
Budget	-	-	500
Remaining	-	-	443.8

► Items not accounted for but have

- Ultrasonic
- Arduino Mega2560
- Bread boards
- Measuring devices
 - Oscilloscope
 - Multimeters

Arduino Nano

- ▶ Sensor controllers
 - ▶ Obtain data
- ▶ Send to central hub
- ▶ Small, but less pins

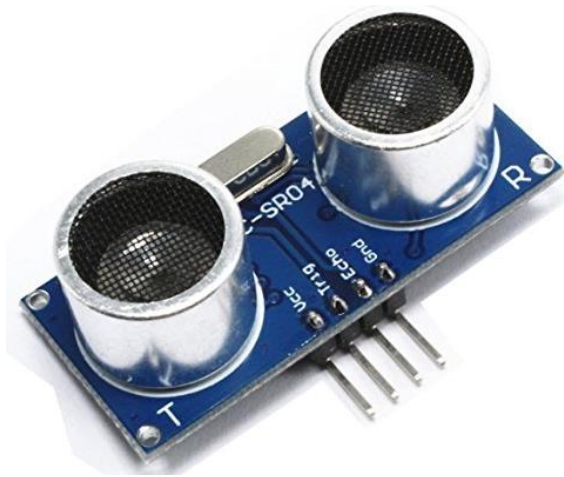


Arduino Mega2560

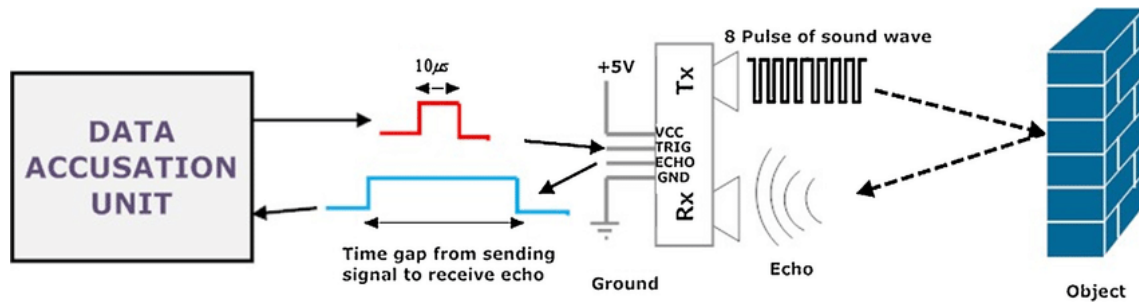
- ▶ Central Hub
 - ▶ Receives Data
 - ▶ Uploads to web
- ▶ Lots of pins
- ▶ Board expansion support for internet connectivity
- ▶ Large in comparison to Nano



Ultrasonic



- ▶ Inexpensive
 - ▶ <\$5.00
- ▶ Home Vs. Not
 - ▶ Consistent
 - ▶ Simple data to send
- ▶ Which room are they in?
 - ▶ Works
 - ▶ Inconsistent
- ▶ Key issue: Reflection
 - ▶ Flat vs. Not



Current transformer (C.T)



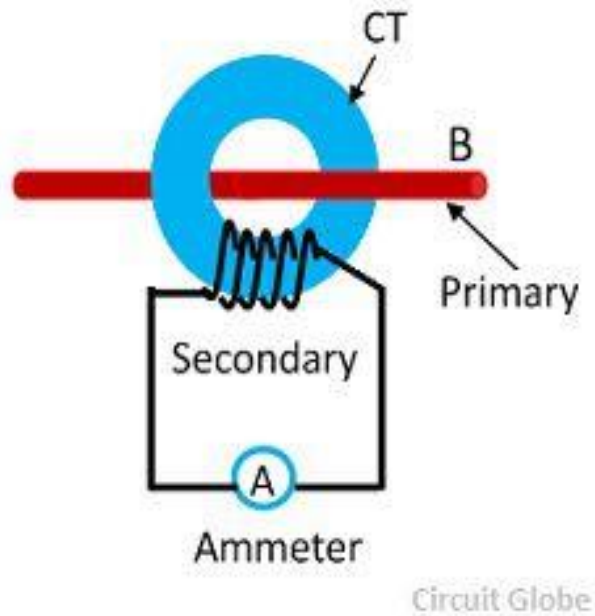
► Purpose?

- Detect whether the electric appliance like a hairdryer or a microwave is open.

► Advantages?

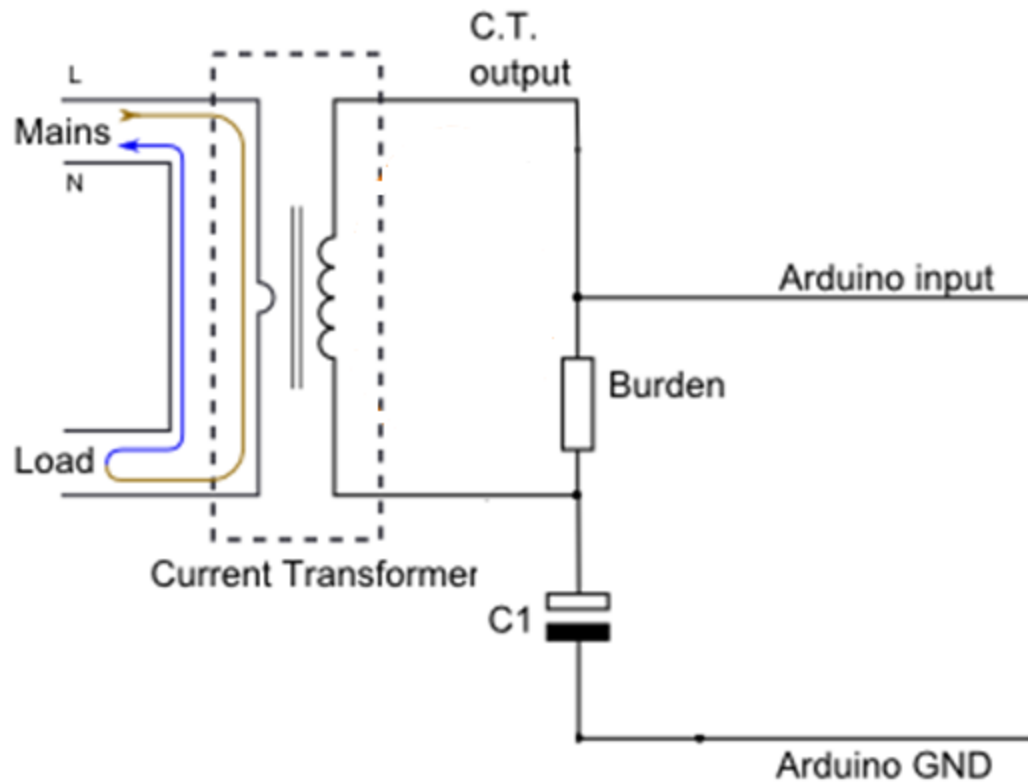
- Low-cost: \$8.30
- Convenient to change the objective.

How does it work?



- ▶ Using a C.T. sensor to get the current value through the wire
- ▶ Transform the analog data into digital.
- ▶ Use the digital data to tell if the appliance is on or off.

Schematic



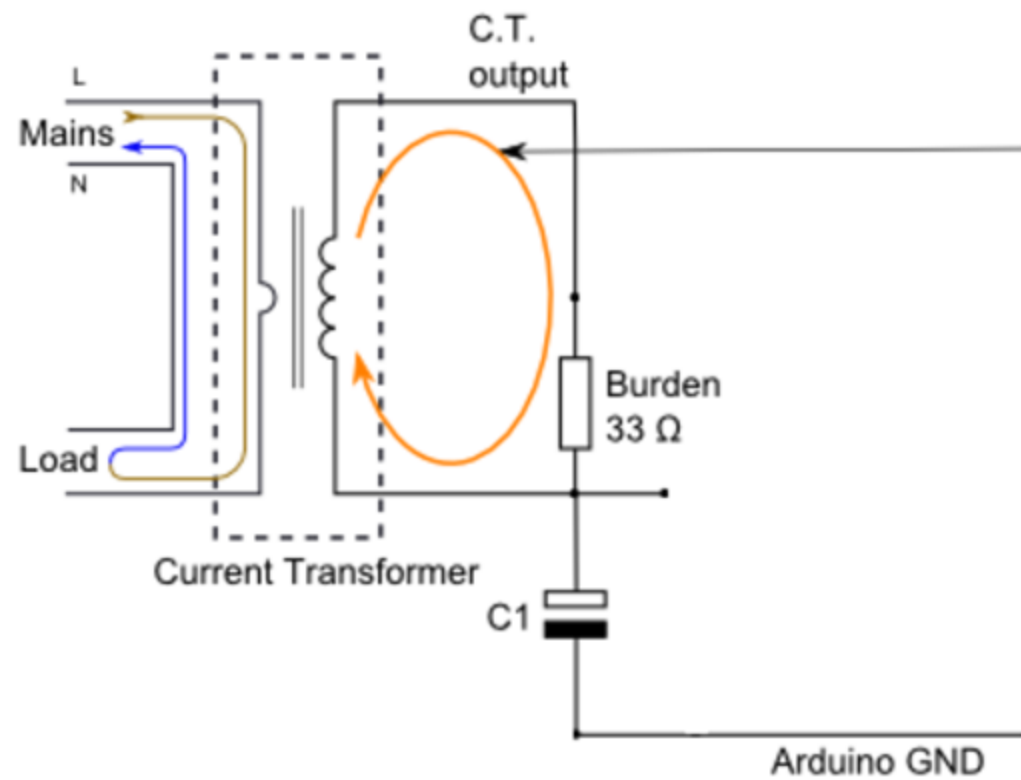
$$\text{turns ratio} \quad a := \frac{1}{2000}$$

$$I_{max} := 100 \text{ A}$$

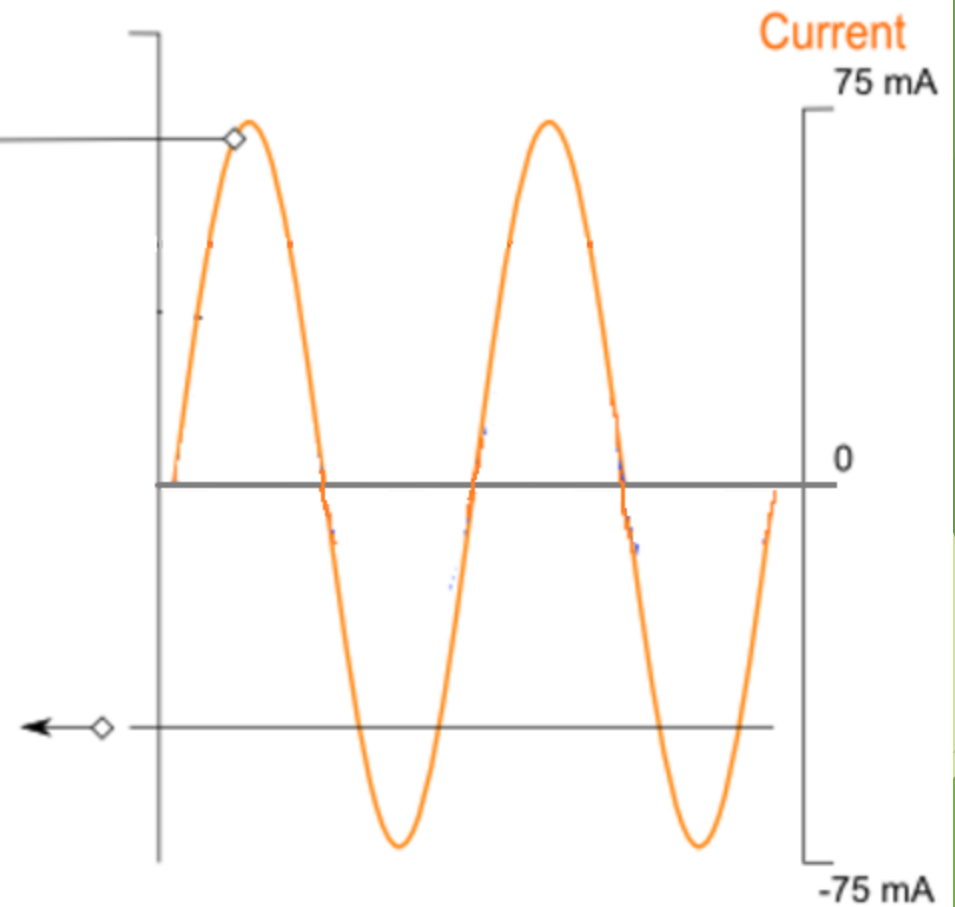
$$I_p := \sqrt{2} \cdot I_{max} = 141.421 \text{ A}$$

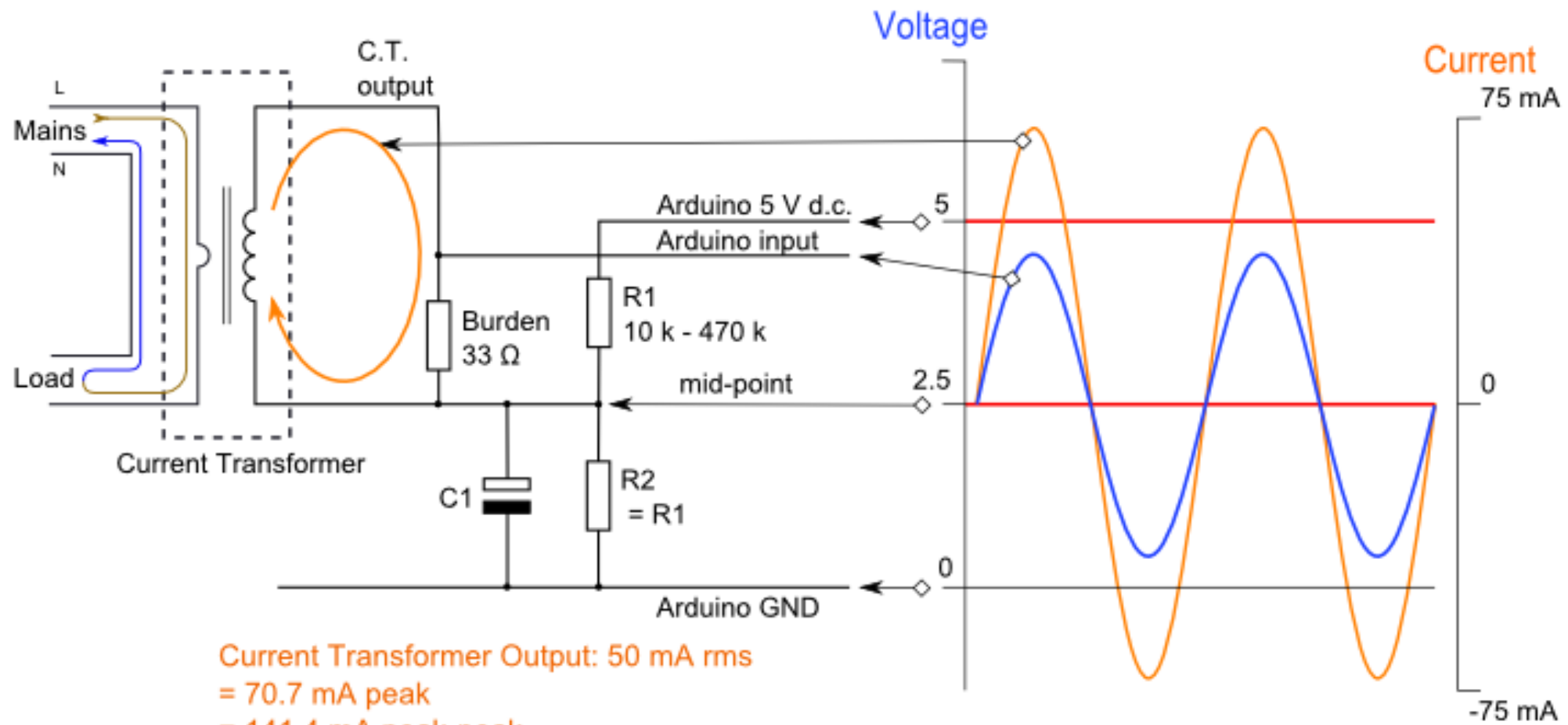
$$I_s := a \cdot I_p = 0.07 \text{ A}$$

$$R_{burden} := \frac{2.5 \text{ V}}{I_s} = 35.355 \Omega$$

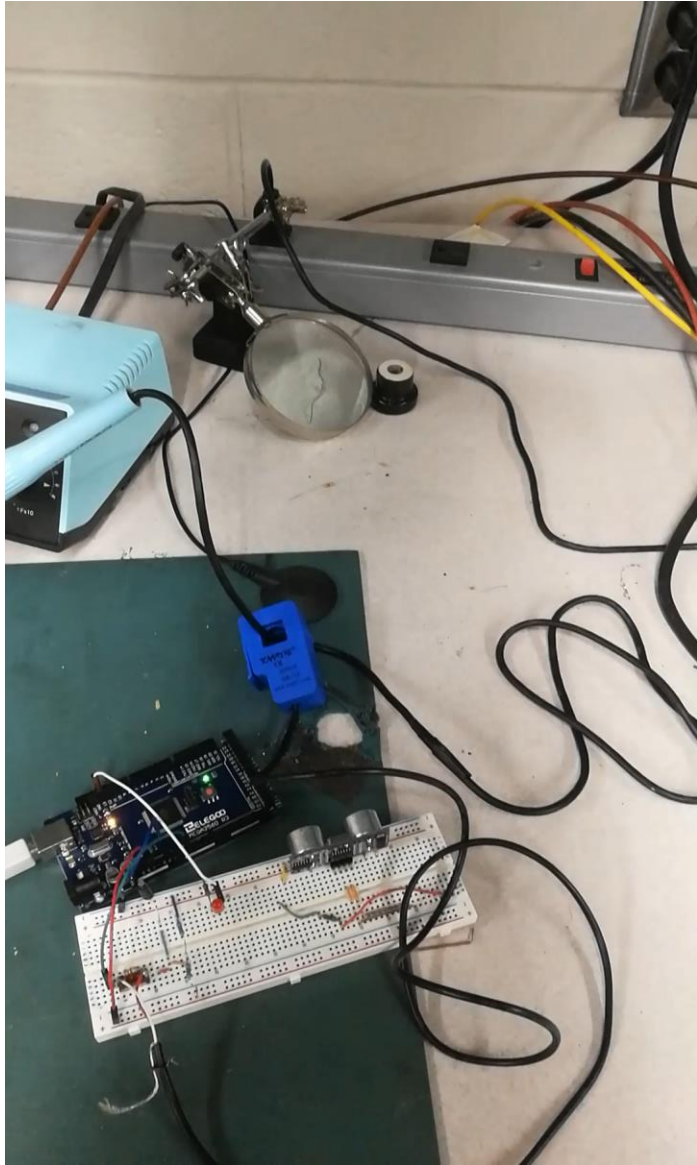


Current Transformer Output: 50 mA rms
 = 70.7 mA peak
 = 141.4 mA peak-peak





Current Transformer Output: 50 mA rms
= 70.7 mA peak
= 141.4 mA peak-peak
generates a voltage of:
 $141.4\text{ mA} \times 33\ \Omega$
= 4.666 V peak-peak input to Arduino



Disadvantage

- ▶ Inaccurate
- ▶ Not stable

Areas to improve

- ▶ Circuit connection
- ▶ Coding
- ▶ Change a current transformer?

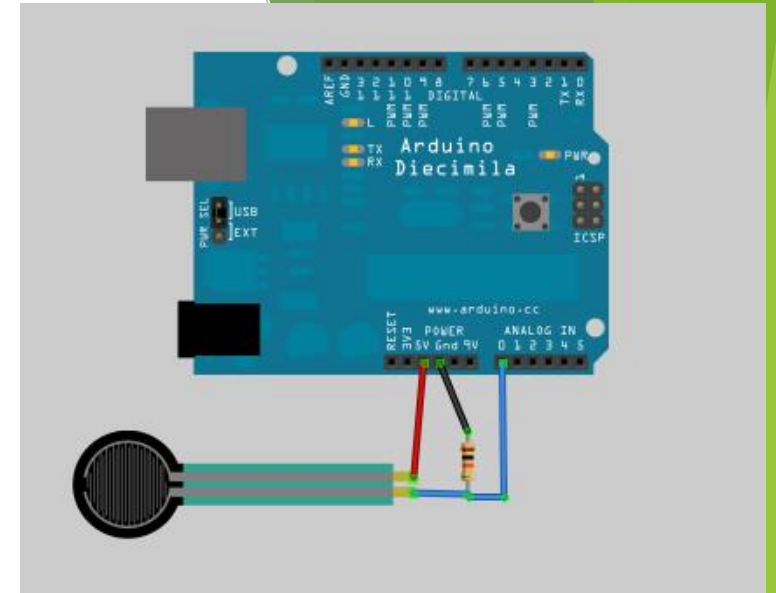
Force Sensitive Resistor (FSR)

► Purpose

- Detect whether the fridge is open to make sure the safety of the electrical device

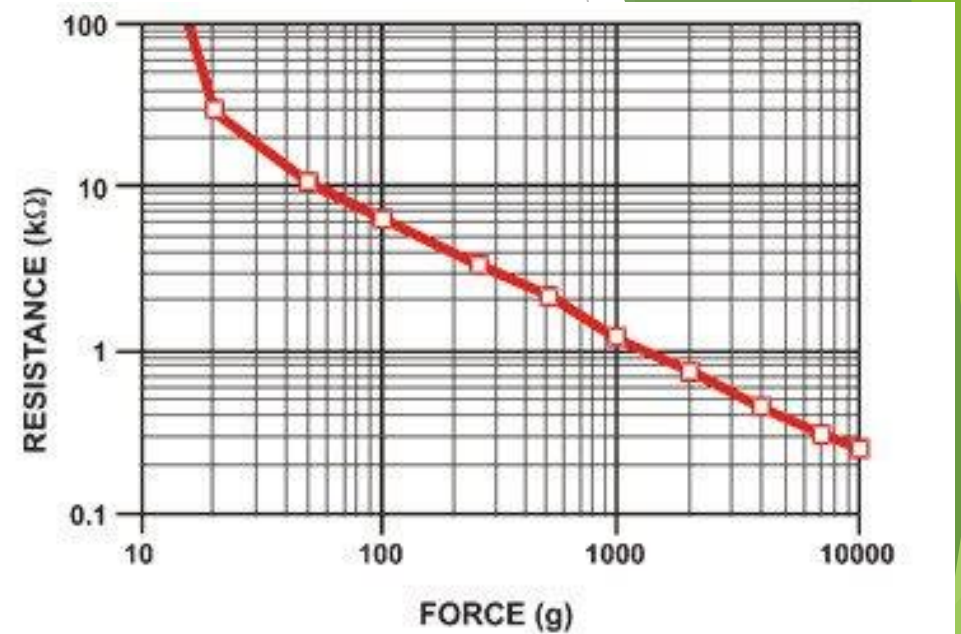
► Advantages

- Affordable
- Stable and high efficiency which has no side effect on disturbing daily life

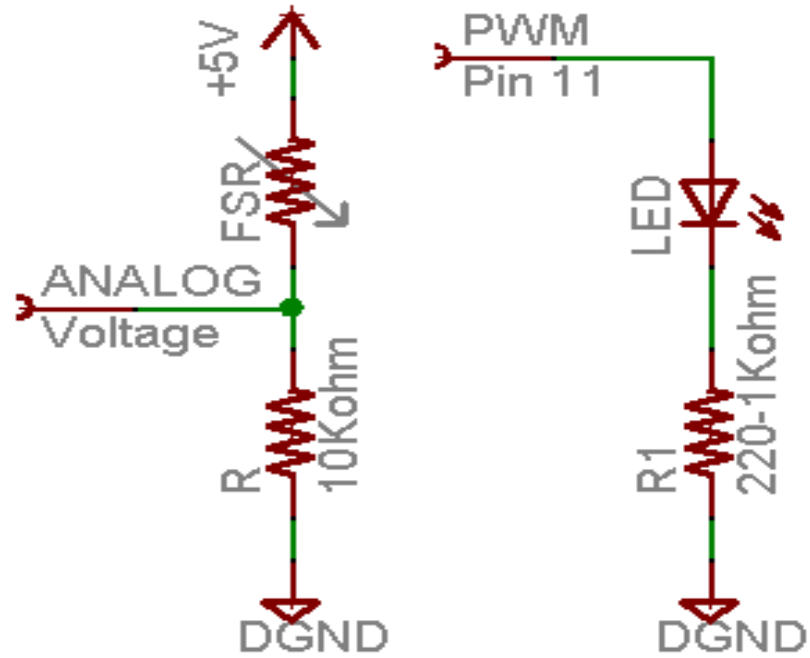


How does it work?

The FSR's resistance changes as more pressure is applied. When there is no pressure, the sensor looks like an infinite resistor (open circuit), as the pressure increases, the resistance goes down. When the resistance increase to certain value ,the LED or alarm will be triggered.



Schematic



Areas to improve

- ▶ The connection between the board and zigbee
- ▶ The battery consumption
- ▶ The method to remind the person of closing the door

Sleeping mode

- ▶ Why we need this?
Save power on Arduino boards
- ▶ How can it work
Power-down sleep mode

Next Semester/Soon

Item	Quantity	Individual Cost	Cost Total
Load cell	TBD	15-35	-
Wireless Comms	3-4	10-25	30-100
FSR	1		
Internet Connection	1	TBD	-

- ▶ FSR
 - ▶ Purchase
 - ▶ Test
- ▶ Communications
 - ▶ To central hub
 - ▶ Central hub to the internet

Questions