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Assignment 1: THIS

clamor.machina

Presented to

Elio Bidinost

documentation:

*https://github.com/sambourgault/CART360/tree/master/ASSIGNEMENT%20*THIS**

PART ONE

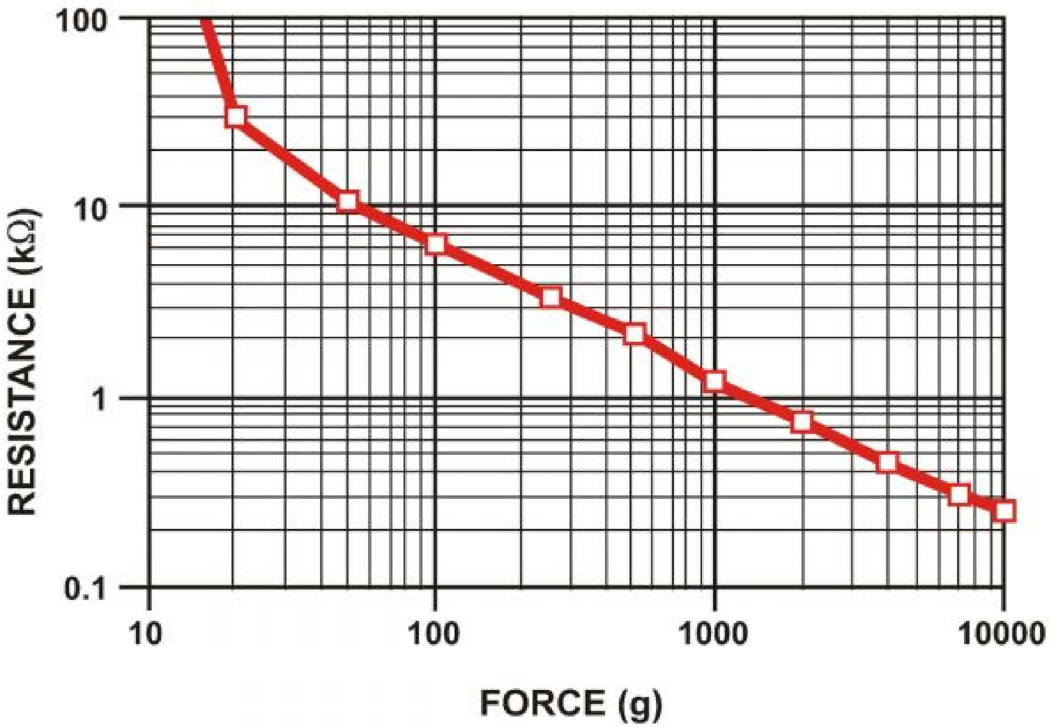
Sensor 1: Force Sensitive Resistor 0.5" (SEN-09375)
https://www.sparkfun.com/products/9375?_ga=2.43962085.1744384200.1539009011-489548125.1538105355

Description: This FSR will vary its resistance depending on how much pressure is being applied to the sensing area. The harder the force, the lower the resistance. When no pressure is being applied to the FSR its resistance will be larger than 1MΩ. This FSR can sense applied force anywhere in the range of 100g-10kg.

Features:

- Overall length: 2.375"
- Overall width: 0.75"
- Sensing diameter: 0.5"

Voltage requirements:
Resistance: 1MΩ if no pressure is applied. When a force is applied, the resistance of this sensor varies according to this following curve. The relation between the force applied and the resistance becomes linear after 50g.



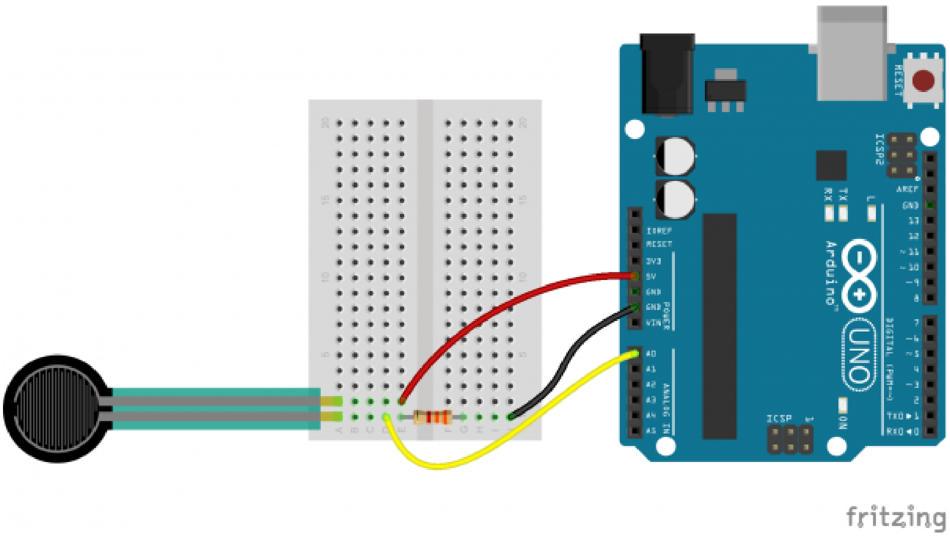
Sampling value range: 100g - 10kg
Temporal-spatial requirement:

How it is used with Arduino:
Create a voltage division. By combining the FSR with a static resistor to create a voltage divider, you can produce a variable voltage that can be read by a microcontroller's analog-to-digital converter.

Arduino.
Resistors.
FSR Adapter!

The tricky part of voltage-dividing an FSR is selecting a static resistor value to pair with it. You don't want to overpower the maximum resistance of the FSR, but you also don't want the FSR's minimum resistance to be completely overshadowed either.

It helps to know what range of force you'll be reading. If your project's force-sensing covers the broad range of the FSR (e.g. 0.1-10kg), try to pick a static resistance in the middle-range of the FSR's resistive output – something in the middle of 200-6kΩ. 3kΩ, or a common resistor like **3.3kΩ**, is a good place to start.



This voltage divider will cause the voltage at A0 to increase as the resistance of the FSR decreases. When the FSR is left untouched, measuring as nearly an open circuit, the voltage at A0 should be zero. If you press as hard as possible on the FSR, the voltage should increase close 5V.

Special requirements:

1. the solder joint will not hold and the substrate can easily melt and distort during the soldering. We recommend using a male or female clincher connector instead.
2. but they aren't incredibly accurate. Use them to sense if it's being squeezed, but you may not want to use it as a scale.

Sensor 2: HIH-4030 **- Humidity Sensor**

Basic analog humidity sensor.

Humiture sensor:

Resistance adjusts based on the presence of water vapor. The humidity excites ions of the sensor and makes it more conductive, which reduces the resistance and therefore increases the current. The output is a ratio between the current resistance and the resistance when completely submerged in water.

https://sensing.honeywell.com/honeywell-sensing-hih4030-4031-series-product-sheet-009021-4-en.pdf

https://www.sparkfun.com/products/9569

https://learn.sparkfun.com/tutorials/hih-4030-humidity-sensor-hookup-guide/all **: works**

Combined Humidity and Temperature Sensor	No
Operating Temperature	-40°C to 85°C [-40°F to 185°F]
Hysteresis	±3 %RH
Output Signal	Analog voltage
Response Time	5 s 1/e in slow moving air

Supply Voltage	5.0 Vdc typ.
Accuracy (Best Fit Straight Line)	N/A
Package Type	Surface mount
Supply Current	500 µA
Stability at 50% RH	±0.5 %RH

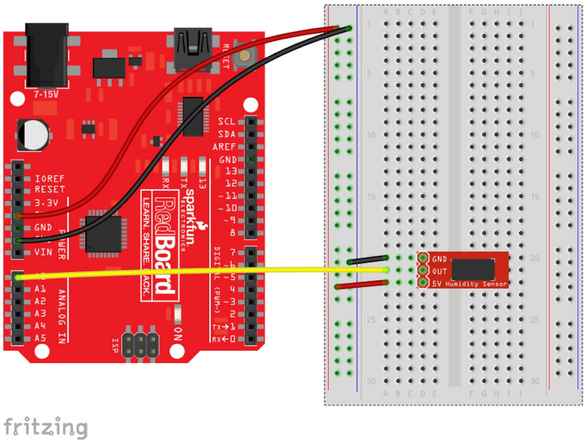
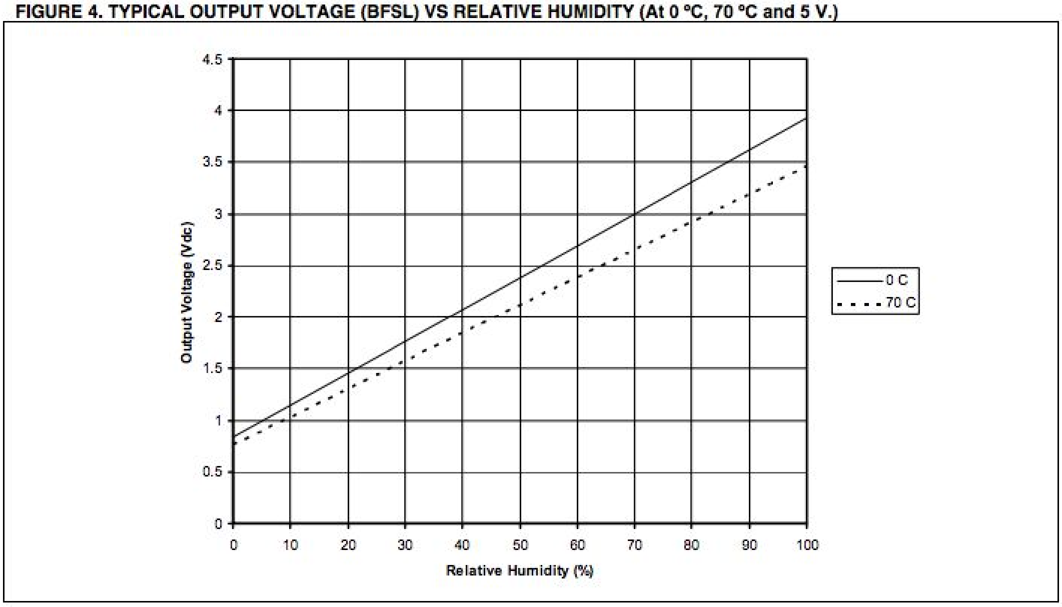


FIGURE 4. TYPICAL OUTPUT VOLTAGE (BFSL) VS RELATIVE HUMIDITY (At 0 °C, 70 °C and 5 V.)



Sensor 3: Proximity Sensor- MB1000 LV-MaxSonar-EZ0

<<Ultrasonic sound vibrates at a frequency above the range of human hearing. Transducers are the microphones used to receive and send the ultrasonic sound. The sensor uses a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.

With 2.5V - 5.5V power the LV-MaxSonar detects objects from 0-inches to 254-inches (6.45-meters) and provides sonar range information from 6-inches out to 254-inches with 1-inch resolution. Objects from 0-inches to 6-inches range as 6-inches. The interface output formats included are pulse width output, analog voltage output, and serial digital output.>>

Source: **https://www.maxbotix.com/articles/how-ultrasonic-sensors-work.html**

Features and Benefits

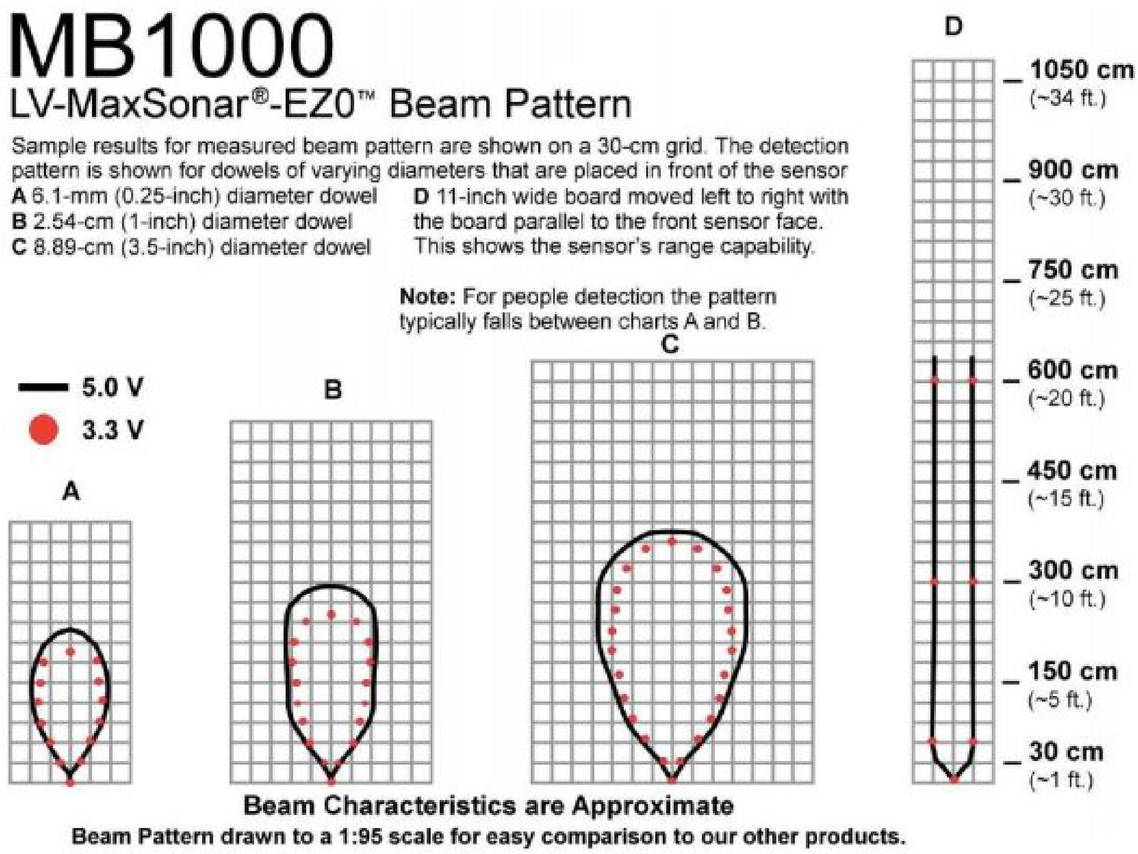
- Low power consumption
- Will pick up the most noise clutter when compared to other sensors in the LV-MaxSonar-EZ line
- Detects smaller objects
- Can be powered by many different types of power sources
- Can detect people up to approximately 10 feet
- Resolution of 1 inch
- Readings can occur up to every 50mS (20Hz reading rate)
- 42kHz Ultrasonic sensor measures distance to objects
- Read from all 3 sensor outputs: Analog Voltage, RS232 Serial, Pulse Width
- Virtually no sensor dead zone, objects closer than 6 inches range as 6 inches
- Maximum Range of 254 inches (645 cm)
- Operates from 2.5-5.5V
- Low 2.0mA average current requirement
- Serial, 0 to Vcc, 9600 Baud, 81N
- Analog, (Vcc/512) / inch
- Pulse width, (147uS/inch)
- Actual operating temperature range from –40°C to +65°C, Recommended operating temperature range from 0°C to +60°C

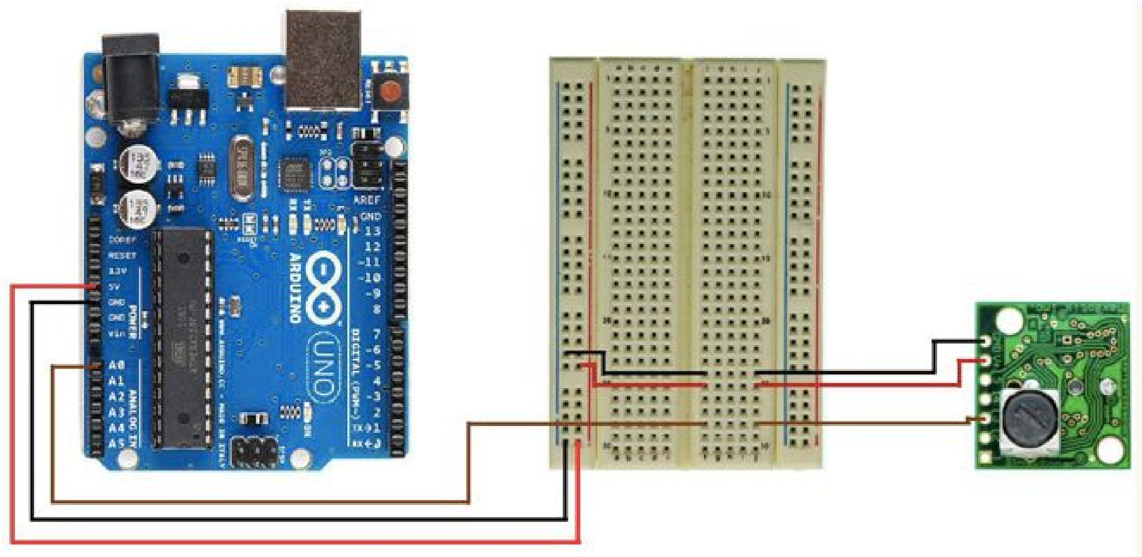
Timing Description

<<250mS after power-up, the LV-MaxSonar -EZ0 is ready to accept the RX command. If the RX pin is left open or held high, the sensor will first run a calibration cycle (49mS), and then it will take a range reading (49mS). Therefore, the first reading will take ~100mS. Subsequent readings will take 49mS. The LV-MaxSonar -EZ0 checks the RX pin at the end of every cycle. Range data can be acquired once every 49mS. Each 49mS period starts by the RX being high or open, after which the LV-MaxSonar -EZ0 sends thirteen 42KHz waves, after which the pulse width pin (PW) is set high. When a target is detected the PW pin is pulled low. The PW pin is high for up to 37.5mS if no target is detected. The remainder of the 49mS time (less 4.7mS) is spent adjusting the analog voltage to the correct level. When a long distance is measured immediately after a short distance reading, the analog voltage may not reach the exact level within one read cycle. During the last 4.7mS, the serial data is sent.

The LVMaxSonar -EZ0 timing is factory calibrated to 1% at 5V, and in use is better than 2%. In addition, operation at 3.3V typically causes the objects range, to be reported, 1 to 2% further than actual.>>

Source: http://www.robotstorehk.com/sensors/doc/LV-MaxSonar-EZ0-Datasheet.pdf





PART TWO

Description of the design

The *clamor.machina* is an emotional hybrid oscillating between the sentient being and the piece of hardware. It is placid and cold as the mechanical world would require, but tender and delicate when we come closer and listen. The proximity of the interaction with human beings triggers emotional reflux, a desire to share, to let it go. The machine then begins to breathe delicately always as a proof of vulnerability, following the soft drone sound of the stepper motors. The interaction reveals its essence.

We no longer fear to expose ourselves and socially, we are encouraged to share information online about our everyday lives. We share our thoughts, our feelings, our worries.[1]But what if machines also had the ability to do so? What if they could be capable of emotions? If so, what could trigger those emotions? Would they share it with humans? And how humans would react to those emotions?

Similarly to the Google Latitude Doorbell that notifies the people at home as family members are approaching[2], the *clamor.machina* keeps track and reacts when individuals come close to it. In our case, the *clamor.machina* would react to proximity. Meaning if something approaches the cinder block where the sensor is located, the crying machine is activated.

The *clamor.machina* unfolds into three different systems: the sensing, the kinematic and the hydration systems. The sensing part uses a proximity sensor (Maxsonar EZ0) to detect the presence of beings in its surroundings. The kinetic part involves two motors that take care of twisting, pulling up and down long pieces of semi-transparent fabric that hangs a grid on the ceiling. The hydration system is made of a submersible pump connected to a PVC tube cribbled with small holes that allows water to flow a few

[1] Enchanting objects, p.170
[2] Enchanting objects, p.161

drops at a time. Nylon wire is used in order to create the impression that the fabric is floating over the floor and to connect the different pieces of fabric kinematically as discreetly as possible.

The Arduino employs the proximity sensor as an analog input to the world when viewers are close enough to the machine, the microcontroller sends digital signals to the motor in order to trigger their rotation in a semi-erratic way, to the pump to begin pumping and to MaxMSP to faster the playback speed of the crying sound.

References

For the stepper circuit:

https://engineersportal.com/blog/2018/1/29/driving-any-stepper-motor-for-less-than-1-with-the-l293

Step Motors:

example with conveyor belt: https://www.youtube.com/watch?v=SajYHxYTv3s

timing belt: https://www.adafruit.com/product/1184

timing pulley: https://www.adafruit.com/product/1252

https://www.brainy-bits.com/dht11-tutorial/

Audrey's written evaluation:

Sam was in charge of the coding and actively did the hardwiring with Nina. Nina and Sam were involved in the process of ideation, and building our structure.

Nina's written evaluation

Sam was responsible for coding and hardwiring the system.

Audrey was involved in the ideation and building of the work and gathering material.

Both members were hands-on in all steps of the process because the conception was progressing and changing as it was being built.

Sam's written evaluation:

Audrey and Nina were involved in the process of wiring and building the structure. The project many design test and trials through which both brought different ideas and material. In order to have a proper idea of these tests, Nina and Audrey helped construct multiple versions of the piece.