

Senior Design Group 15

Data Acquisition Device (DAQ) for Dogs

Students:

Yan Jie Hui

Rohan Yadlapati

Rishab Kinnerkar

Matthew Faronbi

Daeyoo Kim

Advisor and Client:

Dr. Laflamme

<http://www.public.iastate.edu/~laflamme/>

Presentation overview:

I. Project Plan

- a). Problem Statement
- b). Conceptual Sketch
- c). Function Design
- d). Technical Constraints & Considerations
- e). Market Survey
- f). Potential Risks
- g). Costs

II. Project Design

- a). Hardware/Software
- b). Test Plan
- c). Prototypes
- d). Final Design

III. Conclusion

Project Plan

Problem Statement:

What:

Our client needs a hardware/software system (I.E. a D.A.Q device.) that is capable of collecting and storing resistance data from a sensor (provided by client) which is to be attached to a dog.

Why:

This device is needed because it will significantly increase how veterinary surgeons can measure the efficiency of a stitch placed on a dog. This will in turn help veterinary researchers to be able to effectively collect and make changes based on the data received from this device. Conclusively, the results of all this will create a more resourceful and quick method for measuring and collecting data in the veterinary science field.

Project Plan

Conceptual Sketch:

- Resistance values are measured by sensor
- DAQ (Microcontroller) records values and stores them on SD card
- Values on SD card are plotted via app on computer



Project Plan

Functional Requirements:

Initial requirements from our client:

- Collect Data from Sensor
- Lasting Battery
- User Friendly Web Application

Project Plan

Non-Functional Requirements (Additional Features):

We added and continue to add more functionality to our project along the way. some of these include:

- Mobile Application
- Alert System (notify user when resistance gets to a certain value)
- Low Energy Consumption
- Waterproof Casing

Project Plan

Technical Constraints/ Considerations:

- Budget: \$200
 - Pcb
 - 3D printed case for DAQ
- Size and Weight
 - Compact size
- User Friendly
- Sampling Frequency: 100Hz
- 16-bit ADC
- Accuracy (R of $\pm 20\%$)

Project Plan

Market Survey:

Our project is important because it will affect how efficiently a veterinary surgeon can measure the effectiveness of the stitches put on an animal, specifically a small dog. It is unique in the way that most people have not or are not designing a device can specifically gauge the change in resistance caused by movement affecting a medicinary stitch.



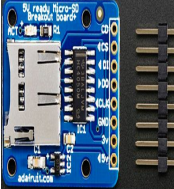


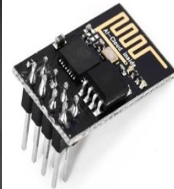
Project Plan

Potential Risks and Mitigation:

- Arduino IDE vs Matlab
- Damage to the DAQ due to dog movement
- Power Supply runs out during data collection

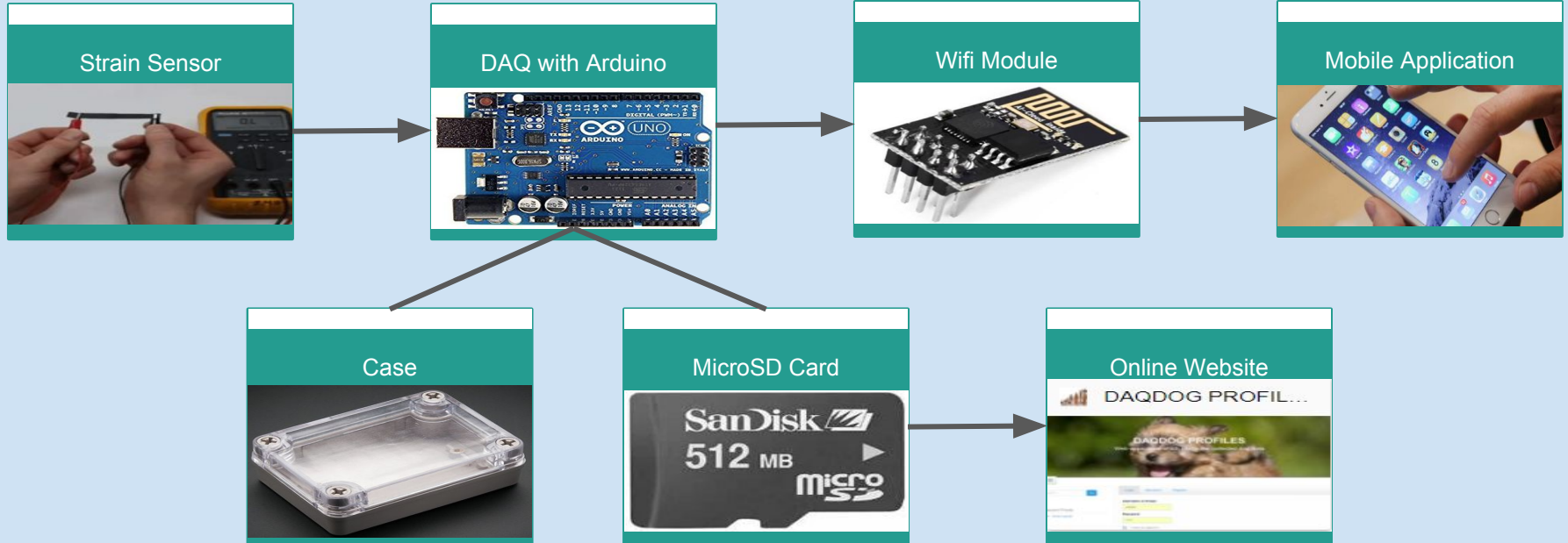
Project Plan

Cost Estimate: \$42.67

	Hardware						Software		
Product							Online Website	MATLAB & Arduino IDE	Mobile App
Price	\$15.99 Provided	\$3.75	\$7.50	\$5.39 each	\$5.75 per cubic inch	\$3.39	Free	Free	Free

Project Plan

Functional Decomposition



Project Design:

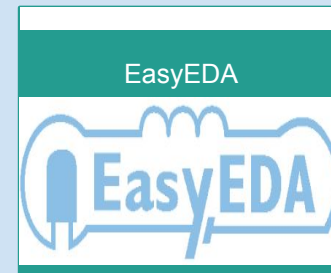
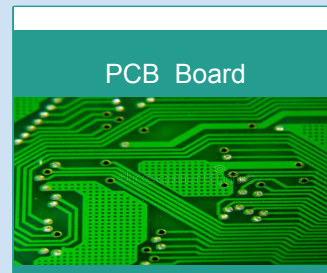
Hardware/Software/Technology Platform(s) used:

Hardware:

- Arduino Uno
- ATmega328
- Strain sensor
- MicroSD Card(512MB)
- MicroSD Breakout Board
- Coin Cell Batteries x2
- Waterproof Case
- Wifi Module
- **PCB Board**

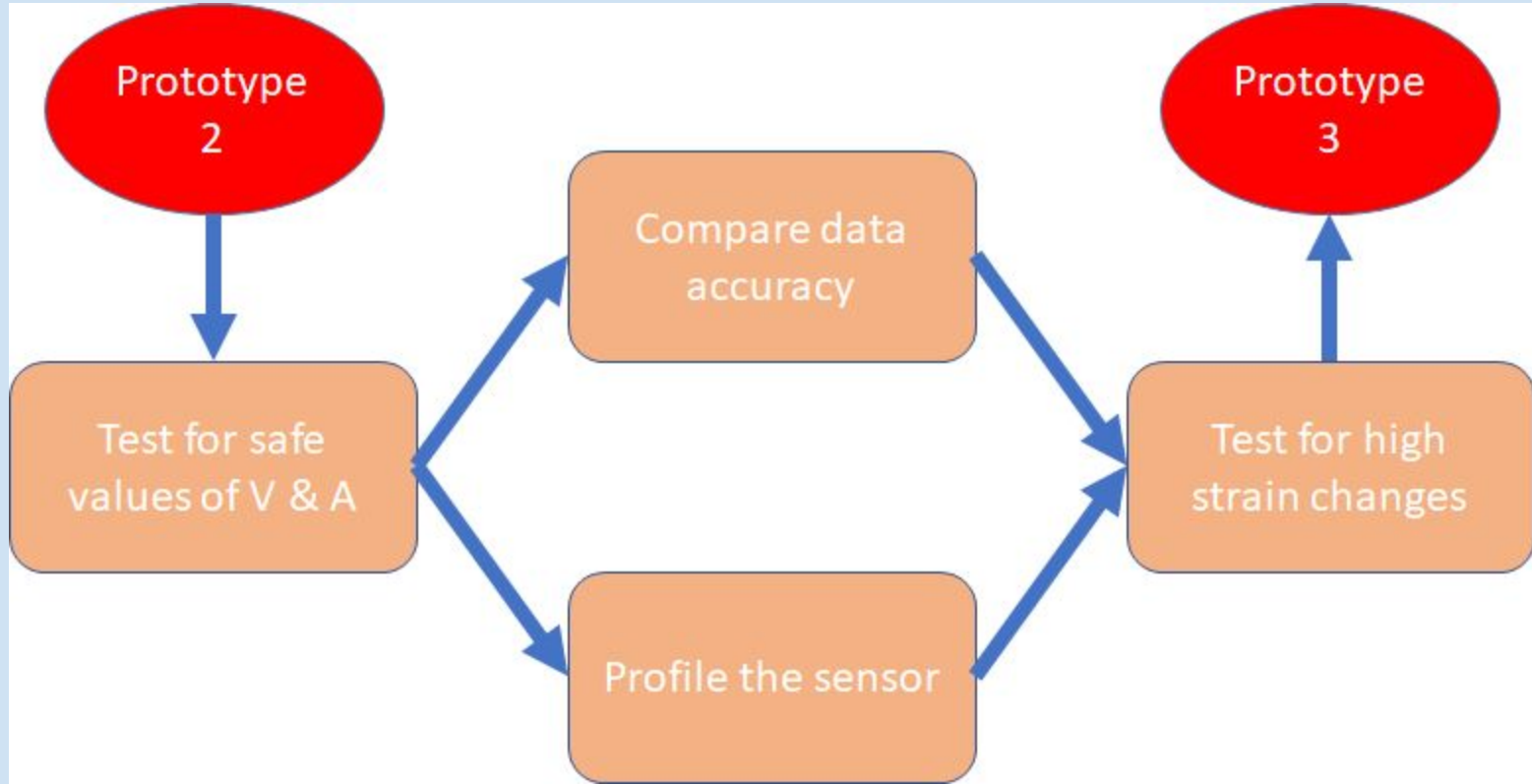
Software

- MATLAB
- Arduino IDE
- **EasyEDA (PCB Fabrication)**



Project Design:

Test Plan:

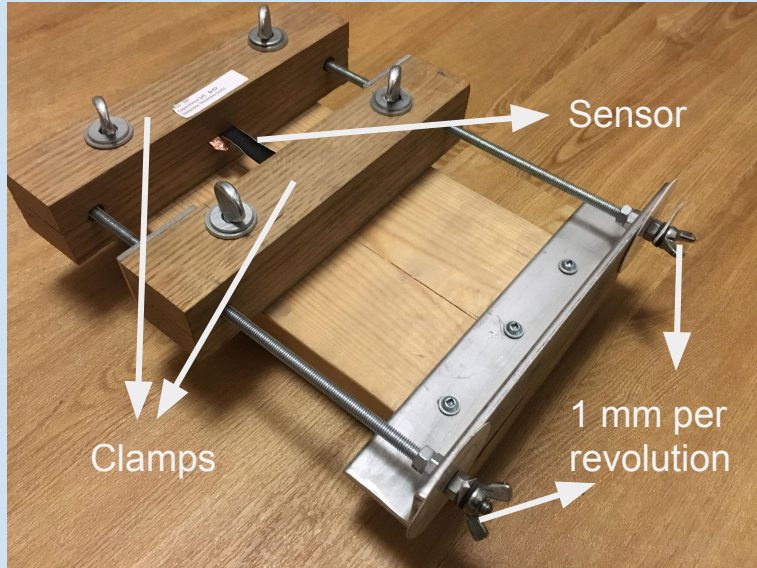


Project Design:

Test Plan:

Platform provided my client:

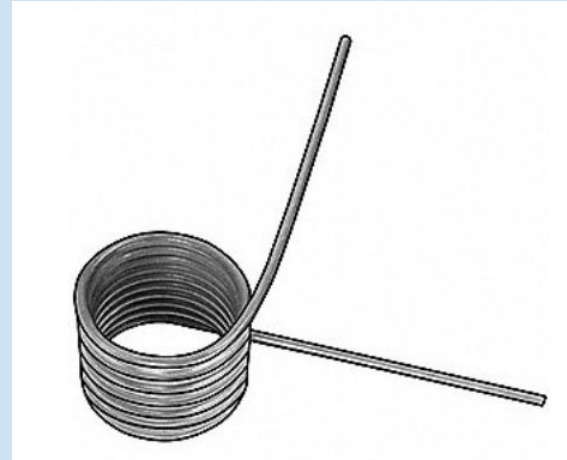
- Stable, precise calibration



EE 491: Senior Design 1 - DAQ for Dogs

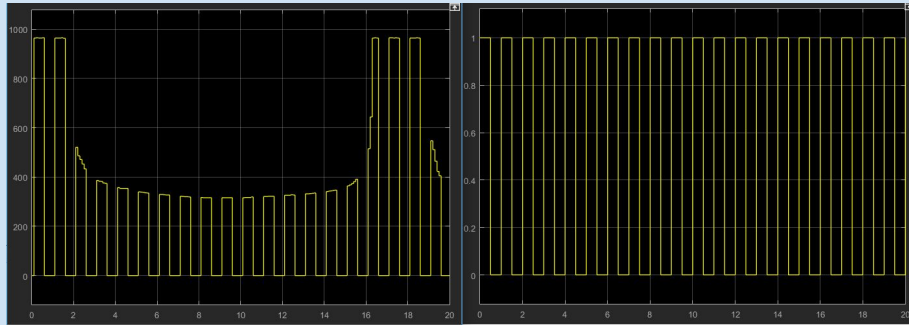
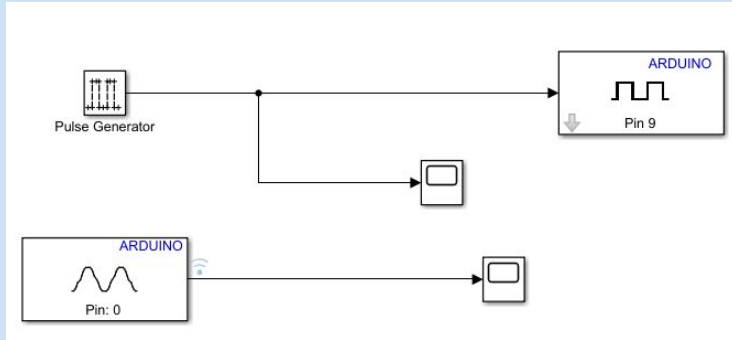
Another design:

- More dynamic simulation

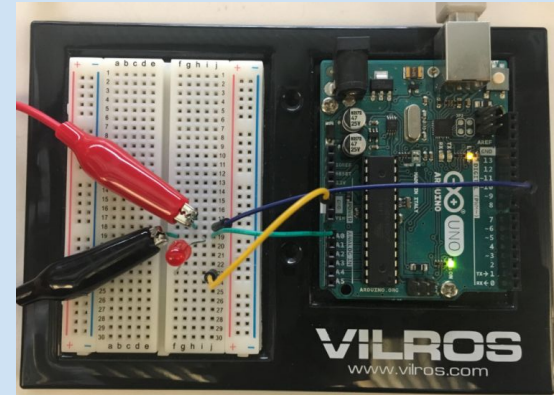


Project Design:

Prototype 1: Using matlab



Sensor



Arduino

Project Design:

Prototype 1



Using Arduino IDE

```
sctest | Arduino 1.8.5
file Edit Sketch Tools Help

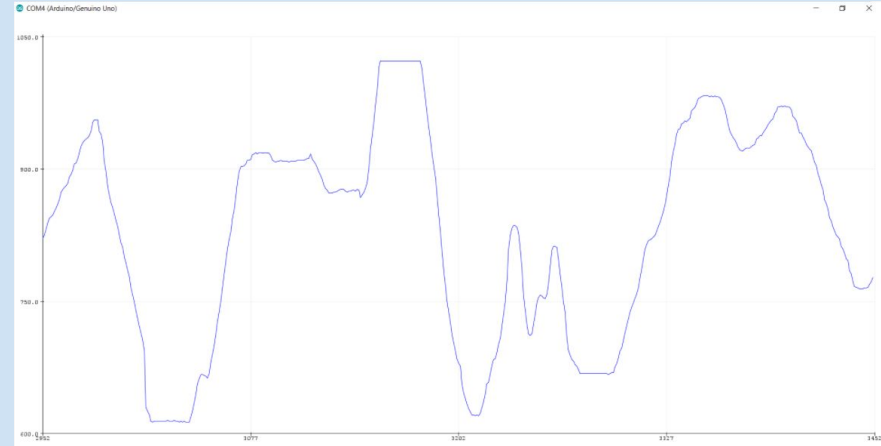
sctest
#include <SPI.h>
#include <SD.h>

const int chipSelect = 4;
int analogPin = 0;
void setup() {

  // Open serial communications and wait for port to open:
  Serial.begin(9600);
  while (!Serial) {
    // wait for serial port to connect. Needed for native USB port only
  }
  Serial.print("Initializing SD card...");
  // see if the card is present and can be initialized:
  if (!SD.begin(chipSelect)) {
    Serial.println("Card failed, or not present");
    // don't do anything more:
    while (1);
  }
  Serial.println("card initialized.");
}

void loop() {
  // make a string for assembling the data to log:
  String dataString = "";

  // read three sensors and append to the strings:
  // for (int analogPin = 0; analogPin < 1; analogPin++) {
  int sensor = analogRead(analogPin);
```



Project Design:

Prototype 2: What is different?

- Smaller (“Bareduino”) using Atmega328
-
-

Project Design:

Online APP



Started by learning HTML,CSS.

Finally moved to Wordpress

Used database- User profile, Dog profile, Store computed data.

Project Design:

Why make an APP?

Client wanted the platform to be to be user-friendly .

Why choose this particular platform?

Easy portability to other devices-: tablets, phones etc.

Project Design:

What are the functions of this app?

- a) Organizes dog and user profiles.
- b) Is able to plot graphs and compute and display inferences which makes it easier for the client to get an empirical understanding of the DAQ data.
- c) Serves as a data recorder which users can use to store data and compare their results with others.

Conclusion:

Milestones:

- Working Prototype
- Web Application Development

Individual Contributions:

- Rishab: Web application development
- Rohan: 3D printed case/Contribution to arduino code
- DaeYoo: Battery research/Consumption calculations
- Yan: Arduino code/Hardware design of prototype V2
- Matt: Testing the sensor/Sensor research

Next Semester:

- Final working design
- Multi-platform Working Web application
- 3D printed case for DAQ

Questions