Background

The FeedRite Feeding Tube is the next generation in naso-duodenal/naso-jejunal (ND/NJ) feeding. Currently, ND/NJ feeding tubes are placed with one of two main methods. The first method, fluoroscopy, accurately places tubes in the duodenum and jejunum. However, it is a notoriously slow process and often requires repeated fluoroscopic procedures, exposing the patient to unnecessary amounts of radiation. The second method relies on RF communication between the tube and a receiver placed on the xiphoid process. This method is relatively safe, but often results in improper tube placement.

Instead of using external indicators like those previously mentioned, the FeedRite Feeding Tube utilizes the body's natural physiology to determine tube location in the gastrointestinal tract. By relying on known pH and pressure differences between the stomach, duodenum, and jejunum, FeedRite plans to accurately, safely, and efficiently place ND/NJ tubes.

Achievements since last report

While waiting for the parts for our testing chamber to arrive, we have decided how we will go about calibrating our pressure sensor without the use of a variable pressure chamber. We will fill the chamber with water and calculate the expected changes in pressure based on the depth. We will then insert the sensor to the known depth and measure the pressure. This will allow us to create a calibration curve and determine our sensor's ability to detect the pressure changes we expect to see in the gastrointestinal system. Because we will be using the pressure characteristics as opposed to the absolute pressure measurements, we are looking to see how the sensor responds to gradual changes in pressure as it moves into deeper and more shallow water.

The pH sensor from Atlas Scientific is now fully functioning. Currently, the sensor operates using a UART communication method. This leaves us needing to calibrate the pH sensor to ensure that we read accurate pH measurements during demonstration.

The pressure sensor from SparkFun is also functioning. The code that has been written uses I2C communication. We have determined that for our final design, SPI may be a more appropriate communication method; however, we are not as familiar with this communication method. In the coming week, we will be investigating the details of SPI and determine if it would actually be a more appropriate communication method, and if so, will slightly alter the existing code so that it will communicate via SPI.

Problems that have arisen

We are currently still waiting for parts in order to continue making progress with our device. We are waiting on the solutions and piping for the testing chamber necessary for both calibration and demonstration of our sensors. We are also waiting for the tubing so that we can test compatibility of size and shape at CELA.

Future Steps

Once the testing chamber parts arrive, we will be able to build the chamber and use it for calibration of the pressure sensor. We will first need to fully waterproof all parts of the circuit that will come in contact with the water during calibration and solutions during demonstration. We can then continue with calibration of the pressure sensor using the testing chamber filled with water.

In addition to constructing the testing chamber, the pH and pressure sensors need to be calibrated. The pH sensor from Atlas offers a specific, easy-to-use calibration method, only requiring stock solution to calibrate. This will be ordered from Atlas Scientific with their pre-made stock solutions.

In addition, we will need to begin integrating pressure and pH sensors into a single .ino file for the Arduino. This will involve combining aspects of code from each program into one functioning file that allows rapid communication. This will also likely require developing a more aesthetically pleasing UI to display the real-time pressure and pH measurements.

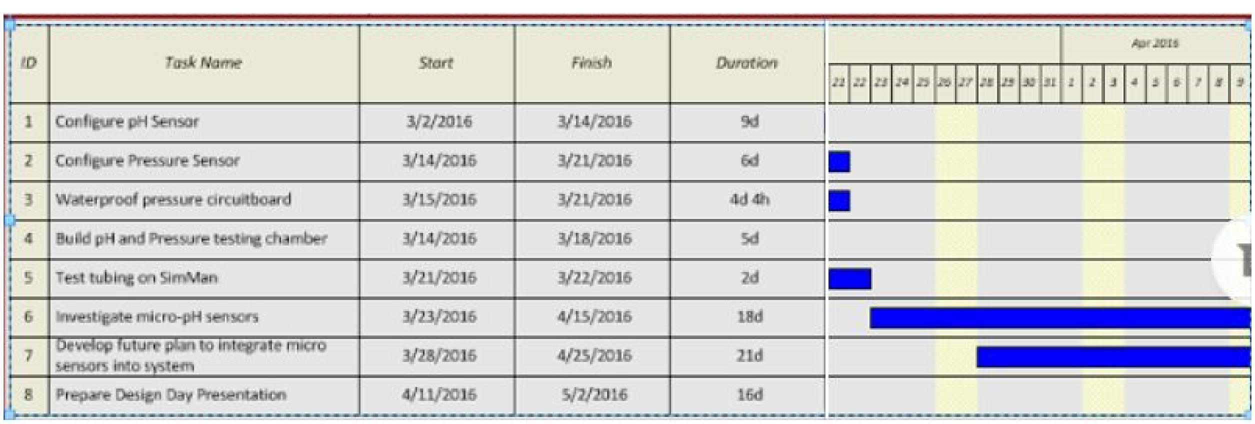
We will be meeting with our sponsor, Dr. Abumrad, to inform him of the limitations of our budget and building materials. We will be unable to incorporate microsensors into our design mostly due to budget constraints as well as practicality. However, we want to outline the parts and code necessary to incorporate these sensors into the device should he want to continue with the project for future use.

Once the tubing arrives, we will be able to schedule a time to test at CELA. We will be using a SimMan to test the compatibility of our tube with the size and shape of the gastrointestinal system. We will also be able to measure the distance between expected landmarks in order to optimize the length of tubing and wire necessary.

Assessment of Schedule, Budget, and Objectives

We are currently waiting for the arrival of the PVC pipe and caps as well as the solutions for our cylindrical testing chamber. Once these parts arrive, we can continue to build our testing chamber. Once the chamber is built and filled with water, we can continue with calibration of the pressure sensor.

Gantt Chart



ID	Task Name	Start	Finish	Duration
1	Configure pH Sensor	3/2/2016	3/14/2016	9d
2	Configure Pressure Sensor	3/14/2016	3/21/2016	6d
3	Waterproof pressure circuitboard	3/15/2016	3/21/2016	4d 4h
4	Build pH and Pressure testing chamber	3/14/2016	3/18/2016	5d
5	Test tubing on SimMan	3/21/2016	3/22/2016	2d
6	Investigate micro-pH sensors	3/23/2016	4/15/2016	18d
7	Develop future plan to integrate micro sensors into system	3/28/2016	4/25/2016	21d
8	Prepare Design Day Presentation	4/11/2016	5/2/2016	16d