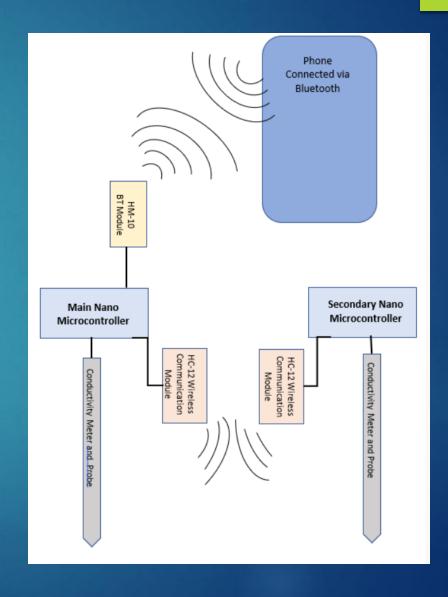
USDA Forest Service – Steam Velocity Measuring Device

STREAM TEAM: COLE BAILEY, JOSH CAMPER, ANTHONY DESANTIS, MAX RIETZE

CLIENTS: PETE ROBICHAUD AND BOB BROWN (FOREST SERVICE)

Problem Statement

Develop Bluetooth technology that can communicate wirelessly with 2 or more conductivity probes to measure small stream velocity. The readout of the probes, probe settings, and software be accessible from a tablet or smart phone.



Project Requirements

OPERATING ENVIRONMENT

Velocity range – 2 L/min to approx. 4 cfs

Stream Width – Sample in USDA lab to Paradise Creek

Required Probe Separation – 6 stream widths

Physical Property Used for Measurement – water conductivity

USER FRIENDLINESS

Remote Operation - would prefer wireless system that reads as far as 100ft away from probes

Versatile Probe Support System - may be used by operator for balance in rough terrain

Display - available to user on tablet or other wireless device

Set Up – Once users arrive at the sampling site, can be up and running reliability with 20 minutes

Transportability - can be easily carried ¼ mile by one person (less than 20 lbs)

Packaging – all components fit within single waterproof carrying case, plus a couple of hand-held poles

Project Requirements (Continued)

DURABILITY

Must be suitable for use in all weather conditions, including rain/sleet/snow

Streams sometimes are full of sediment and that can interrupt testing

Cannot break in such a way that the devices pollute the environment

Batteries can support field operation for 10 hours w/o recharging

SOFTWARE

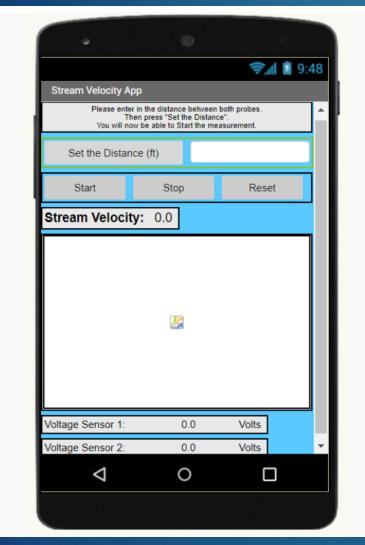
Velocity Calculation – Probe separation divided by time between Peak to Peak concentrations

Reliability - Integration of peak with 5% offset

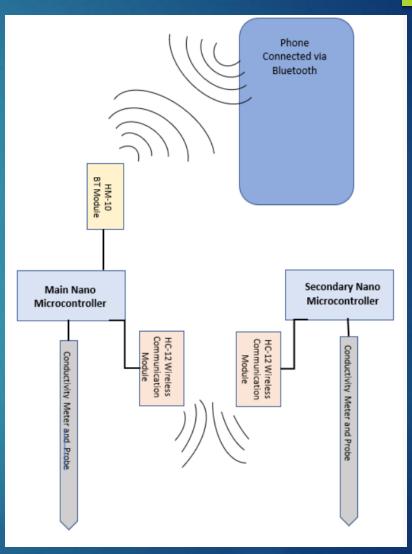
Data Logging – DAQ that runs on batteries equipped with Excel-like tool

Sampling Rate – 8 readings/sec with simultaneous sampling from two channels

Concept Development – Electronics

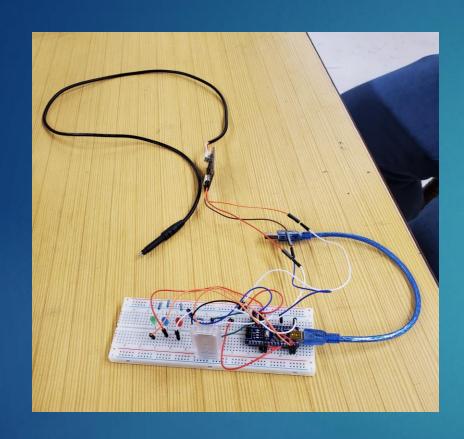


App Design

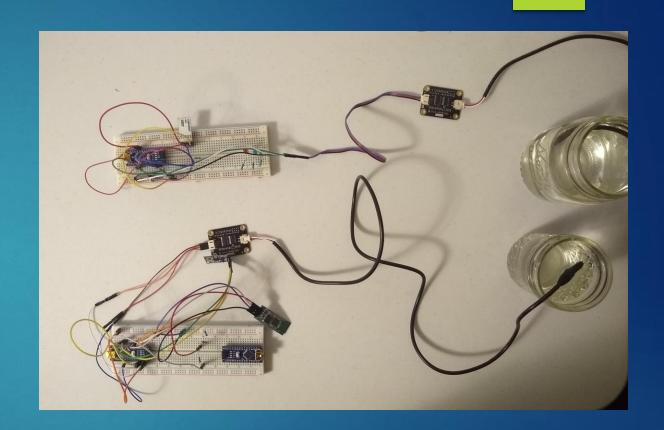


Circuit Diagram

Concept Development - Electronics

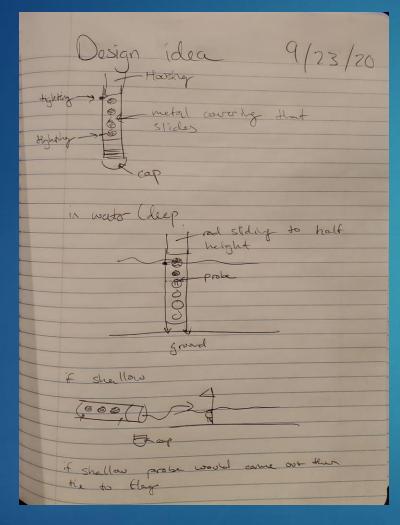


Single Probe System



Double Probe System

Concept Development – Probe Stick



Initial Holder Design



SolidWorks 3D Model

Schedule

Capstone	Project Schedule Template - Fall-Spring																														
			Project: USDA Foreset Service - Steam Velocity Measurment Device																												
		Last	t Updated:																												
			Year											4. A	10			- 4			2021										
			Month		Se	pt			Oct				Nov			Dec				Jan				Feb			-	Mar			
Category	Task Description	Duration	rear someon	9/2			9/23	9/30	10/7		10/21	10/28	11/4			11/25	12/2			12/23	12/30	1/6		1/20	1/27	2/3				3/3	
Main 1	Make sure probes read concentration and communicate between them				95								22														- 27				
Sub 1.1	Set up a way to read the signal from a device		EE								- 85		(); 10						183							- 1	155	90			
Sub 1.2	Test probes with the salt solution and the device that reads the signal		EE																												
Main 2	Waterproofed components (housing)				(A)						- 89		%						955							17	13	90			
Sub 2.1	Design sketches/drawings/3D models		ME				-																								
Sub 2.2	Prototype designs		ME		% **						8		3						955							17	155	- 8			
Main 3	Make app to read data																														
Sub 3.1	Get app to read data from probes		EE		(); ()						9		9						983							19	15	- 80			
Sub 3.2	Get app to make calculations that are desired client		EE		*																										
Sub 3.3	Get app to make graphs that are desired by client		EE		(); (0)								9													11	95	- 8			
Main 4	One system that we can use to set housing for all stream sizes				**																										
Sub 4.1	Design sketches/drawings/3D models		ME		% 80						9		G S						9								95	- 8			
Sub 4.2	Prototype designs		ME		*																										
Main 5	Lab tested "working" version by end of semester				en en			š š			- 59		(%) (3)				· 8		38		2					10	95	- 80			
Sub 5.1	Combine waterproof housing with the system design		ME/EE																												
Sub 5.2	Test everything combined in a small stream		ME/EE		8						18		3													- 10	153	90			
Main 6	Test real world in spring																														
Sub 6.1	Test everything combined in a bigger stream outdoors		ME/EE		3						8		e e						8								- 8	3			
Sub 6.2	Client Testing		ME/EE																												
					2																			3			19				

Feedback / Questions?