



BITNG PROJECT UPDATE

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Date 9/24/2020

Outline

- Progress to date
- Shriner's project
- Robotic arm
- Schedule
 - Gantt Chart update
- Path forward
- Personal schedule

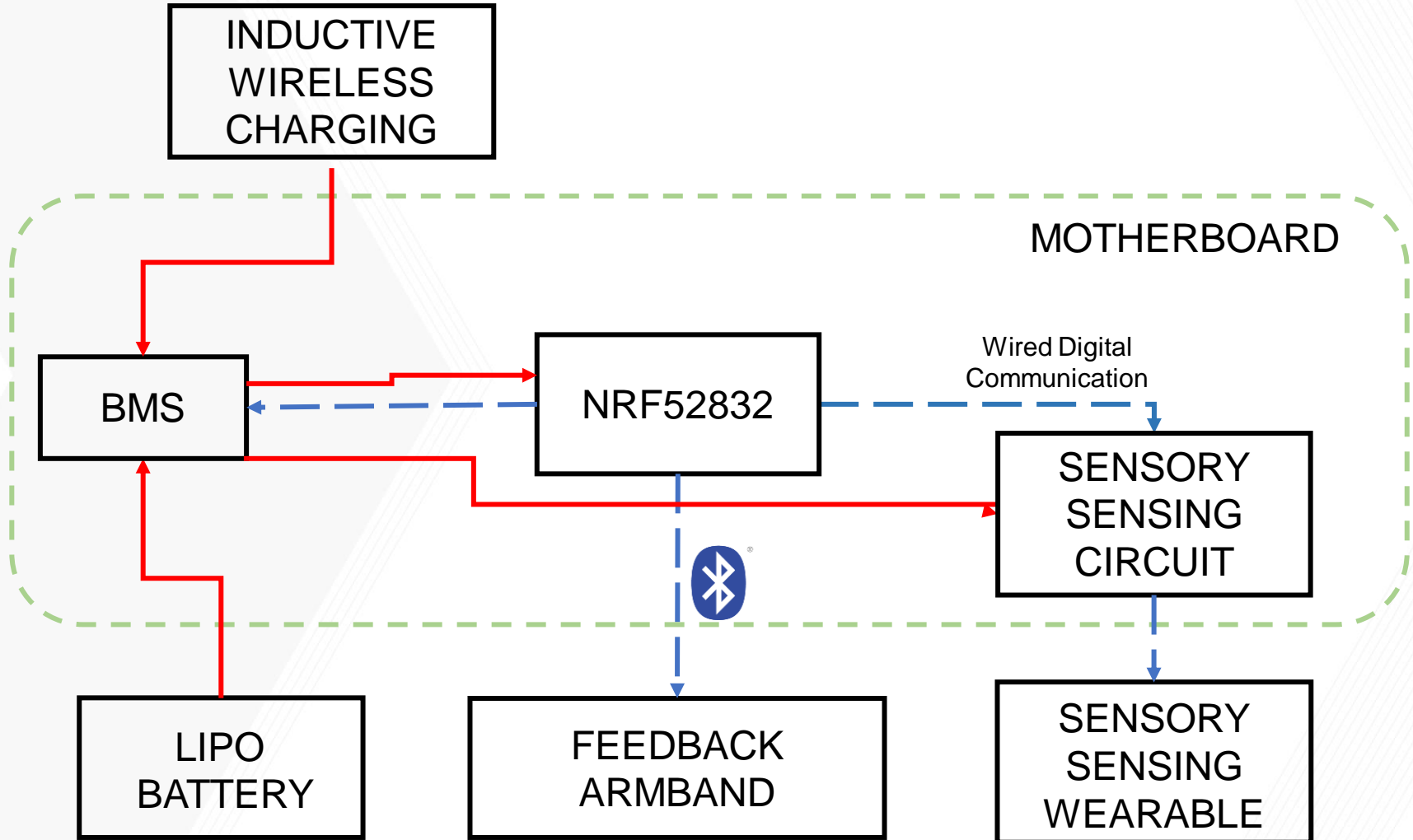
PROGRESS TO DATE

Progress from last week

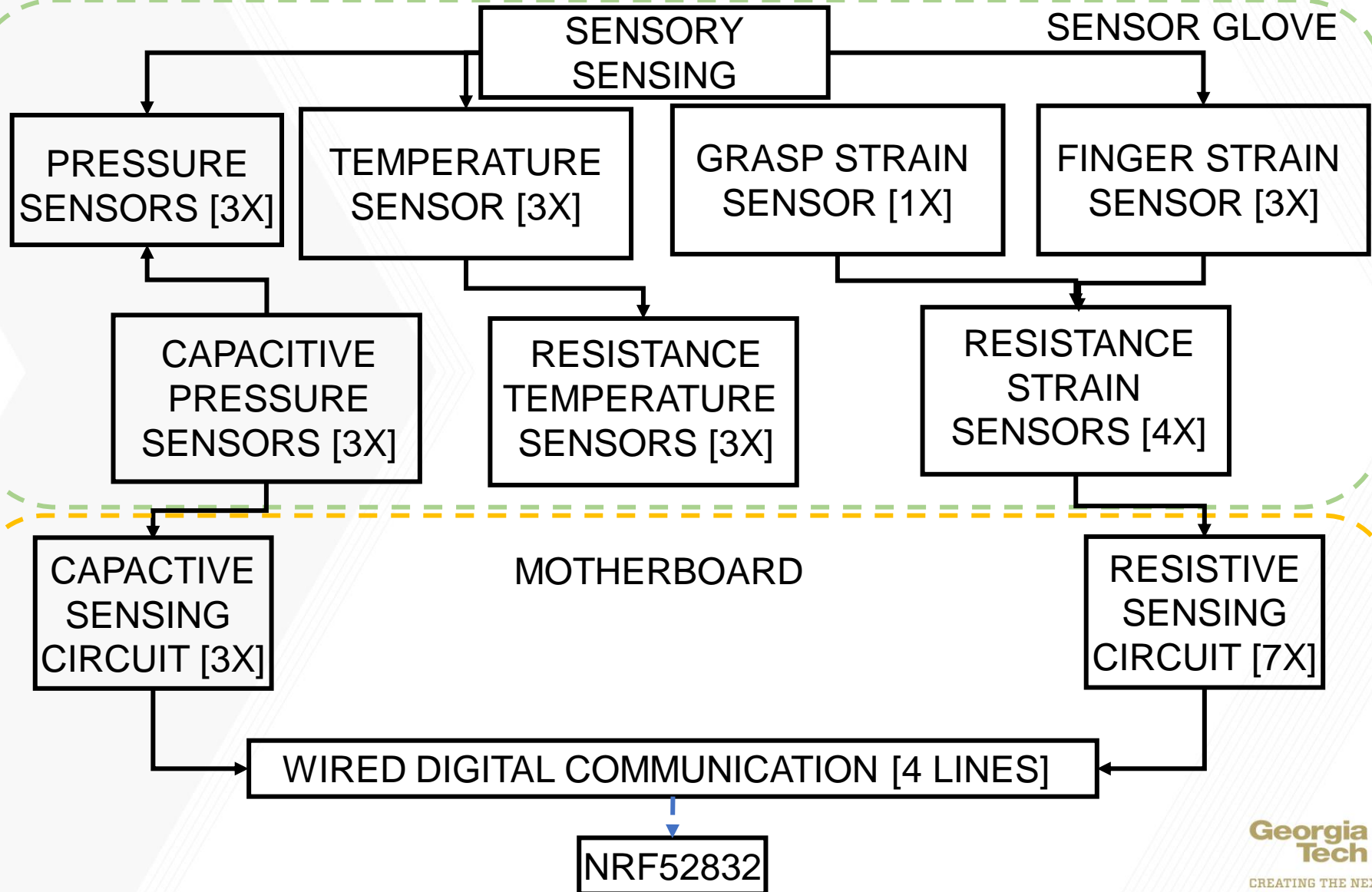
- Firmware
 - DAQ Slave driver [IN PROGRESS]
- Hardware
 - Inductive charging [IN PROGRESS]
 - Trying to optimize coil size
 - Waiting for coils
 - RF wireless power harvesting
 - Waiting for ICs
- Pediatric wearable
 - Literature review [IN PROGRESS]
 - Block diagram [FINISHED]
- Robotic arm
 - Configured robotic arm to replicate movements

SHRINER'S PROJECT

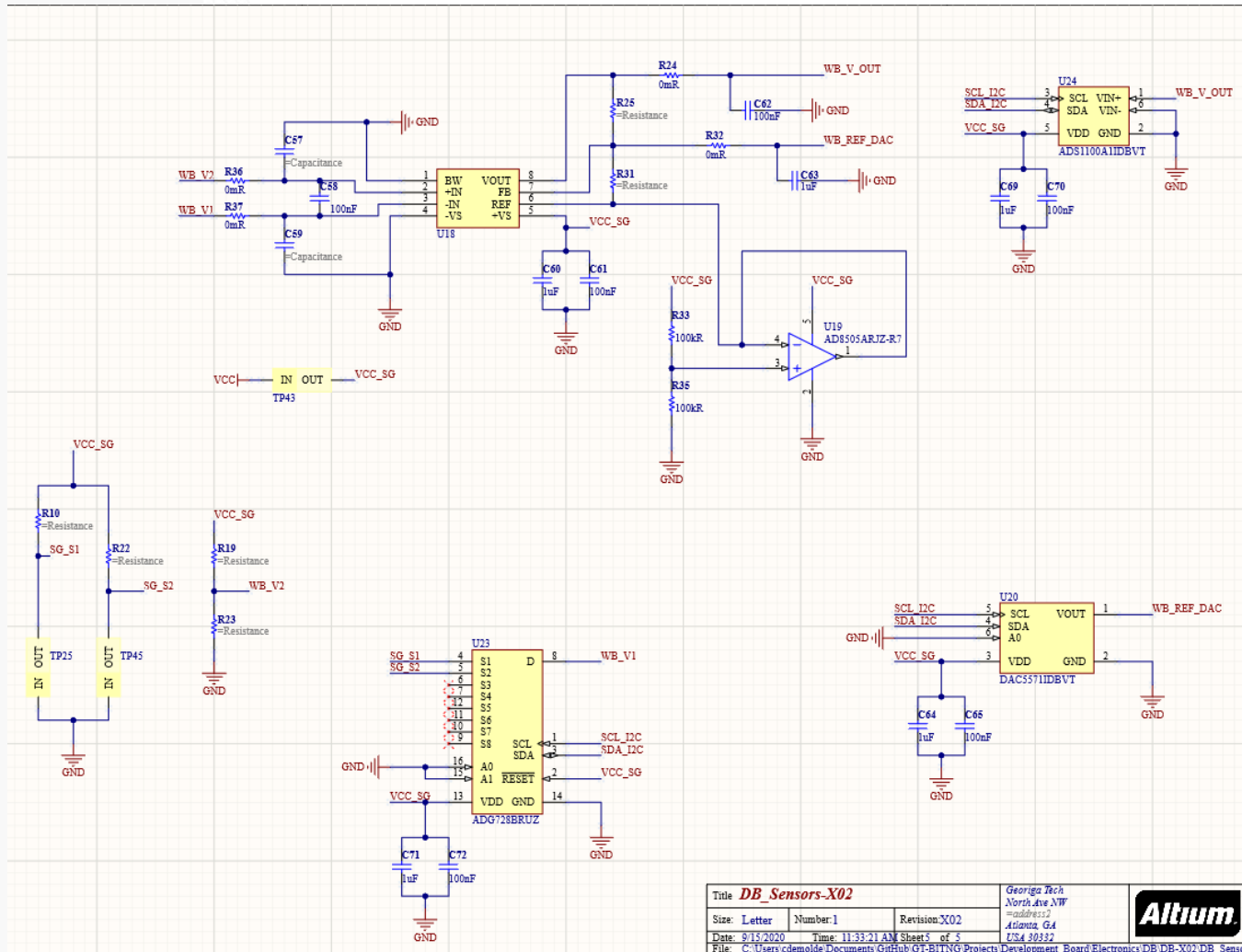
Block diagram-motherboard



Block diagram-sensory sensing



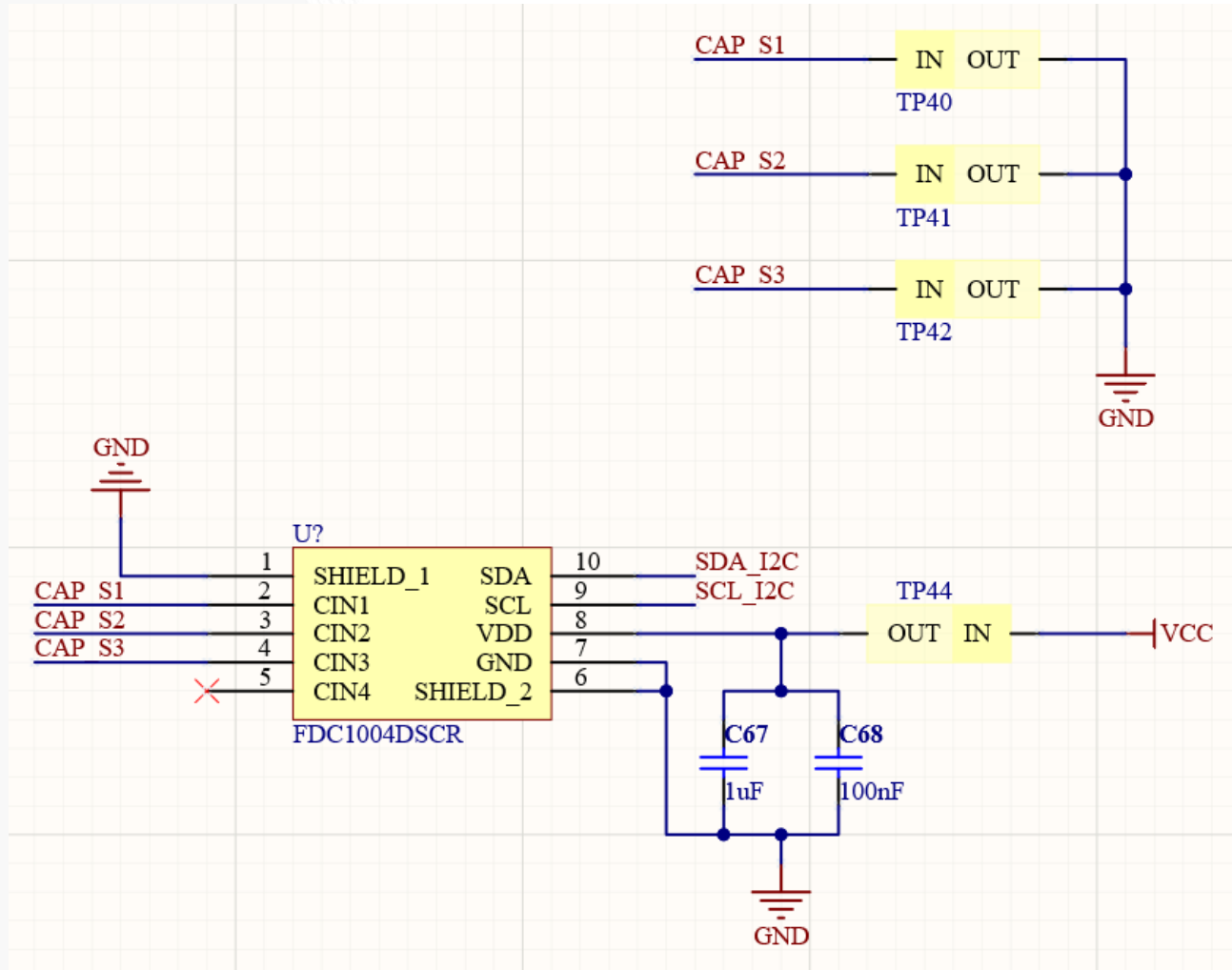
Resistive sensing circuit



Up to 8 resistance sensors

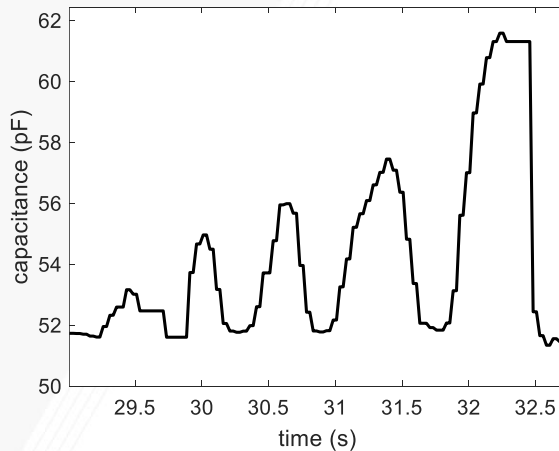
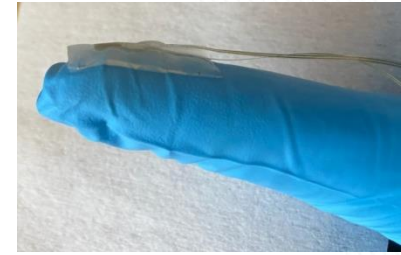
Capacitive sensing circuit

Up to 4 Capacitance sensors**

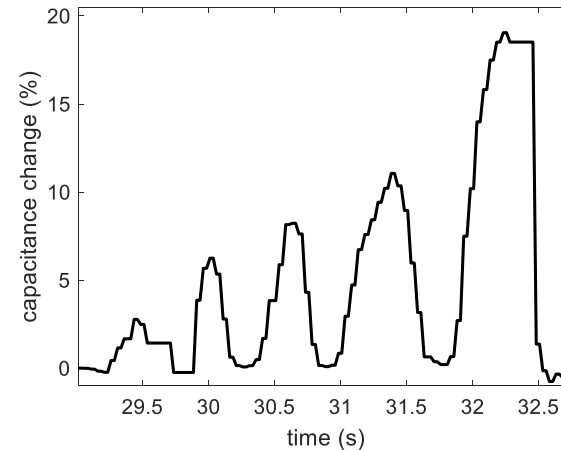


Capacitor sensors

- Data collected from Robby
- Max capacitance change
 - 20% ~ 10 pF



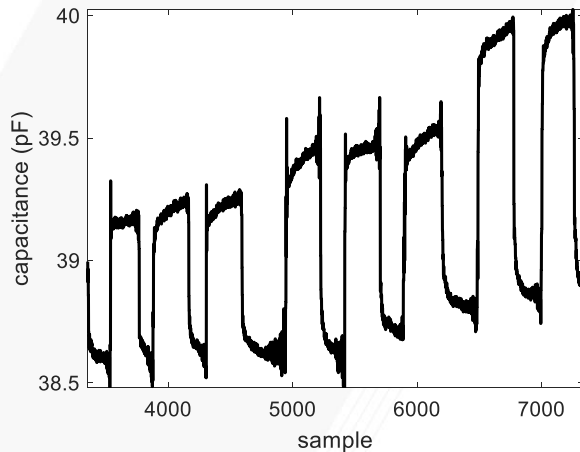
→
Increasing pressure



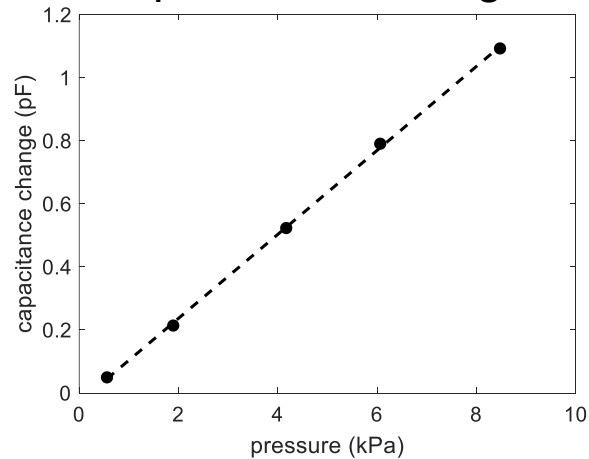
Capacitor sensors

- Data collected from Robby
- Sensitivity: 0.133 pF/kPa
- Pressure threshold > 0.5 kPa

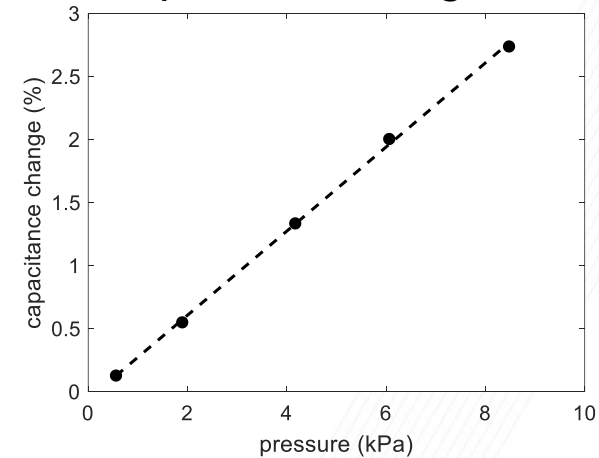
example data



capacitance change



percent change



Semmes Weinstein scale

- 4-180 grams of target force

Product Number	Evaluator Size	Target Force* in grams	Representation	Palmar Hand & Dorsal Foot Thresholds	Plantar Thresholds
NC12775-01	1.65	0.008	Green	Normal	Normal
NC12775-02	2.36	0.02			
NC12775-03	2.44	0.04			
NC12775-04	2.83	0.07			
NC12775-05	3.22	0.16	Blue	Diminished Light Touch	
NC12775-06	3.61	0.4			
NC12775-07	3.84	0.6	Purple	Diminished Protective Sensation	Diminished Light Touch
NC12775-08	4.08	1			
NC12775-09	4.17	1.4			
NC12775-10	4.31	2			
NC12775-11	4.56	4	Red	Loss of Protective Sensation	Diminished Protective Sensation
NC12775-12	4.74	6			Loss of Protective Sensation
NC12775-13	4.93	8			
NC12775-14	5.07	10			
NC12775-15	5.18	15			
NC12775-16	5.46	26			
NC12775-17	5.88	60			
NC12775-18	6.10	100			
NC12775-19	6.45	180			
NC12775-20	6.65	300		Deep Pressure Sensation Only	Deep Pressure Sensation Only

* Individually calibrated to within a 5% standard deviation.

Capacitance sensor design

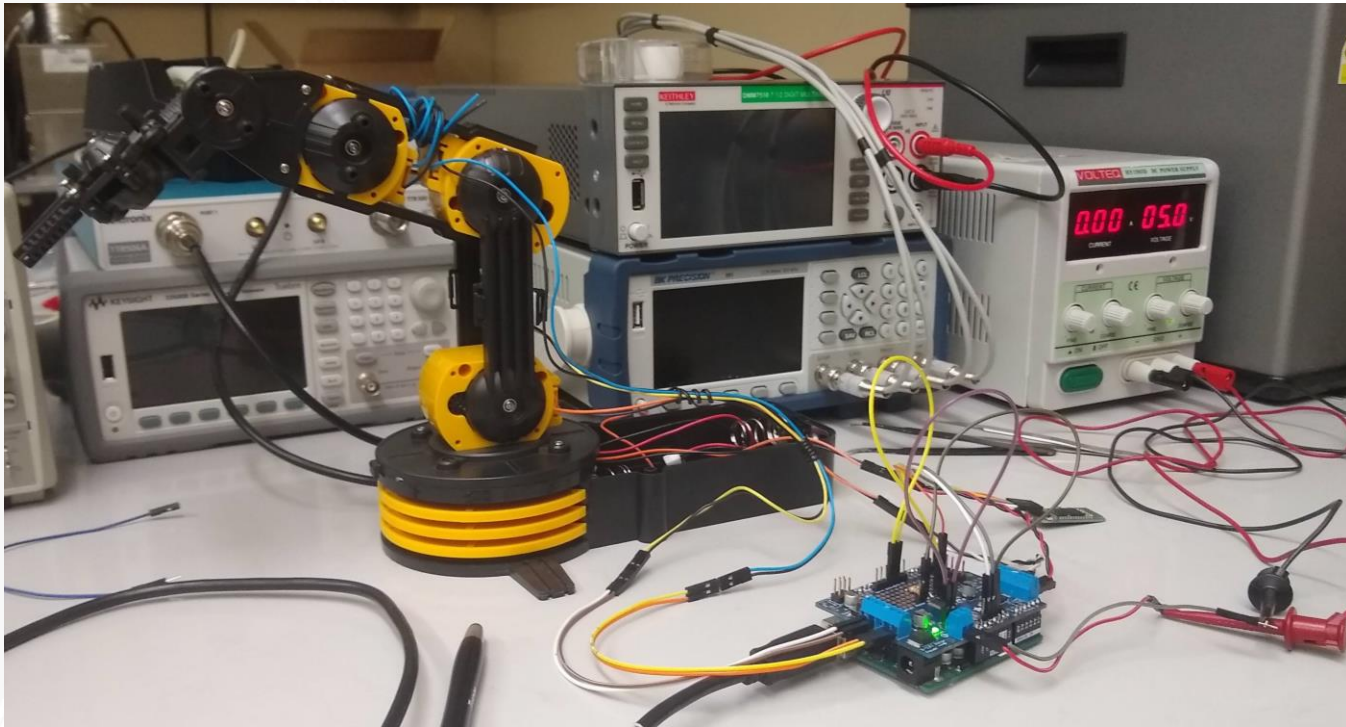
- Capacitor area (prior art): 5mm x 5mm
- Initial capacitance: 52 pF
- Sensitivity: 0.133 pF/ kPa

	Low threshold	High Threshold
Target force (g/N)	4 / 0.0392	180 / 1.764
Target pressure (kPa)	1.568	70.56
Capacitance change (pF/%)	0.2085 / 0.4	9.384 / 18
CDC units	910	40,999

ROBOTIC ARM

Robotic arm

- Configured robotic arm to replicate movements
 - Turn, grab, shoulder joint, elbow joint
 - PC to Arduino communication
 - Bluetooth to Arduino communication



SCHEDULE

Schedule Gantt chart

Task	9/13-9/20	9/20-9/27	9/27-10/4	10/4-10/11	10/11-10/18	10/18-10/25	10/25-11/01
DEVELOPMENT BOARD	✕						
-HARDWARE DEBUGGING	✕	●					
-FIRMWARE DEBUGGING	✕	●					
NEUROMOTOR PEDIATRIC WEARABLE							
-LITERATURE REVIEW	✕	●	●				
-DESIGN PROPOSAL	✕	●					
-BLOCK DIAGRAM	✕	●					
YEO GENERAL LAB							
-ROBOTIC ARM	✕	●					
-LOW POWER ECG	✕	●	●	●	●	●	●

LEGEND

- ✕ FINISHED
- TO-DO

PATH FORWARD

Path forward (9/21/20 – 9/28/20)

- Hardware:
 - Wireless charging
 - Inductive charging: Need to test with smaller coils
 - RF: Need to test development kit
 - Sensor glove
 - Overall schematic design
 - Preliminary PCB layout
- Pediatrics Wearable:
 - Literature review
 - Existing landscape matrix
 - Paper draft
 - 9/22 Monthly meeting with clinicians
- EMG robotic arm:
 - Test bluetooth app
 - Map EMG movements to Bluetooth app

PERSONAL SCHEDULE

Personal schedule

- Planning on heading home to San Diego for a week
- 10/10 – 10/18
- Schedule in person work before I leave
- Working remotely on:
 - circuit design
 - programming for Shriner's project

APPENDIX