



BITNG LAB UPDATE

Carl Demolder

Date 1/11/2021

Outline

- Progress to date
- Path forward

PROGRESS TO DATE

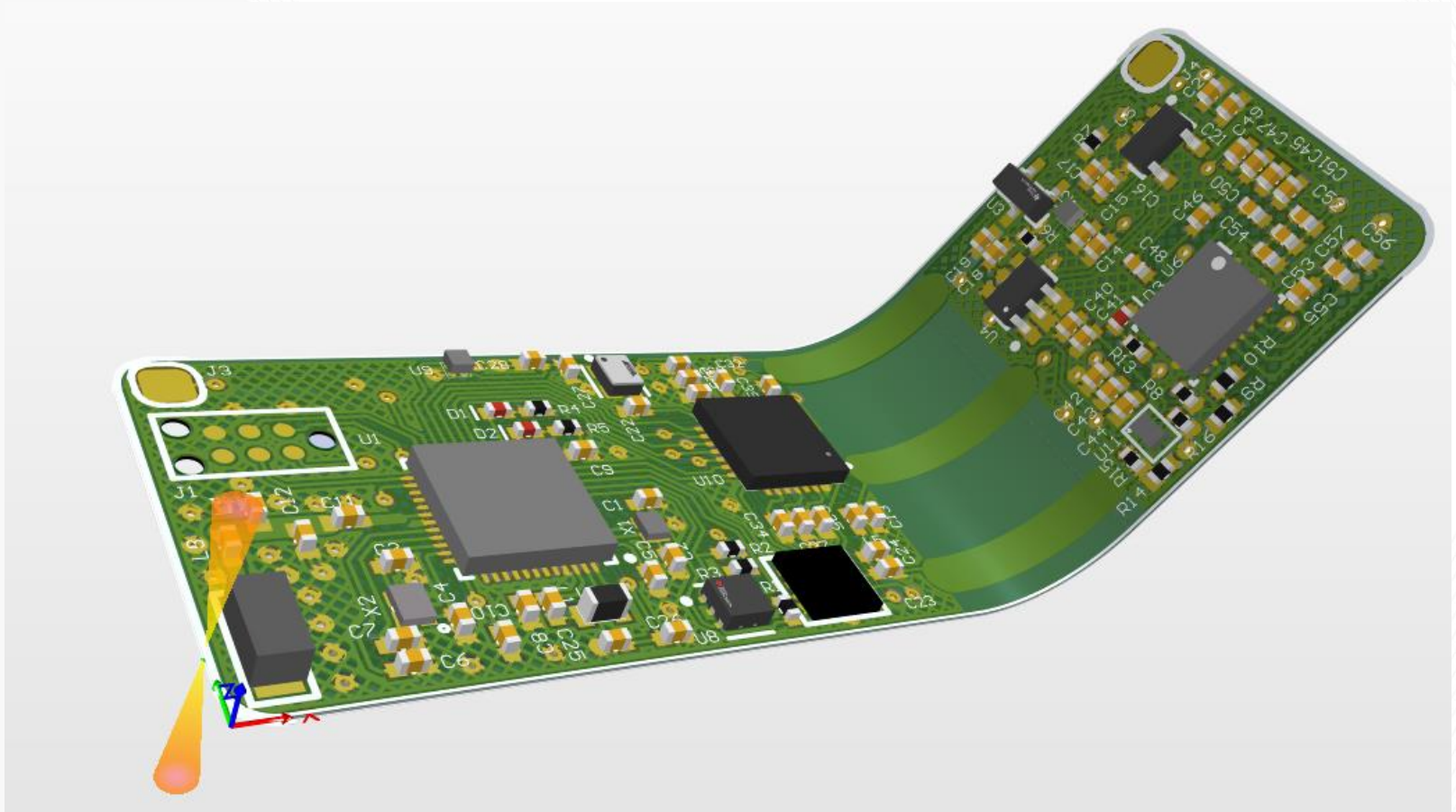
Progress from last week

- LP ECG
 - PCB procurement
- Shriner's project
 - Literature review

LP ECG PROJECT

FLEX PCB

- Arriving 1/13



SHRINER'S PROJECT

Literature review

- Tables:
 - Existing Technology Overview
 - Pressure sensors (wearable sensor glove)
 - Temperature sensors (wearable sensor glove)
 - Strain sensors (wearable sensor glove)
 - Glove Application
 - Glove Characteristics
- Figures:
 - Pie chart showing all three sensor nodes
 - Applications of sensor glove

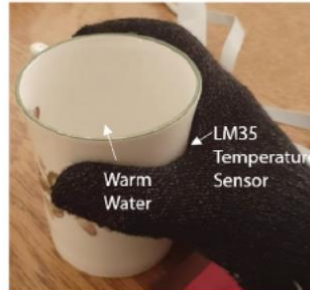
Sensor	Sensor properties			Glove application	Reference
	Material	Mechanical	Electrical		
Temperature	OTS Texas Instruments Contact Temperature Sensor	2.80 mm x 2.95 mm	0.0625 C/Bit using TC77 IC	Prosthetic and robotic hand sensory enhancement	Polishchuk et al. [16] (2016)
	OTS Texas Instruments Contact Temperature Sensor	5.00 m x 4.8 mm	$\pm 0.5^{\circ}\text{C}$ Accuracy; 10 mV/ $^{\circ}\text{C}$	Temperature detection for wearable sensor glove	Hughes et al. [5] (2020)
Pressure	OTS Interlink Electronics FSR	Piezoelectric sensor; 0.2" Diameter	22 N/M Ω	Prosthetic and robotic hand sensory enhancement	Polishchuk et al. [16] (2016)
	Silicone tubing filled with water	2 mm diameter soft tubing	Pressure Delta = 3 – 100 Pa; transducer sensitivity = 38.26 mV/kPa	fluidic pressure sensors glove	Hughes et al. [5] (2020)
	Silicone based sensor with conductive liquid	5.3% Hysteresis @ 1 Hz	100% Resistance increase at 5 N;	Soft fluidic sensors for wearable sensor glove	Xu et al. [6] (2019)
	Galinstan liquid metal in EcoFlex silicone rubber	H = 500 um, W = 300 um, L = 157.4 mm	Pressure sensitivity = 125 kPa / V	Elastomer film to integrate sensors onto hand	Hammond et al. [17] (2014)
Strain	EPR, Scotch Electrical Semi-Conducting Tape 13	Elongation = 800%; 5 mm x 20 mm	Resistance change = 30.6%	Fabric sensor glove using silver plated nylon thread	Shen et al. [3] (2016)
	OTS Flexion sensors	H = 0.43 mm; L = 112 mm; W = 6.35 mm	> 1 million cycles; Flat resistance = 10 k Ω	Mirror therapy and task-oriented therapy	Chen et al. [10] (2019)
	Galinstan liquid metal in EcoFlex silicone rubber	H = 500 um, W = 300 um, L = 97 mm	1.58 N / V	Elastomer film to integrate sensors onto hand	Hammond et al. [17] (2017)
	???	Conductive knitted glove with insulated wire	120 unique sensor readouts	Resistive knitting for strain detection in glove	Hughes et al. [5] (2020)
	Silicone based sensor with conductive liquid	Silicone Eco-Flex; E = 70 kPa; Failure Strain = 900%	GF = 2.2 @ 1 Hz	Soft fluidic sensors for wearable sensor gloves	Xu et al. [6] (2019)



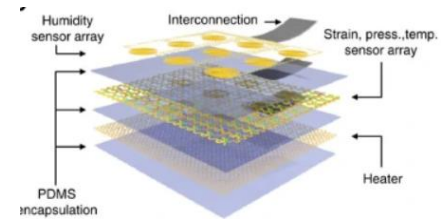
A1



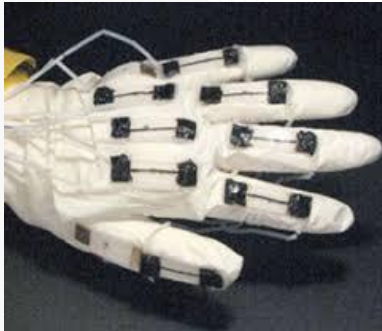
A2 [3]



A3 [7]



B1



B2 [3]



B3 [5]

Flexed Joints



C1



C2



C3 [5]



Figure XX. Various type of wearable sensor gloves for recording physical signals. A)

PATH FORWARD

Path forward (1/4/21 – 1/11/21)

- Shriner's Project:
 - Literature review
 - Tables and figures

APPENDIX