BITNG LAB UPDATE

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Date 1/14/2021

Outline

- Progress to date
- Path forward

PROGRESS TO DATE

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Progress from last week

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

LP ECG PROJECT

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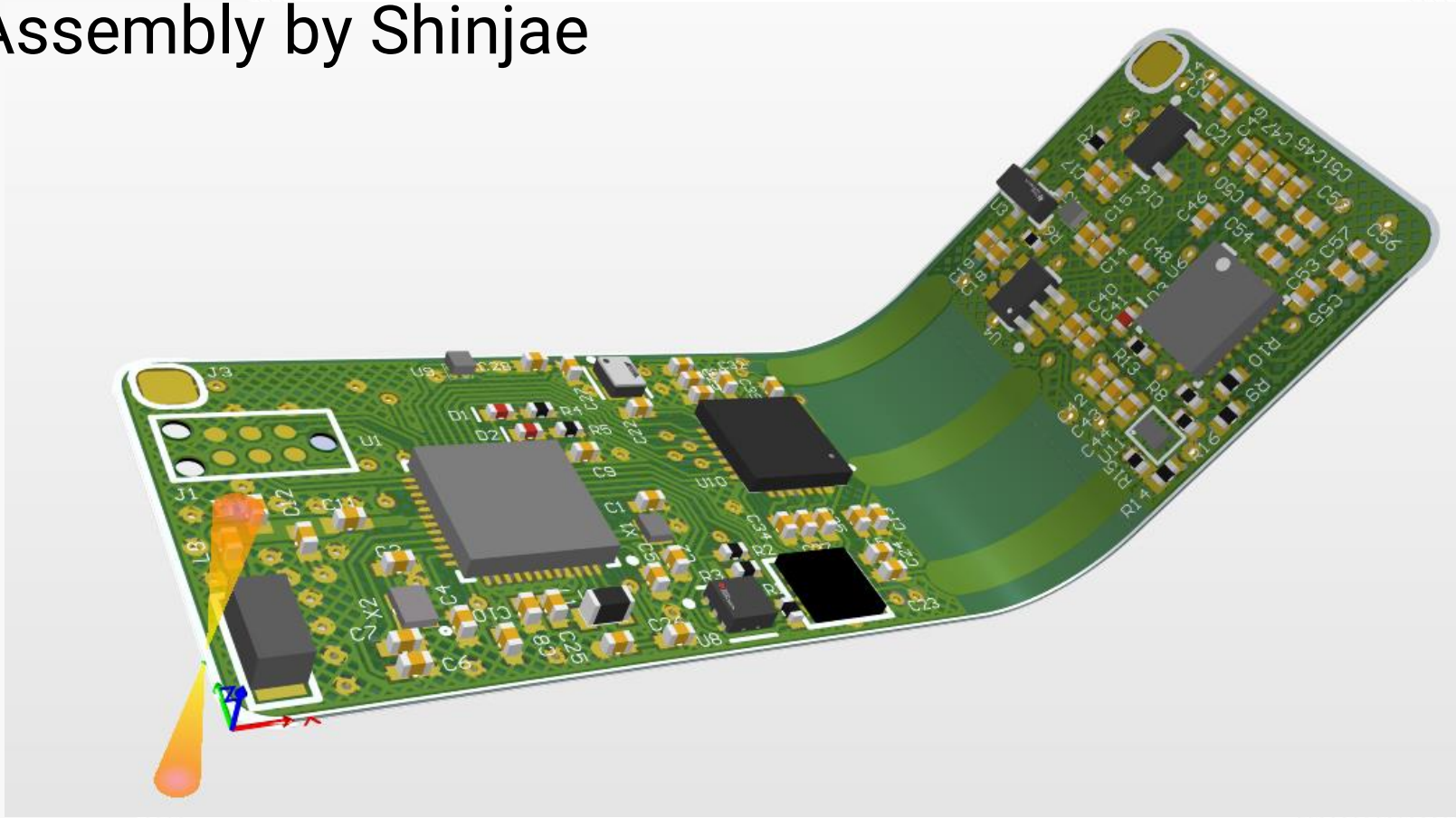
FLEX PCB & Components

- Arrived 1/13
- Assembly by Shinjae



SHRINER’S PROJECT

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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	Si, Au Nanoribbon in Polyimide	GF = 200; Fracture toughness = 1 MPa $m^{1/2}$; t = 110 nm	10 mV/C	Artificial skin containing staggered arrangement of sensors	Kim et al. [7] (2014)
	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	±0.5°C Accuracy; 10 mV/ C	Temperature detection for wearable sensor glove	Hughes et al. [5] (2020)
Pressure	OTS Interlink Electronics FSR	Piezoelectric sensor; 0.2" Diameter	22 N/MΩ	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)
	Si, Au Nanoribbon in Polyimide	GF = 200; Fracture toughness = 1 MPa $m^{1/2}$; t = 110 nm	Delta R/R0 %/Pressure kPa ~ 0.40	Artificial skin containing staggered arrangement of sensors	Kim et al. [7] (2014)
	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)
	Si, Au Nanoribbon in Polyimide	GF = 200; Fracture toughness = 1 MPa $m^{1/2}$; t = 110 nm	Delta R/R0 %/Strain % = 0.833	Artificial skin containing staggered arrangement of sensors	Kim et al. [7] (2014)
	OTS Flexion sensors	H = 0.43 mm; L = 112 mm; W = 6.35 mm	> 1 million cycles; Flat resistance = 10 kΩ	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)

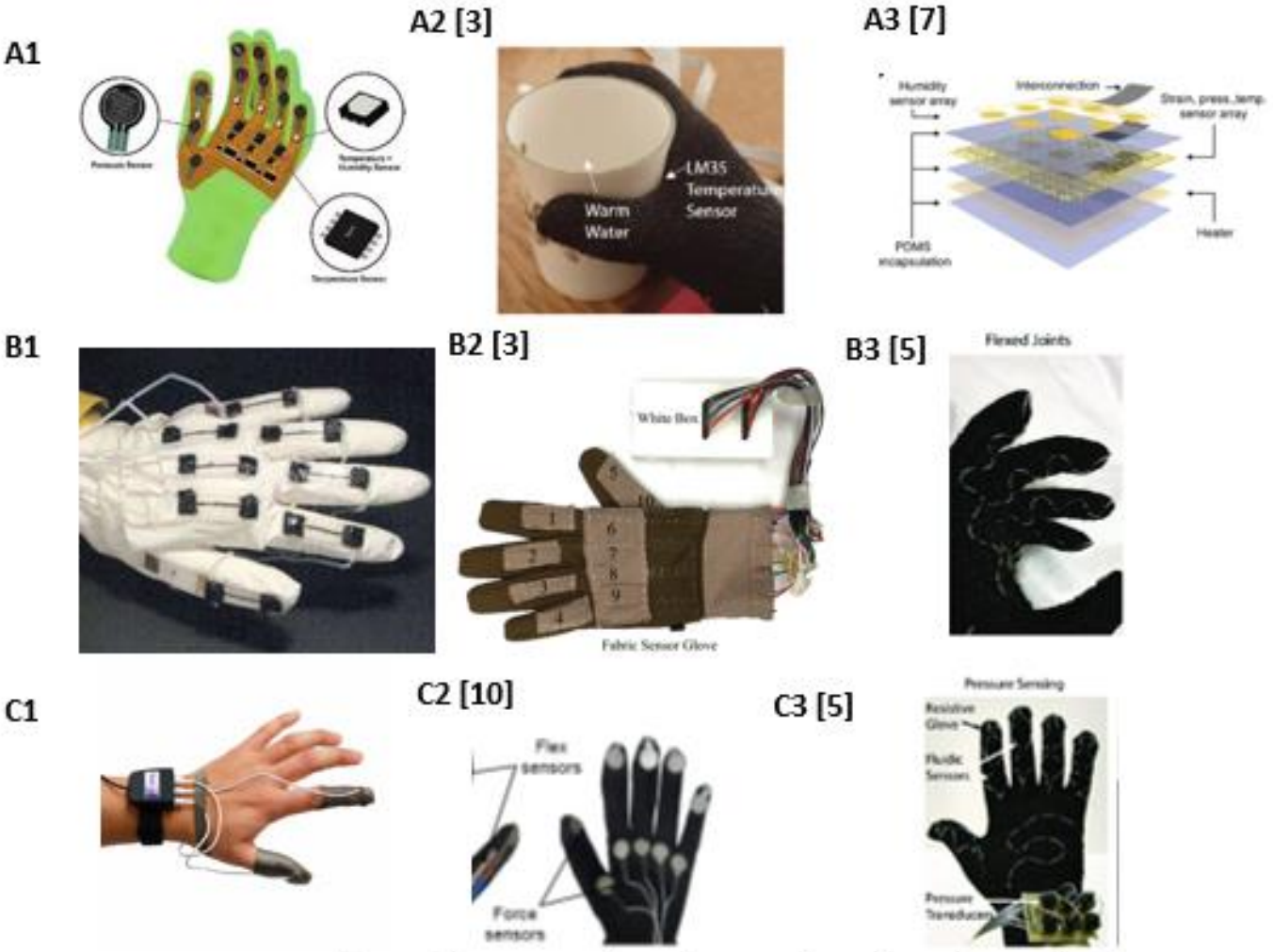

Figure XX. Various type of wearable sensor gloves for recording physical signals. A)

PATH FORWARD

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Path forward (1/4/21 – 1/11/21)

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

APPENDIX

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