



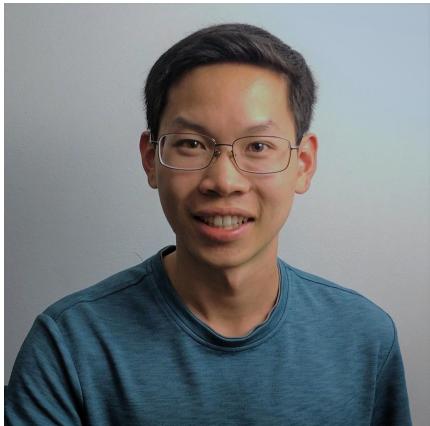
Project Gestur

by Reihlo

Kyle Carson, Ryan Kaveh, Jon Young, Ryan Lee, Ryan Tsukomoto



Introduction



Jon Young
4th Year EE



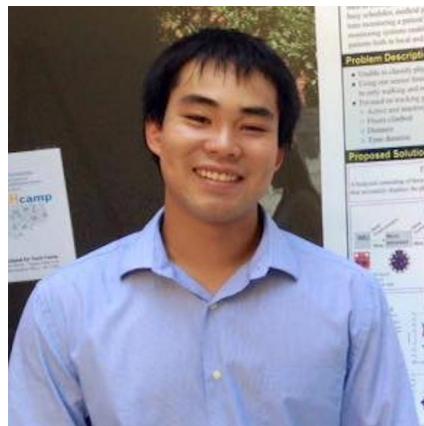
Ryan Kaveh
4th Year CE



Kyle Carson
4th Year CE



Ryan Tsukamoto
3rd Year ME



Ryan Lee
3rd Year ME

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Background

Virtual Reality
Unintuitive controls for 3D
Limited haptic devices



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Background —

- Gestur glove as a bridge
- Intuitive virtual control
- Applications outside of VR



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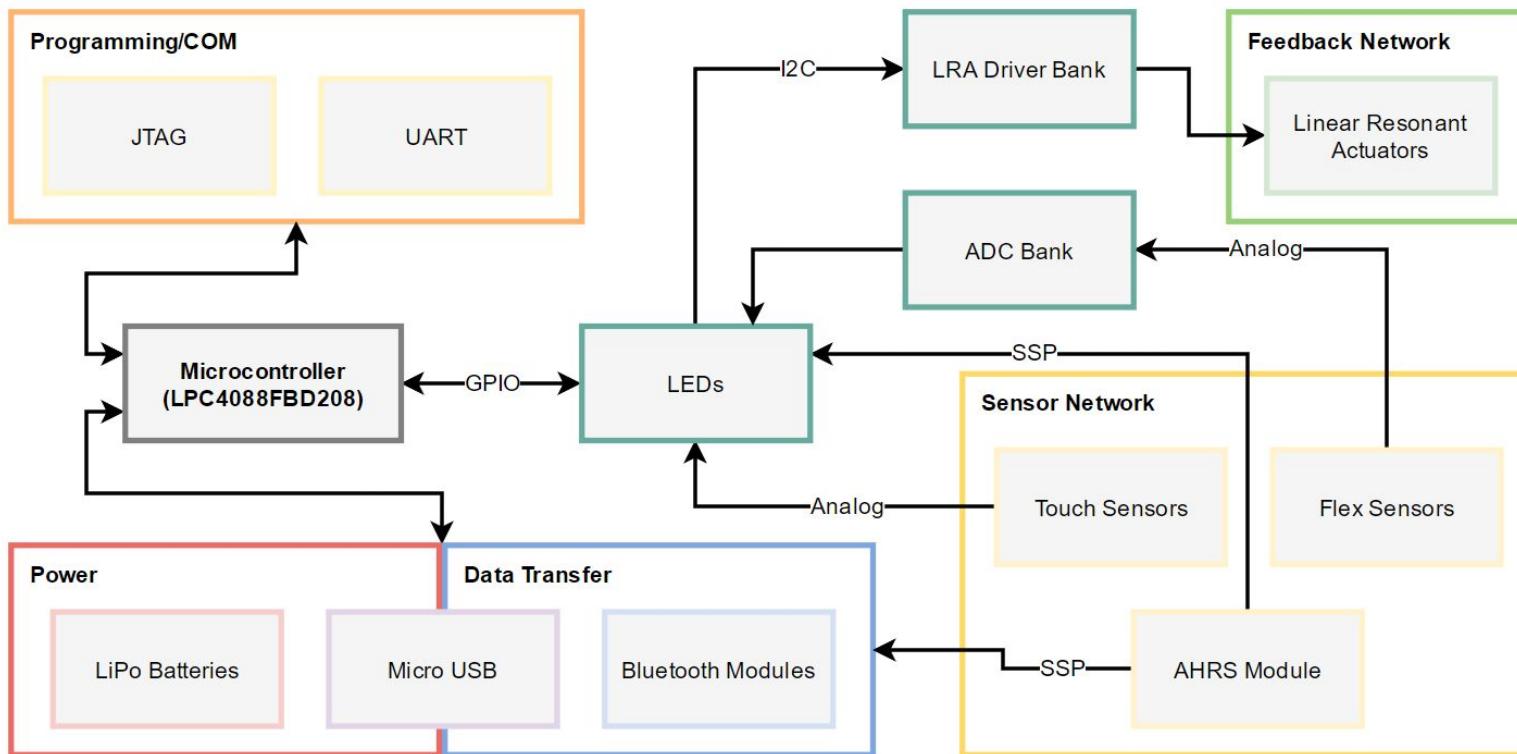
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Entire System

Sensors - Electronics - Host-Side Processing



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Subsystems — Glove

- Flex sensors
- AHRS
- Vibration motors
- Touch controls



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Subsystems

- Flex sensors
- AHRS
- Vibration motors
- Touch controls

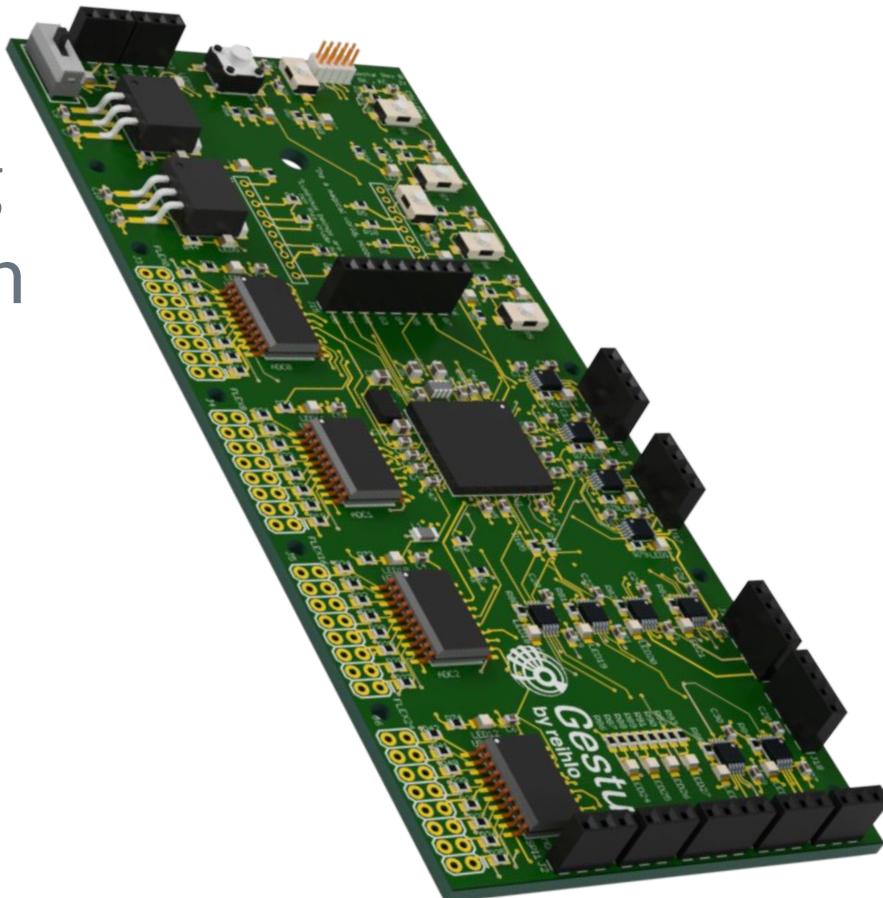


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Subsystems

 — **Board**

- LPC 4088 uC
- Sensor sampling
- Low pass filtering
- Com w/ bluetooth
- Battery board



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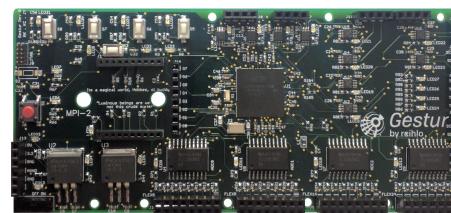
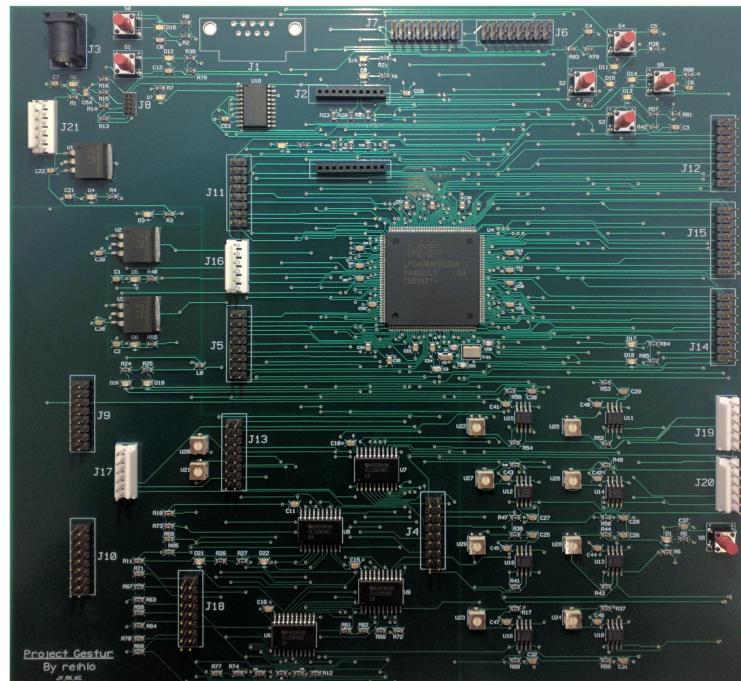
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Hardware

Iterative Design

- Two iterations thanks to Laritech
- First Capstone to use a BGA
- 2nd spin is 80% smaller
- Updated design



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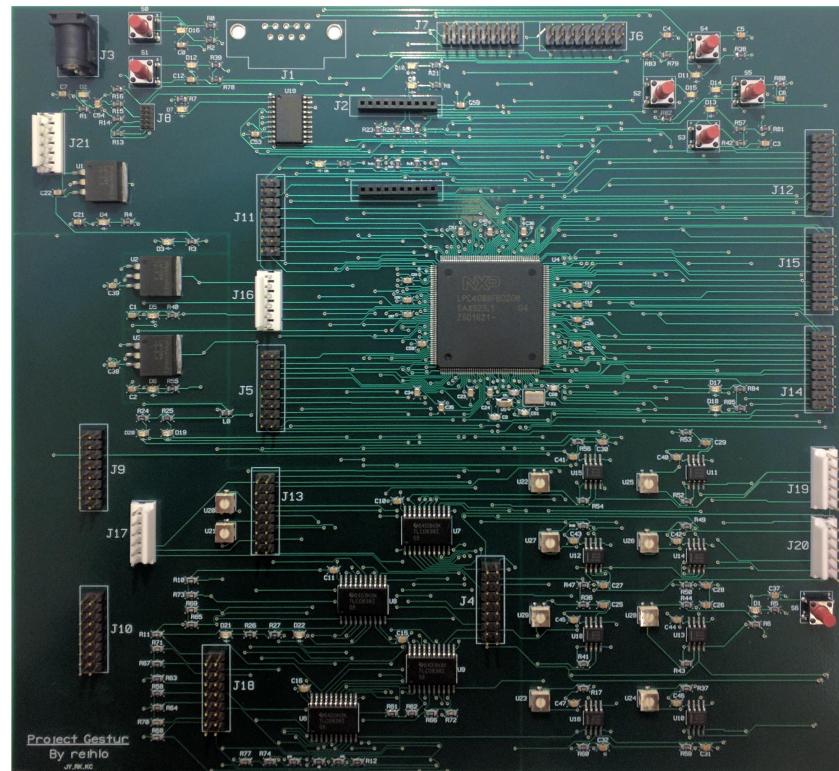
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Hardware

Rev A

- Dev kit
- Adaptable
- Redundancies
- Reused designs from past groups
- More of a backpack than glove



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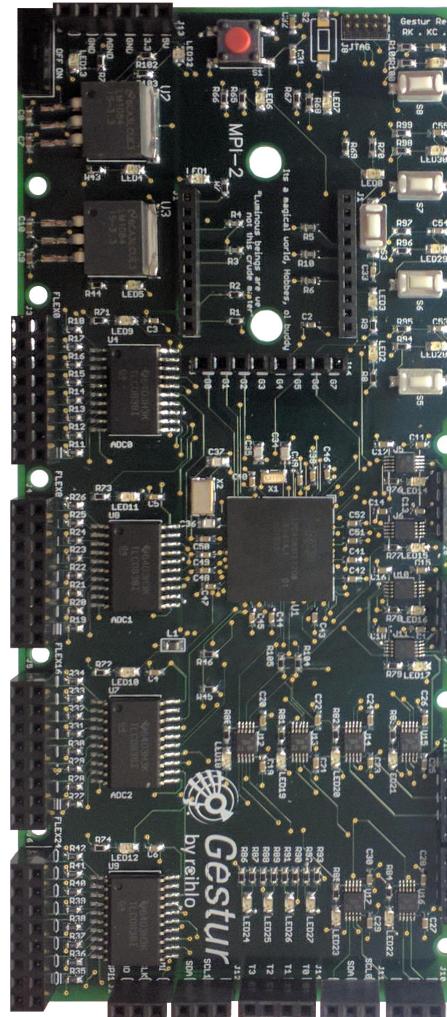
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Hardware

Rev B

- Closer to production model
- Significantly better design
- BGAs & 0603s
- Updated design for vibration motors
- Battery powered
- Fully wireless
- Smaller than a smartphone (2.5" x 5.5")



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Construction

- All parts sewn onto glove/sleeve
- 3D printed wire rack/mount
- Challenges include:
 - Wire management
 - Sensor placement
 - Longevity
 - Durability (strain relief)

Glove



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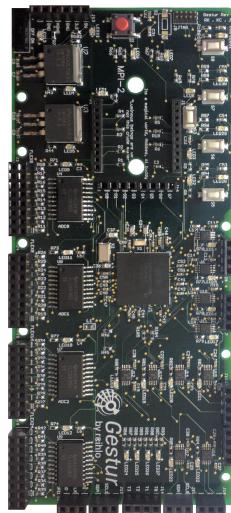
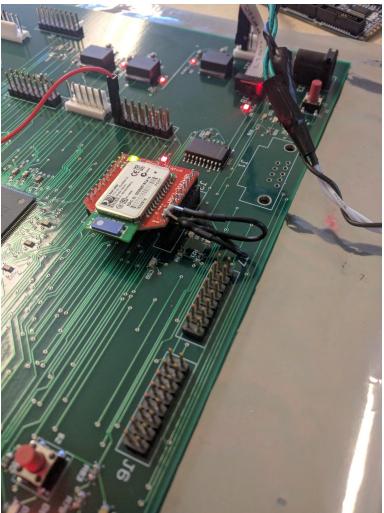
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- Flex sensor testing & improvements
- AHRS testing
- Board reworking



Integration



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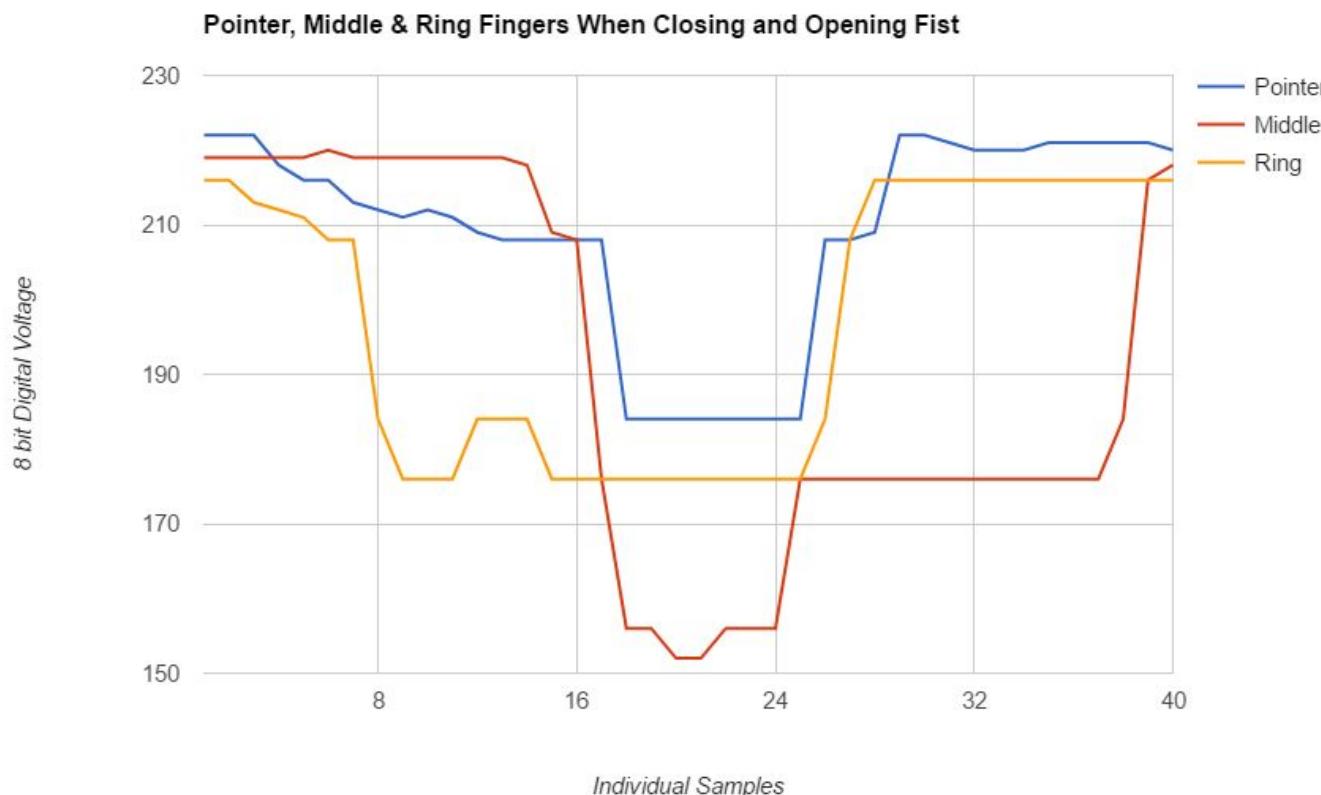
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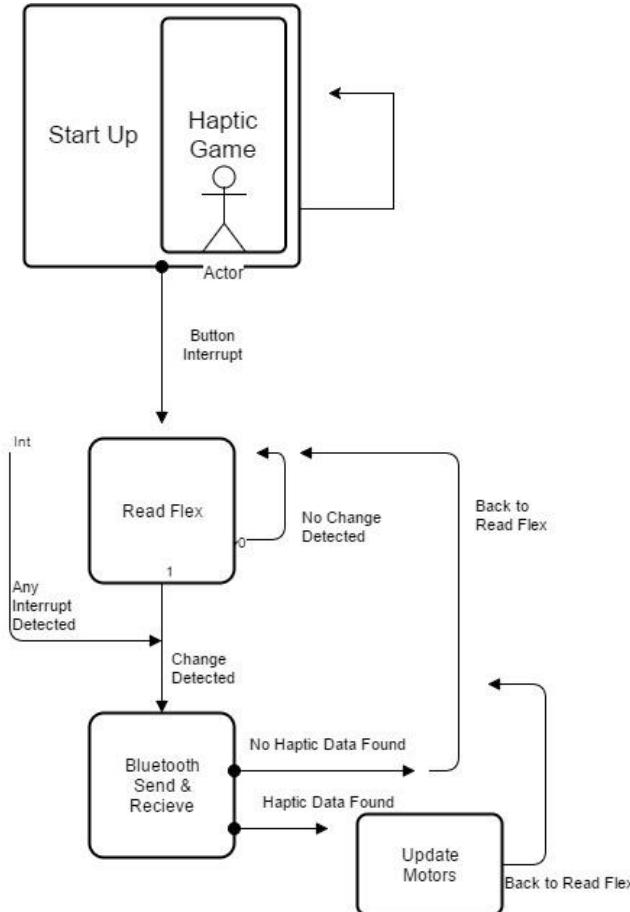
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Software

- FSM on LPC4088
- Communicates with host
- Poll & interrupt based state transitions
- Low power idle mode
- Will ensure board is always doing something useful



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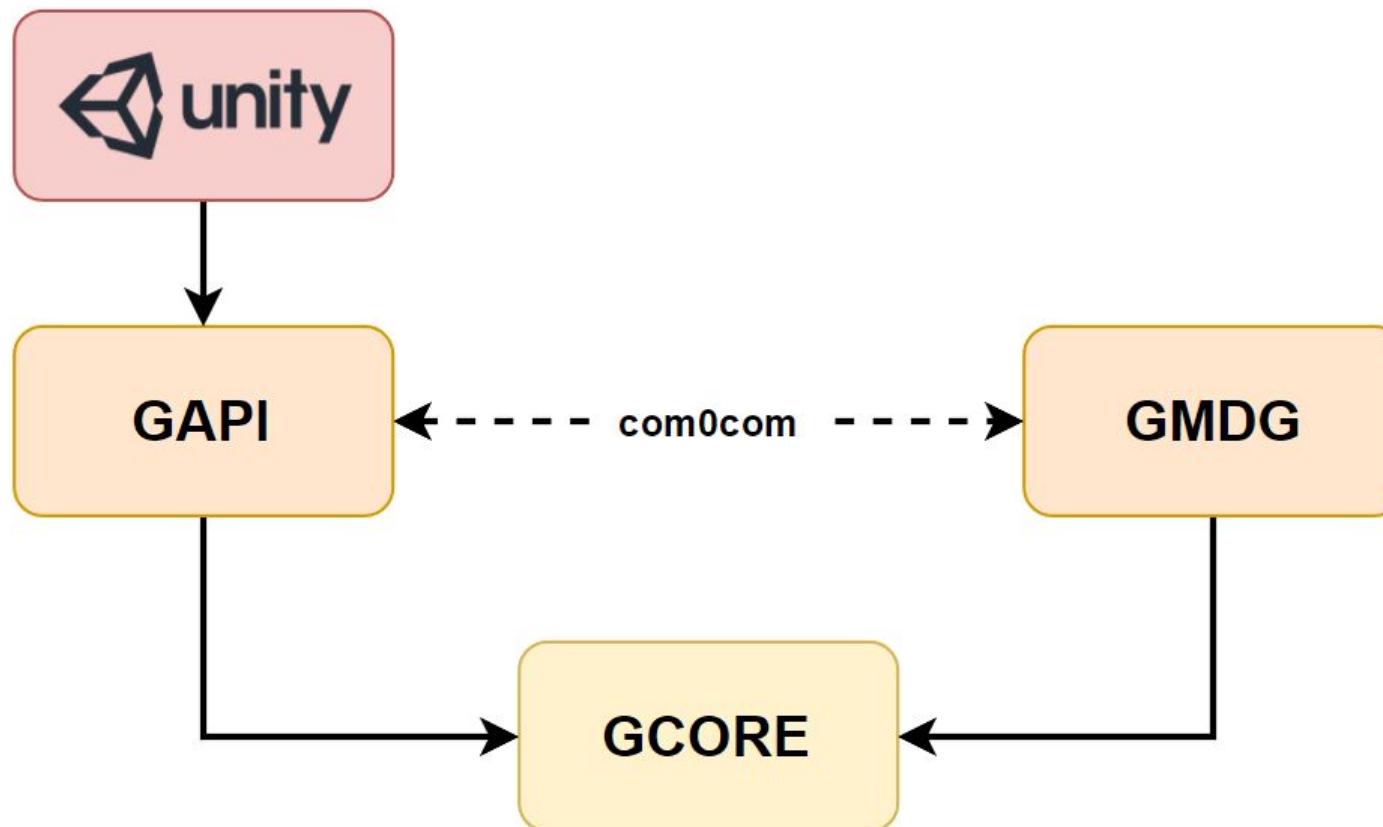
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Software API Hierarchy



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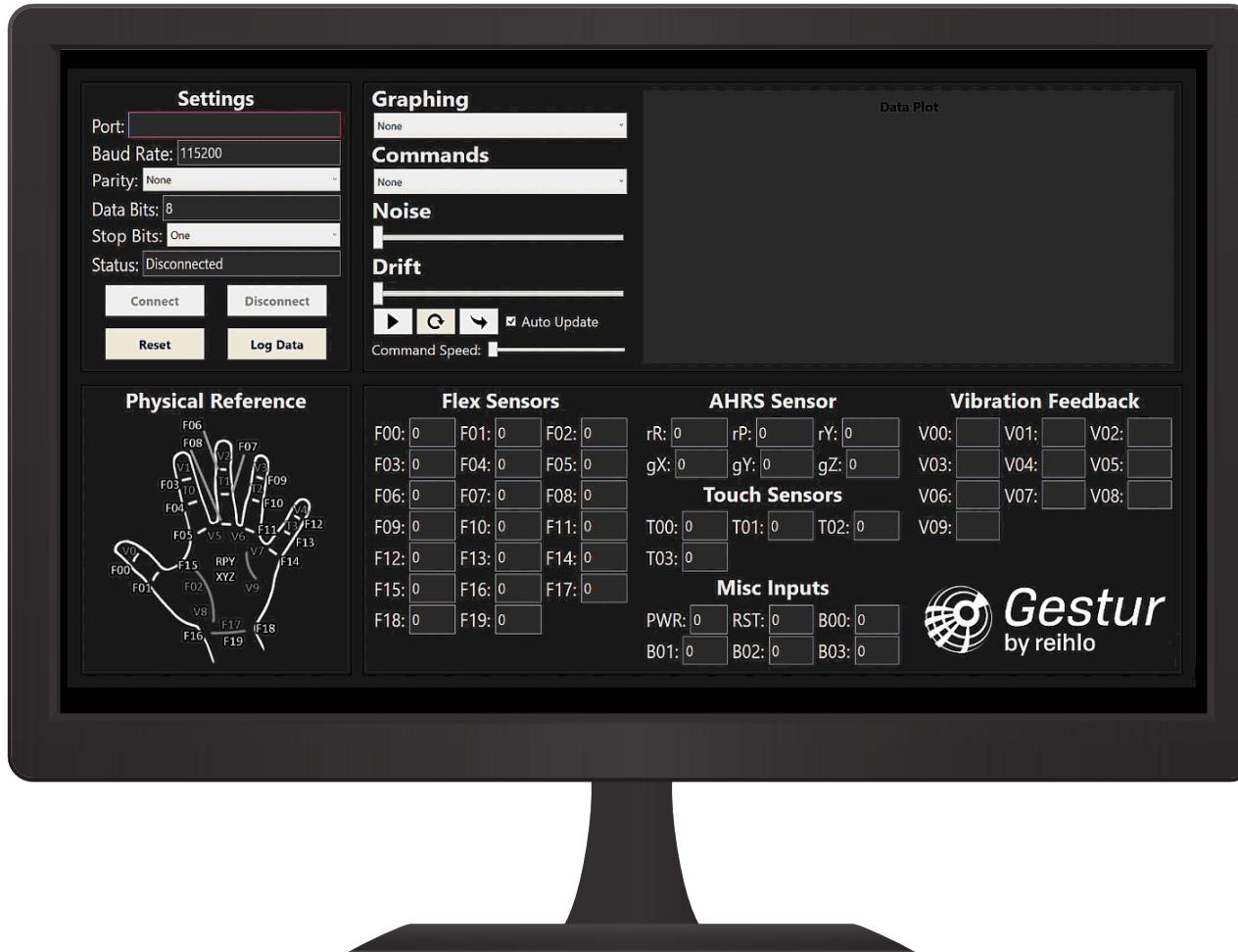
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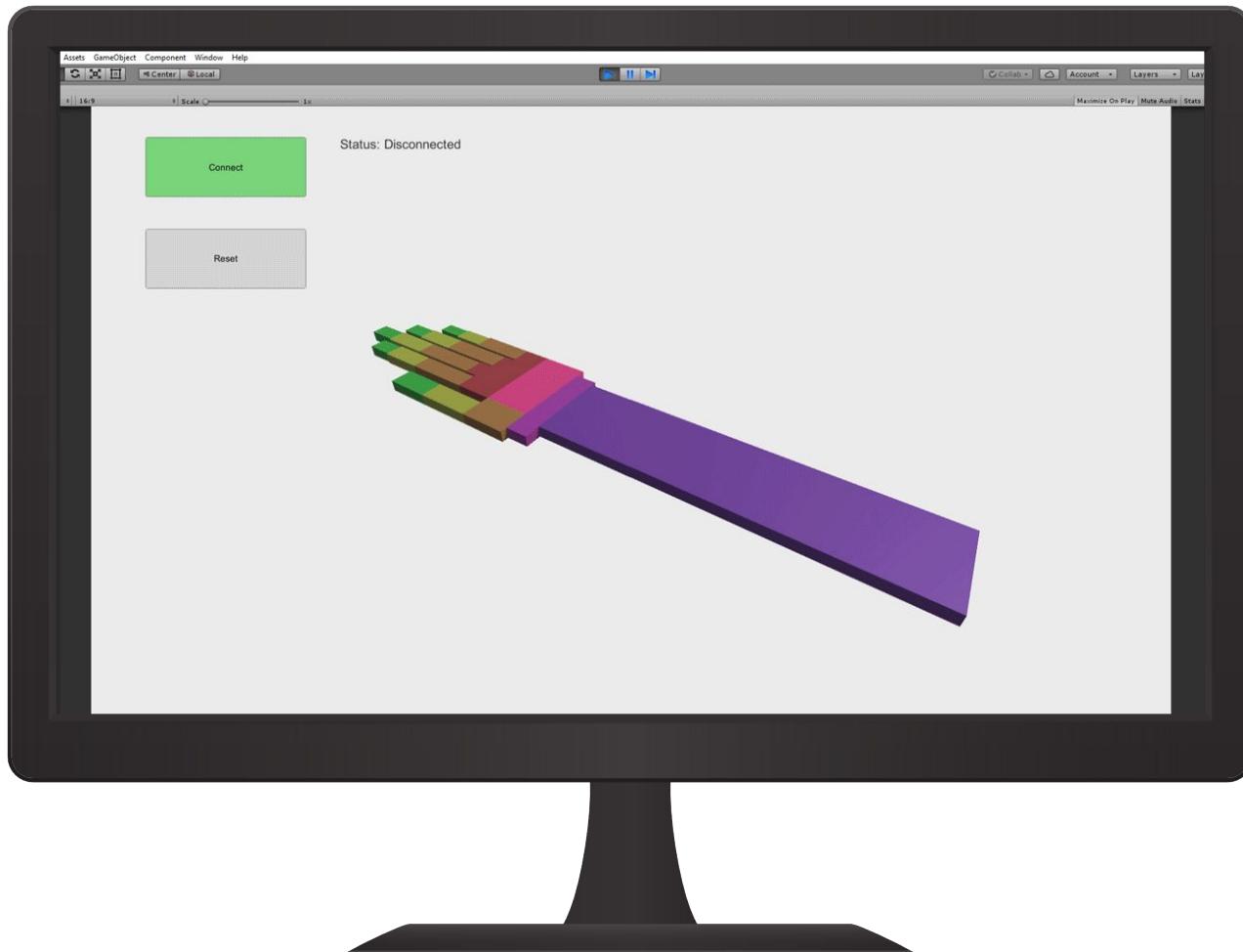
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Software

Gestur Model Data Generator


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Software - TouchBox



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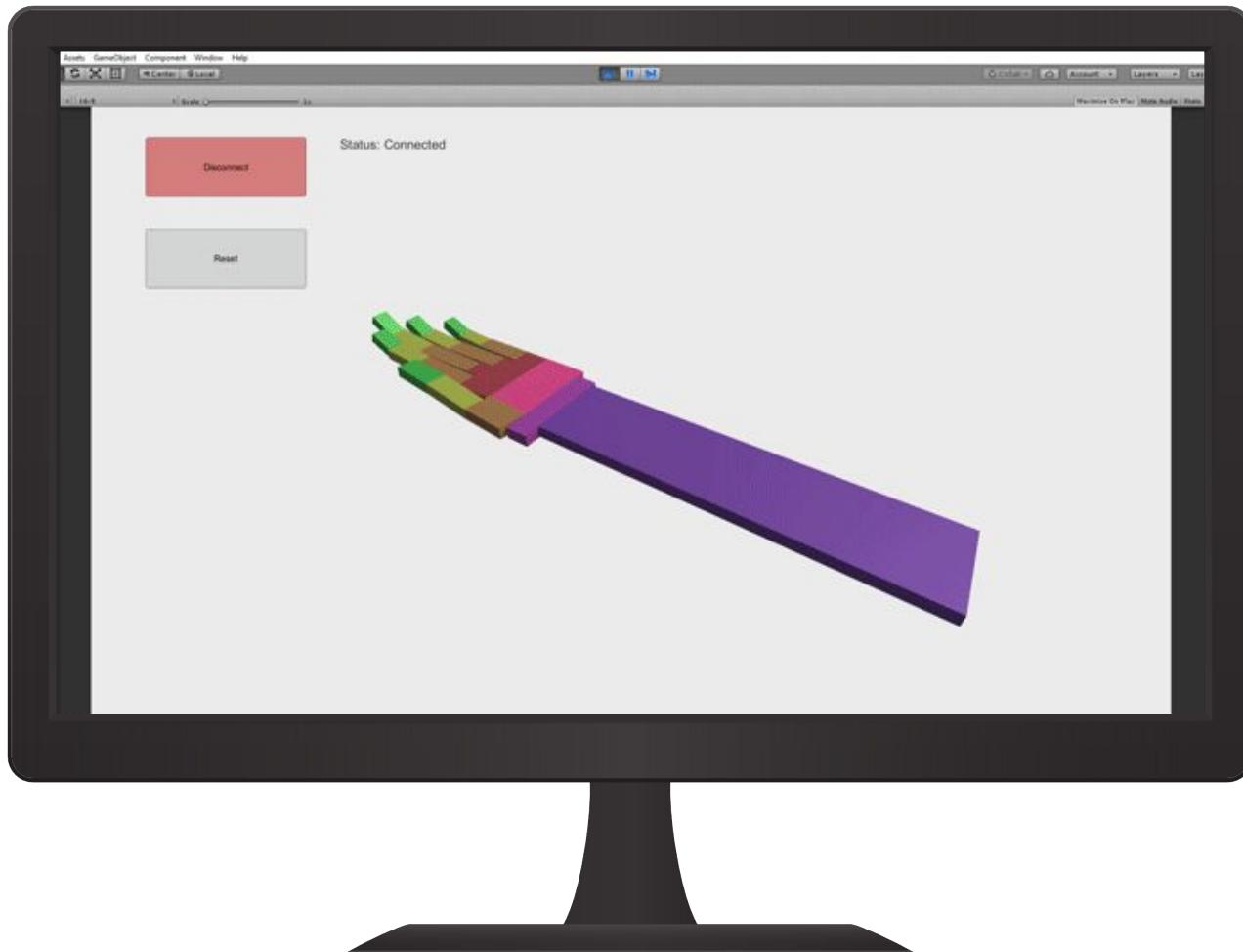
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Unity



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Description	Manufacturer	Manufacturer Part Number	Vendor	Vendor Part Number	Type	Units/Board	Unit Price	Price
Bluetooth Header	4UCON Technology Inc	-	Sparkfun	PRT-08272	Through Hole	2	\$1.00	\$2.00
1X03	GCT	SP-140520-03-001	Sparkfun	PRT-13875	Through Hole	6	\$0.50	\$3.00
1X04	Sullins Connector Solutions	PPTC041LFBN-RC	Digi-key	S7002-ND	Through Hole	7	\$0.43	\$3.01
2X8	Sullins Connector Solutions	PPTC082LFBN-RC	Digi-key	S7076-ND	Through Hole	4	\$1.02	\$4.08
JTAG	Harwin	M50-3500542	Mouser	855-M50-3500542	Through Hole	1	\$1.18	\$1.18
3V3 Voltage Regulator	Texas Instruments	LM1084ISX-3.3/NOPB	Digi-Key	296-35390-1-ND	Through Hole	2	\$2.73	\$5.46
uController	NXP Semiconductors	LPC4088FET208,551	Digi-Key	568-9832-ND	BGA	1	\$11.49	\$11.49
20 MHz Crystal	TXC Corporation	7B-20.000MEEQ-T	Digi-Key	887-1303-1-ND	SMT	1	\$1.14	\$1.14
32.768 kHz Crystal	Citizen FineDevice Co Ltd	CM315D32768EZFT	Digi-Key	300-8816-1-ND	SMT	1	\$0.80	\$0.80
8 channel - 8 bit ADC	Texas Instruments	TLC0838IDW	Digi-Key	296-2867-5-ND	SMT	4	\$3.15	\$12.60
Reset Button	C&K	PTS645SK43SMTR92 LFS	Digi-Key	CKN9084CT-ND	SMT	1	\$0.25	\$0.25
Other Buttons	sparkfun	COM-08229	Sparkfun	COM-08229	SMT	6	\$0.10	\$0.60
On/Off Switch	sparkfun	COM-00102	Sparkfun	COM-00102	SMT	1	\$1.50	\$1.50
RED LED	Kingbright	APT2012SURCK	Digi-Key	754-1133-1-ND	SMT	31	\$0.16	\$4.96
RG LED	Lite-On Inc.	LTST-C195KGJRKT	Digi-Key	160-1452-1-ND	SMT	1	\$0.50	\$0.50
Motor Controller	Texas Instruments	DRV2605LDGST	Digi-Key	296-38481-1-ND	SMT	10	\$4.30	\$43.00
Flex Sensors	Spectra Symbol		Digi-Key			18	\$7.95	\$143.10
PCB	Sunstone					1	\$300	\$300.00
Assembly	Laritech					1	\$300	\$300.00
Misc (wires, gloves, thread)						1	\$50	\$50.00
Total Price								\$888.67

Prototype cost per glove: \$888.67

Mass Production cost per glove: <\$80.14

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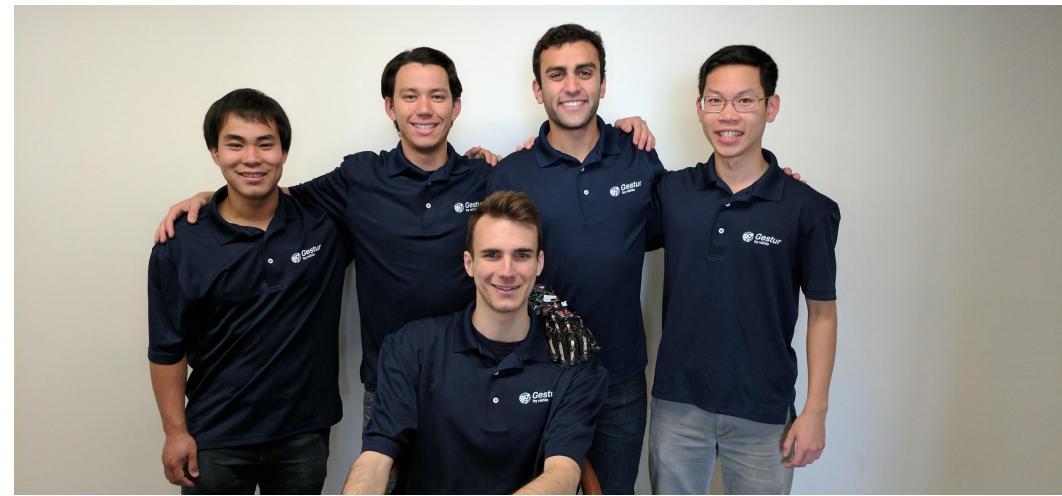
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Conclusion

- Future Direction
 - New 3D-printed board rails
 - Different physical materials
 - More sensors
 - Optical
 - Heart rate
 - Integrate physical tracking with commercial VR headsets
 - Medical applications
- Reihlo
 - Datasheet
 - Website
 - Github
 - Open Source



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Thank you!

John Johnson & Yoga Isukapalli
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And of course, our wonderful sponsors:



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