

GESTUR

Motion Tracking & Haptic Feedback Glove

Introductions: Kyle Carson, Ryan Kaveh, & Jon Young



Market & Project Overview



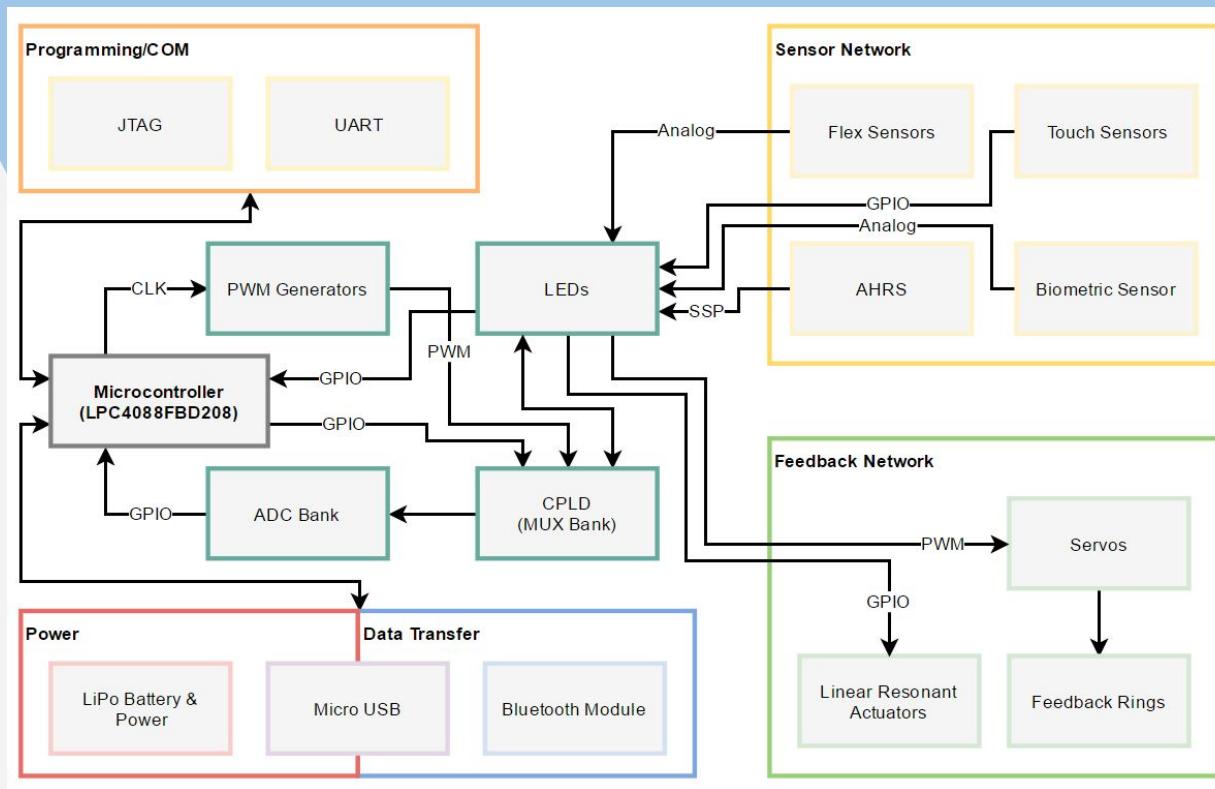
\$30 Billion Industry
10 million Google VR Users

Few motion tracking solutions
No haptic Feedback

Our Vision

- ▶ Map movement in 3D space
 - ▶ Haptic Feedback
 - ▶ Stand-alone and Affordable

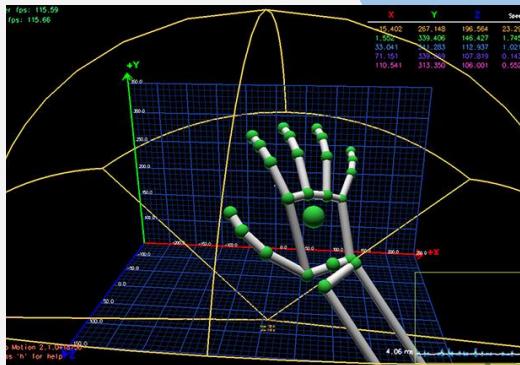
System Design



Subsystems

Sensor Network

- ▶ Hand Movement
- ▶ Finger flex & spacing
- ▶ Touch sensors
- ▶ Vitals



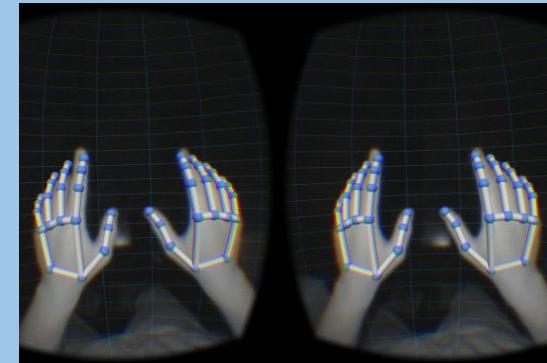
Feedback Network

- ▶ Vibration elements
- ▶ Ring system



Software

- ▶ Data Transfer
- ▶ Post-processing
- ▶ Interface to Unity
- ▶ Demo



Subsystems: Haptic Feedback

- ▶ Based off of research performed by Professor William Provancher from the ME department at the University of Utah



- ▶ 3D printed rings actuated by small servos attached to forearm

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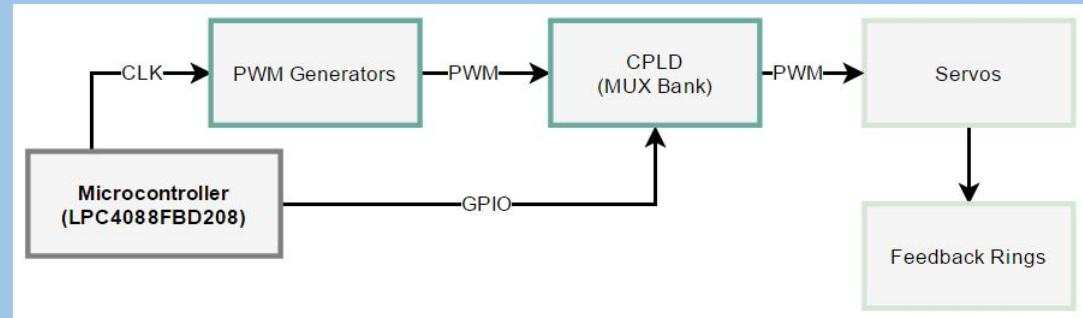
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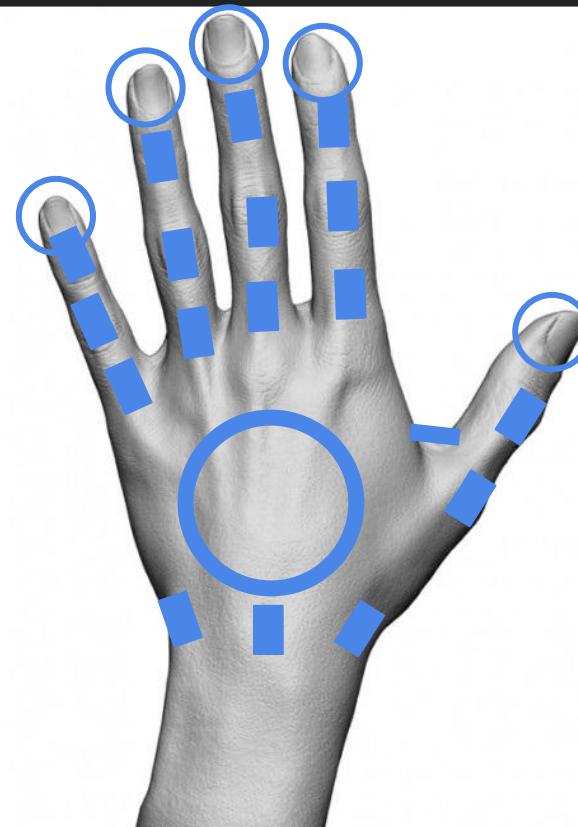
Subsystems: Servo control

- ▶ Need to control 5 servos
 - ▶ Beware of overloading microcontroller
 - ▶ Separate PWM generator using 555 timers
 - ▶ Signals are muxed to minimize area



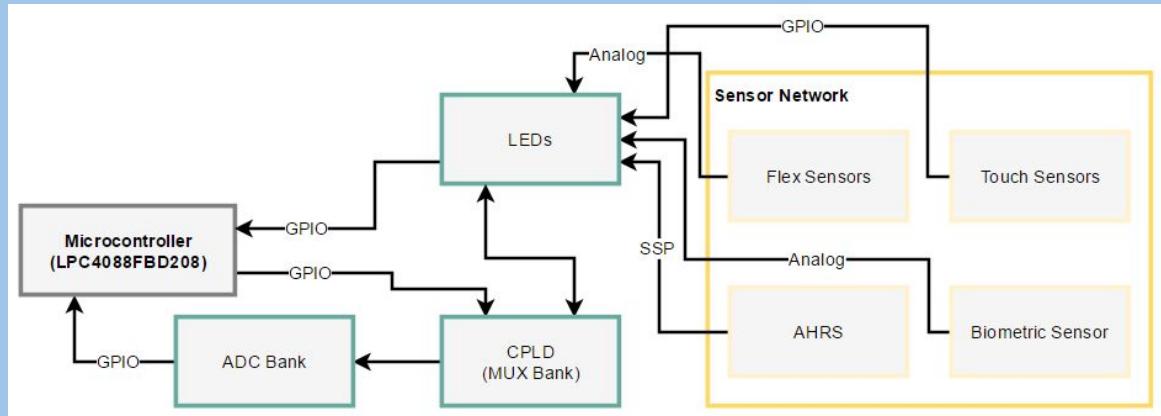
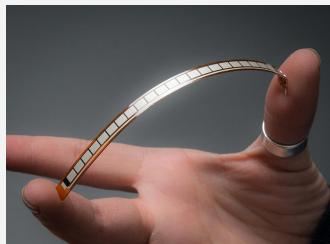
Subsystems: Components & Placement

- ▶ AHRS, LRA, HR
 - ▶ Feedback rings
 - ▶ Touch sensors
 - ▶ Flex sensors



Subsystems: Sampling

- ▶ What to do with a lot of data?
- ▶ Data handling is large issue

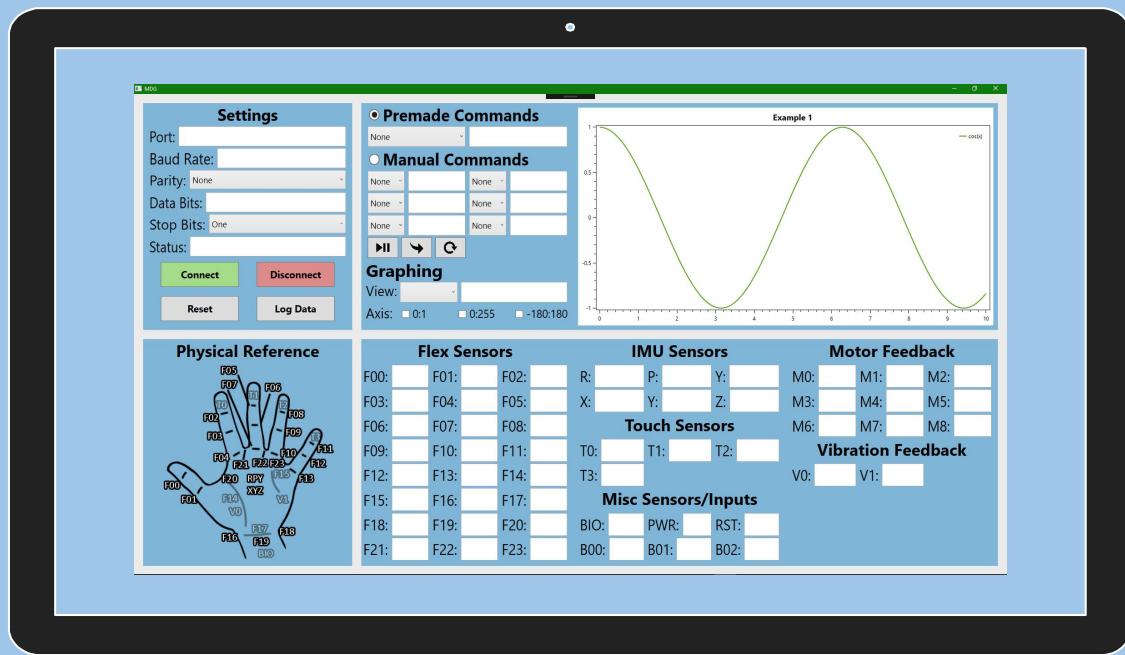


Software: Data Transfer and Processing

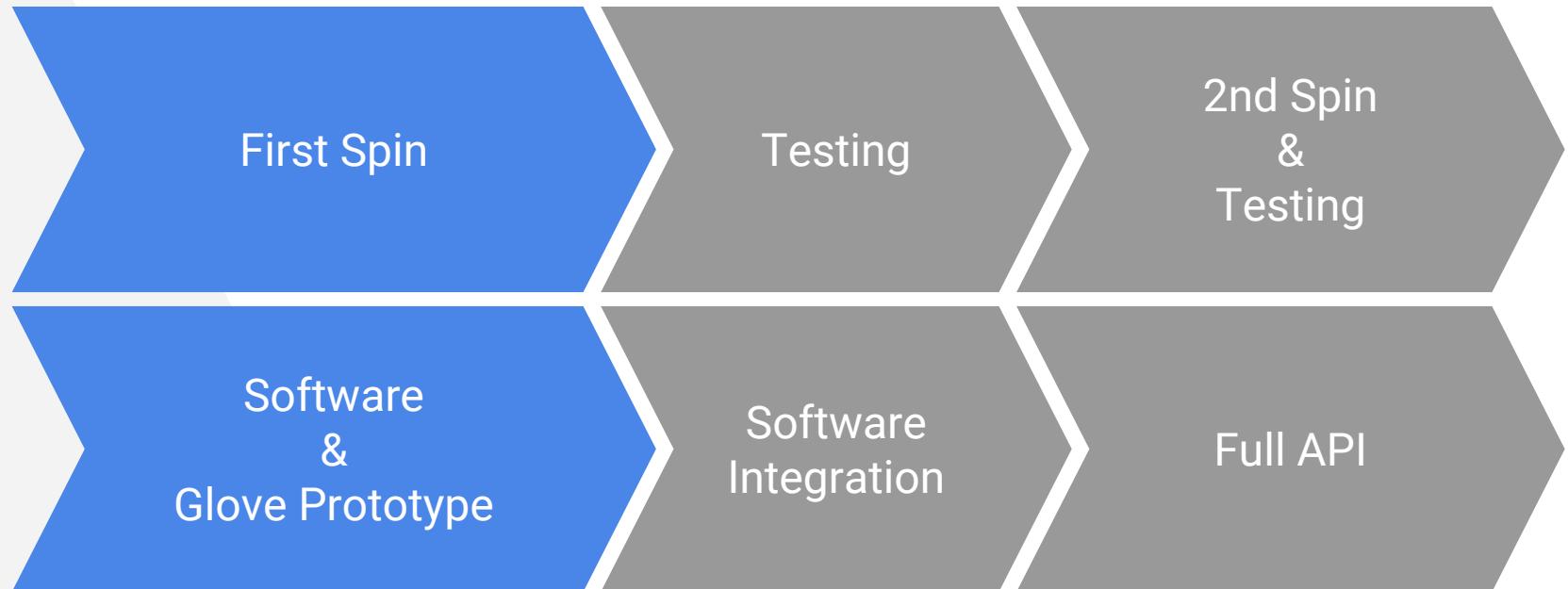
- ▶ Flex and touch sensors straightforward
- ▶ Attitude and Heading Reference System (AHRS)



Software: GUI & Forward Testing

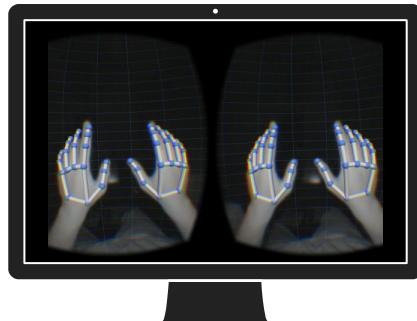


Progress & Parallel Development: Timeline



Progress & Parallel Development: 2nd Spin

- ▶ Shrink size
- ▶ Remove Redundancies
 - ▶ Fully integrated HW/SW
 - ▶ Product



2nd Spin
&
Testing

Full API

THANK YOU!

Questions?

References & Acknowledgments

- ▶ Professor John Johnson; Instructor/Primary Advisor
- ▶ Professor Forrest Brewer; Assembly & Data Sampling Consultation
- ▶ Professor Yon Visell; Haptic Feedback Consultation, 3D Printing Machines
- ▶ Bill Lerrick and everyone at Laritech; PCB Production
- ▶ University of California, Santa Barbara; Additional Funding

Ashley L. Guinan, Markus N. Montandon, Andrew J. Doxon, and William R. Provancher, "Discrimination Thresholds for Communicating Rotational Inertia and Torque using Differential Skin Stretch Feedback in Virtual Environments," to be presented at the 2014 IEEE Haptics Symposium, Houston, Texas, Feb. 23-26, 2014, pp. 6. Published, 02/2014.



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