KineTrax

KineJax

Capstone Team

KineJax Team:

Chris Whitney - Team Lead

Anthony Black - Security Assurance

Cherie Parsons - Recorder

Jack Jenkins - Release Manager

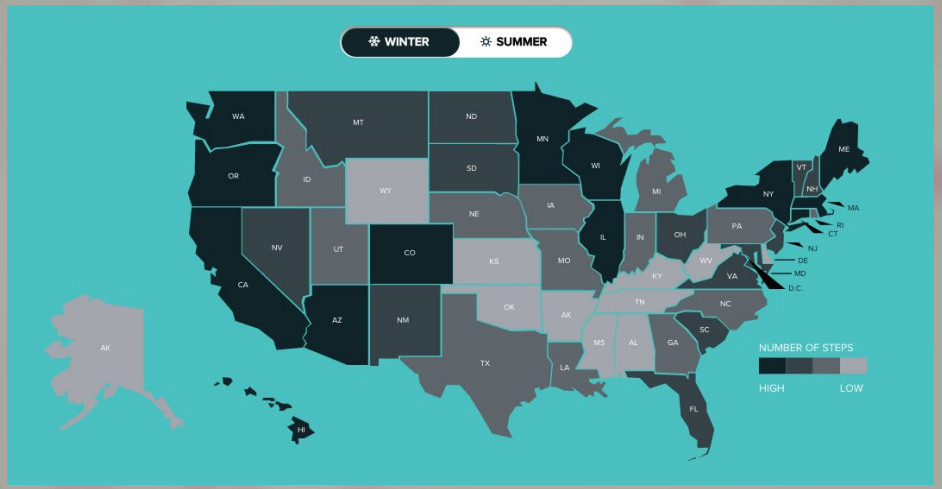
Grant Swenson - Editor

Mentor/ Client

Faculty Mentor/ Client

- Kyle Winfree
  - BS Physics
  - MES Robotics
  - PhD Biomechanics and Movement Science
- Part of SICCS department here at NAU
- Interest in:
  - Using wearable technologies to measure and improve healthcare.

Background - Wearables



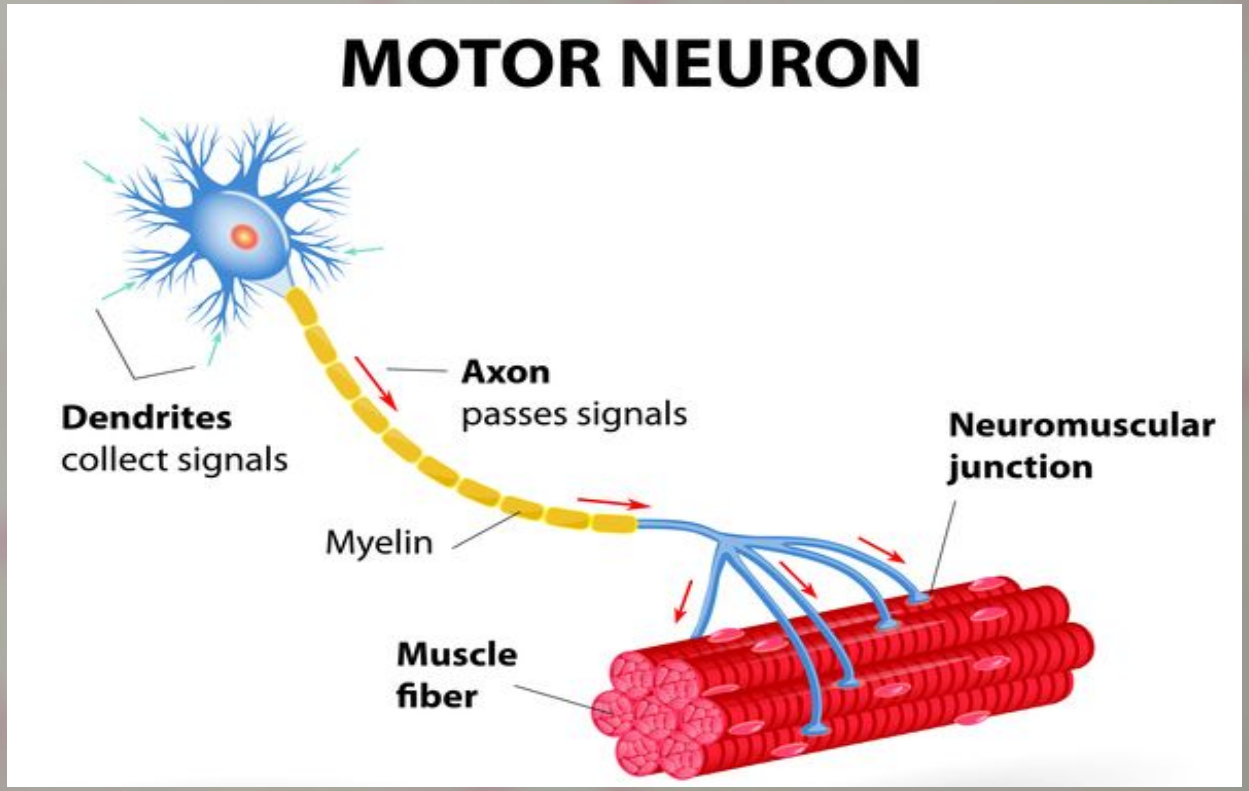
Average Daily Steps per State

Top Five Wearables Vendors, Shipments, Market Share and Year-Over-Year Growth, Q2 2015 (Units in Millions)

Vendor	2Q15 Shipment Volume	2Q15 Market Share	2Q14 Shipment Volume	2Q14 Market Share	2Q15/2Q14 Growth
1. Fitbit	4.4	24.3%	1.7	30.4%	158.8%
2. Apple	3.6	19.9%	0	0.0%	%
3. Xiaomi	3.1	17.1%	0	0.0%	%
4. Garmin	0.7	3.9%	0.5	8.9%	40.0%
5. Samsung	0.6	3.3%	0.8	14.3%	-25.0%
Others	5.7	31.5%	2.6	46.4%	119.2%
Total	**18.1**	**100.0%**	**5.6**	**100.0%**	**223.2%**

Source: IDC Worldwide Quarterly Wearable Device Tracker, August 27, 2015

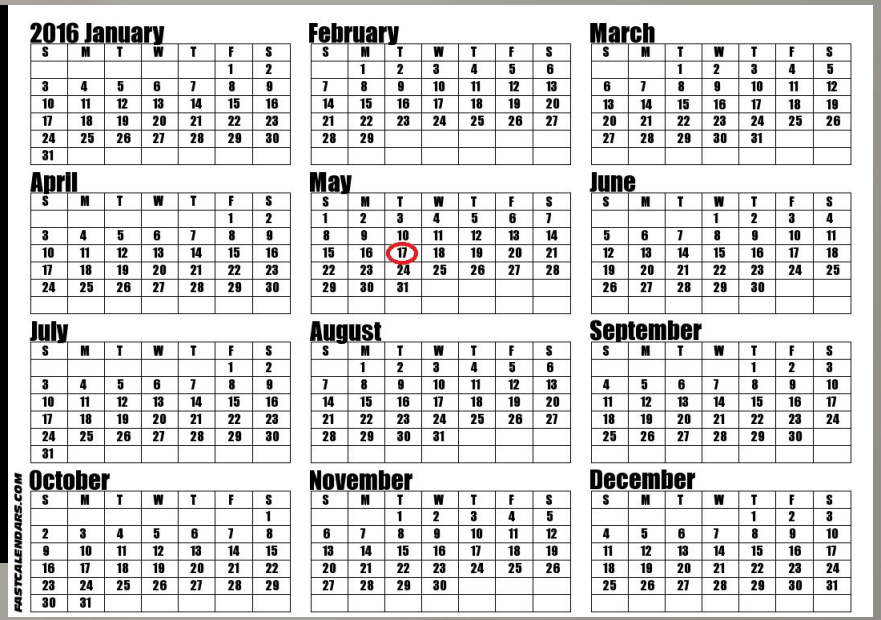
Background - Neurodegenerative Disorders



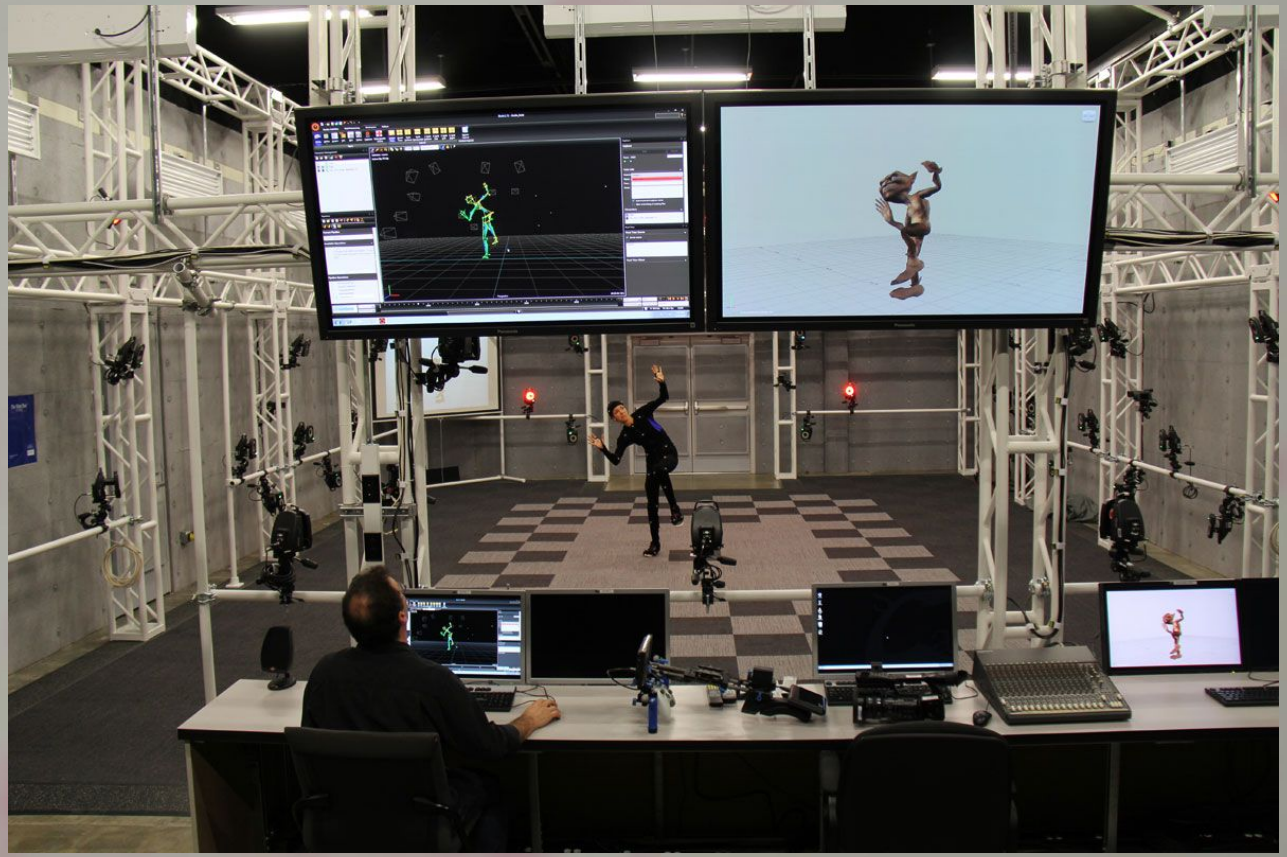
Problem Statement - Current Methods

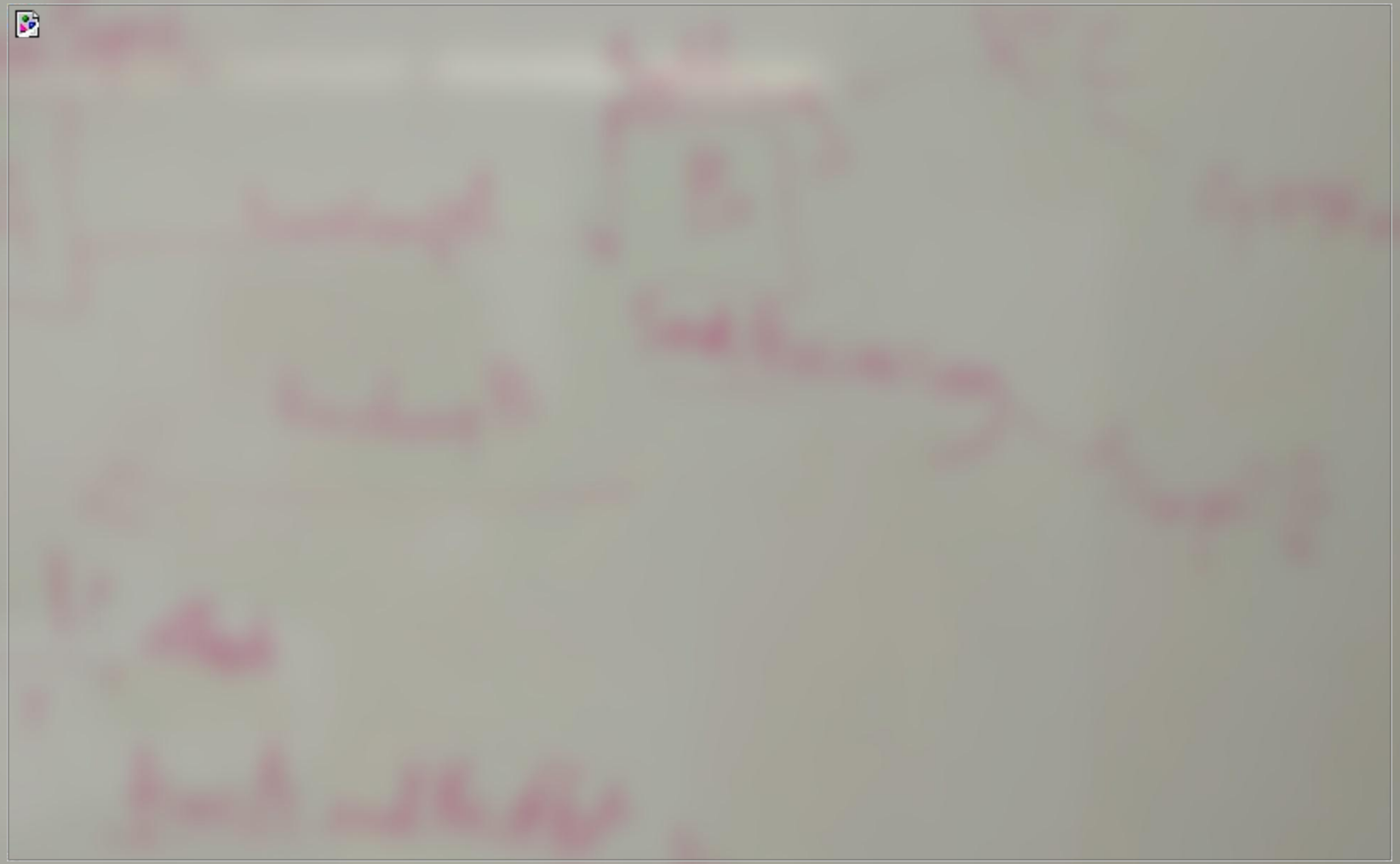
Current problems

- Less doctor visits => less data



Current Method - Motion Capturing Technologies (i.e Vicon)

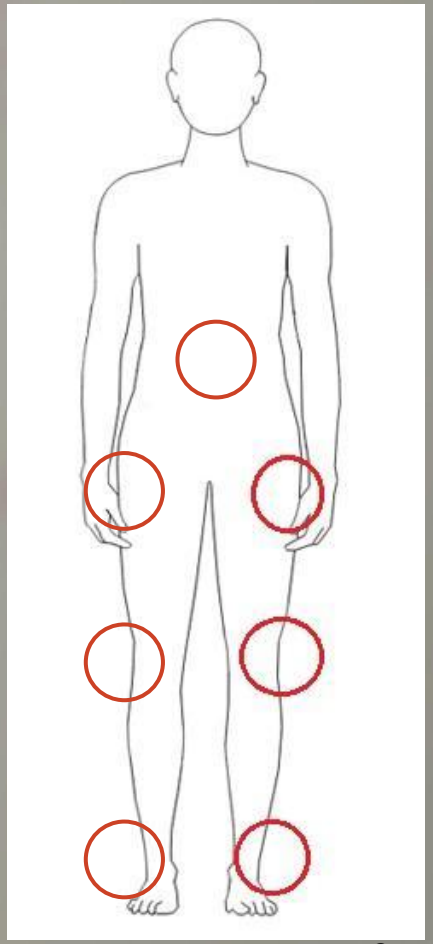




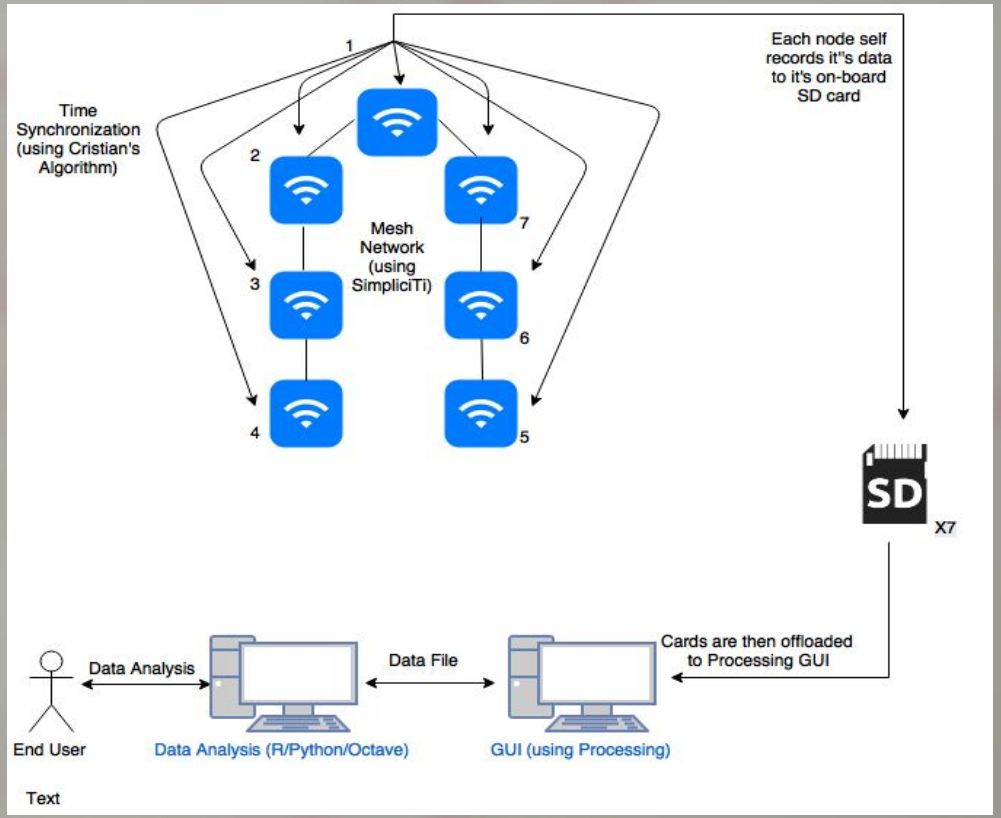
Solution

A wearable device (e.g KineTrax) that can record a variety of USEABLE sensor data over an extended period of time.

Can analyze day to day data for a month before offloading.



Solution - System Diagram



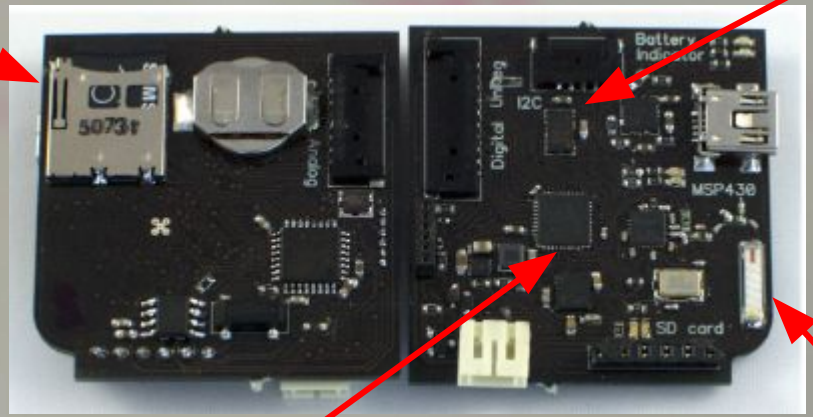
Solution - Key Chip Parts

Records data (accelerometer) daily into 32GB (per month storage)

Tracks time

I2C(RTC protocol)

SD CARD



Radio antenna(communication to other KineTrax devices)

Gets data from different parts of body

MSP430 CHIP

Functional Requirements

Self-assembling network between devices

Automatic synchronization of clock time between devices

Adjustable sampling rate

Assessment of distance and signal strength between devices

User GUI to interact with the device

Offload records to a standard format (i.e csv, etc.)

Performance Requirements

Time is synchronized between devices down to millisecond precision

Sample rate must be at least 100 Hz

Drift needs to be stable, ideally no more than 1 millisecond every day.

Environmental Requirements

Embedded software must be coded in C

Software must run on MSP430 equipment

Data offloading must be done with Processing

Networking must be done with the SimpliciTi protocol

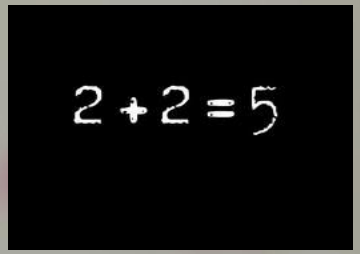
Potential Risks

Private personal data could be maliciously used against the user

- Insurance companies up cost of coverage
- Job security

Gathered inaccurate and/or unusable data

Improperly written/designed software could cause overheating on the device



Schedule

	January	February	March	April	May
Wireless communication dev.					
Time sync dev.					
Distance calculation dev.					
GUI dev.					
Offloading data dev.					
Data acquisition dev.					
Testing					

Conclusion

Current method of gait analysis are limited

KineTrax seeks to overcome these limitations

- Adaptable hardware

Impacts a large population

Will change the way neurological impairments are analysed

References

[1] Google glass image. http://www.shinyshiny.tv/2014/07/google-offers-free-demos-glass.html

[2] Fitbit image. http://descriptionebooks.com/fitbit/fitbit-flex.html

[3] http://www.cgadvertising.com/pages/posts/vicon-technologies-give-usc-students-hands-on-motion-capture-experience-128.php Vicon Image

[4] https://images.duckduckgo.com/iu/?u=https%3A%2F%2Fghr.nlm.nih.gov%2Fart%2Flarge%2Fmotor-neuron.jpeg&f=1 Motior Neuron Picture

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