

A RAPID TOUR OF MY

EXPLORATIONS IN E-TEXTILES





MAKEABILITY LAB

FALL 2013

DC MAKERFAIRE



MAKEABILITY LAB

SUMMER 2018

SEATTLE ARBORETUM





Our Mission

**DESIGN, BUILD, & STUDY INTERACTIVE
TOOLS & TECHNIQUES TO ADDRESS
PRESSING SOCIETAL CHALLENGES**

CMSC838f

Tangible Interactive Computing



"Joy is a well-made object, equaled only to the joy of making it."

-a Canadian Native American tribe saying, as quoted by [Mark Fraunfelder](#) (author, co-founder of [BoingBoing](#), & editor of [MAKE Magazine](#))

Preamble

This class is about making, being creative, taking risks. We will make to learn and learn to make. We will use materials to help us think and to push our own boundaries of what interactive computing is and could be. I taught this class once before: <http://cmssc838f-f12.wikispaces.com>. It was, by most accounts, a success (I think!). I learned a lot. The class learned a lot. Most importantly, along the way, we had *fun* together, we *made* interesting things, and we *helped* each other (peer learning ftw).

As another indicator of success, the aforementioned [Fall2012](#) class generated one MS thesis topic, one PhD thesis topic, and two publications (with more to come!). In addition, the instructables posted for the final project have garnered over 74,265 views and have been favorited 317 times (as of Jan. 2014) including [HandSight](#) (9,330 views

Course Pages

- [Home](#)
- [Schedule](#)
- [Resources](#)
- [HCIL Hackerspace](#)

Individual Assignments

- [IA01 Background Survey - 1/29](#)
- [IA02 Arduino Graph - 2/13](#)
- [IA03 Partner Eval for MPA01 - 3/10](#)
- [IA04 Partner Eval for MPA02 - 4/02](#)
- [IA05 Partner Eval for MPA03 - 4/21](#)

Mini-Project Assignments

- [MPA01 Input Inventions - 3/3](#)
- [MPA02 High-Low Tech - 3/26](#)
- [MPA03 Kinects & Motors - 4/16](#)

Semester Project Assignments

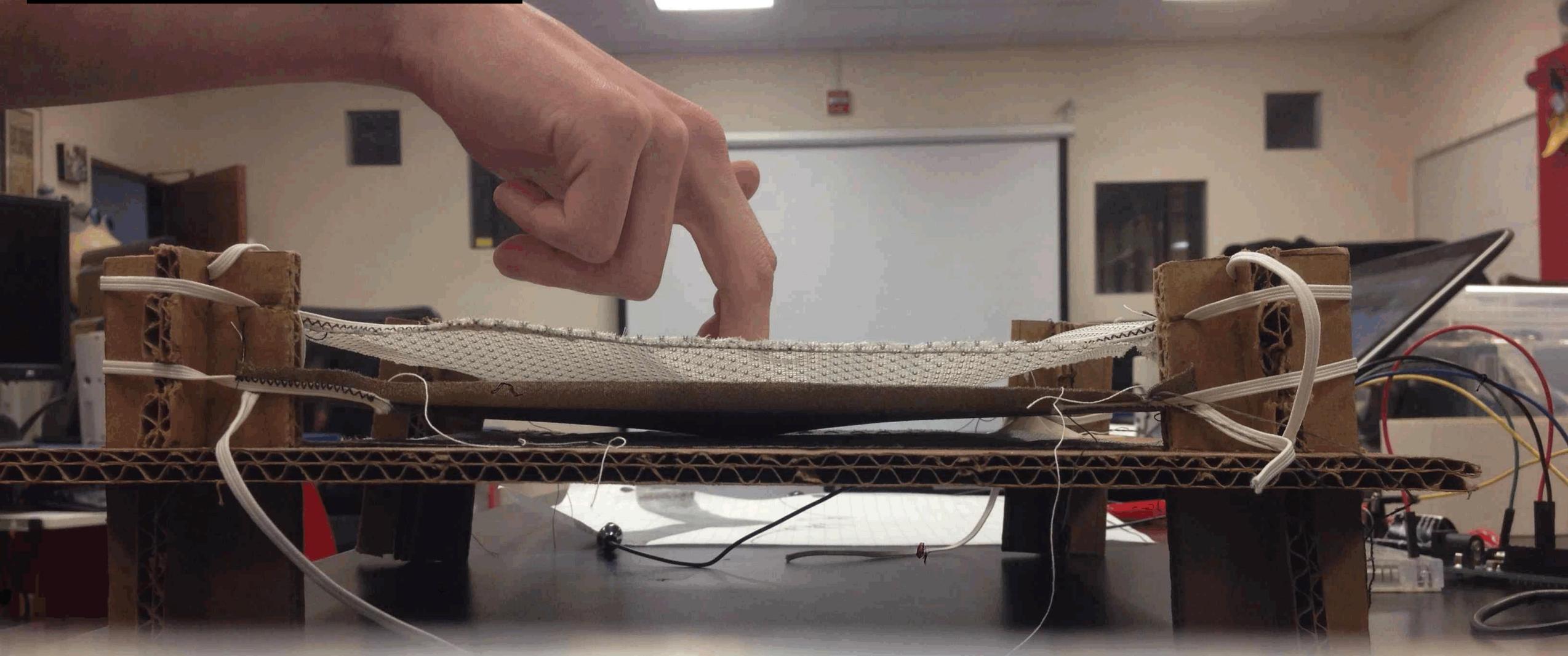
- [SPA01 Project Pitch](#)
- [SPA02 Project Presentation](#)
- [SPA03 Project Instructable](#)
- [SPA04 Project Video](#)
- [SPA05 Project Artifact](#)

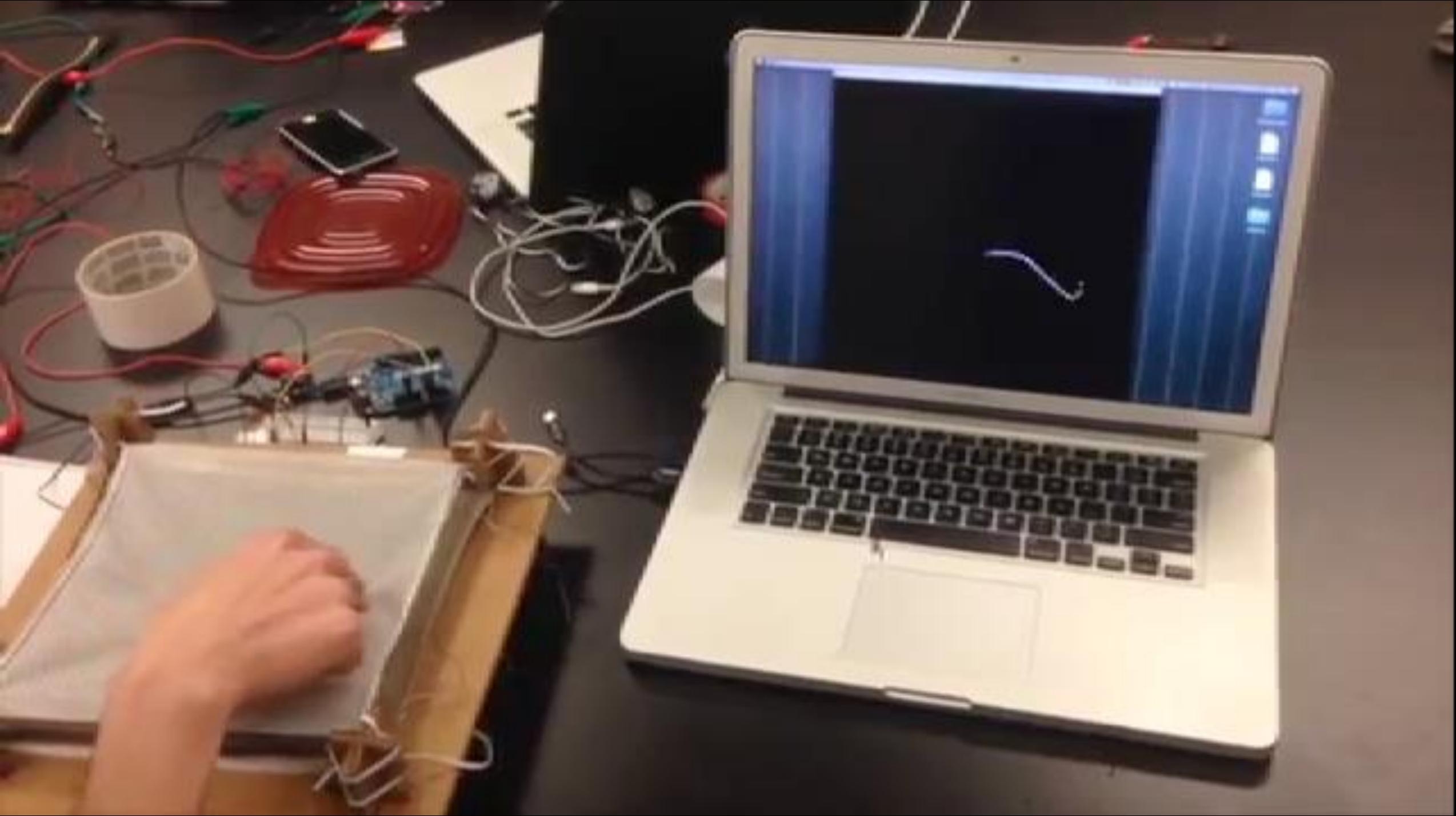
Reading Assignments

- [RA01 Tangible Bits - 1/29](#)
- [RA02 Arduino Intro - 2/3](#)
- [RA03 Electricity Intro - 2/13](#)
- [RA04 Switches \(p 39-59\) - 2/19](#)
- [RA05 Input Technology - 2/26](#)
- [RA05 Sensor-Based Input - 2/26](#)
- [RA06 Prototyping 3/5](#)

FABRIC MOUSE TOUCHPAD

BY PETER ENNS & CHRIS IMBRIANO, SPRING 2014





MUSICAL SPAGHETTI MADNESS

BY RICHARD JOHNSON, SPRING 2014







WHAT ARE? **ELECTRONIC TEXTILES**

E-textiles (or smart textiles) are fabrics that contain electronic components—even small computers—embedded within them

WRECKING CREW ORCHESTRA

CHOREOGRAPHY LEAD BY YOKOI



Source: <http://youtu.be/6ydeY0tTtF4>

WRECKING CREW ORCHESTRA

CHOREOGRAPHY LEAD BY YOKOI



Source: <http://youtu.be/6ydeY0tTtF4>

WRECKING CREW ORCHESTRA

CHOREOGRAPHY LEAD BY YOKOI



INTERACTIVE WALL HANGING

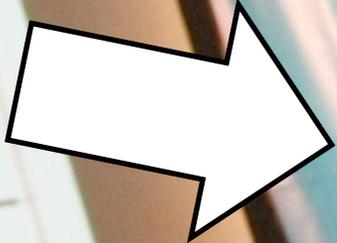
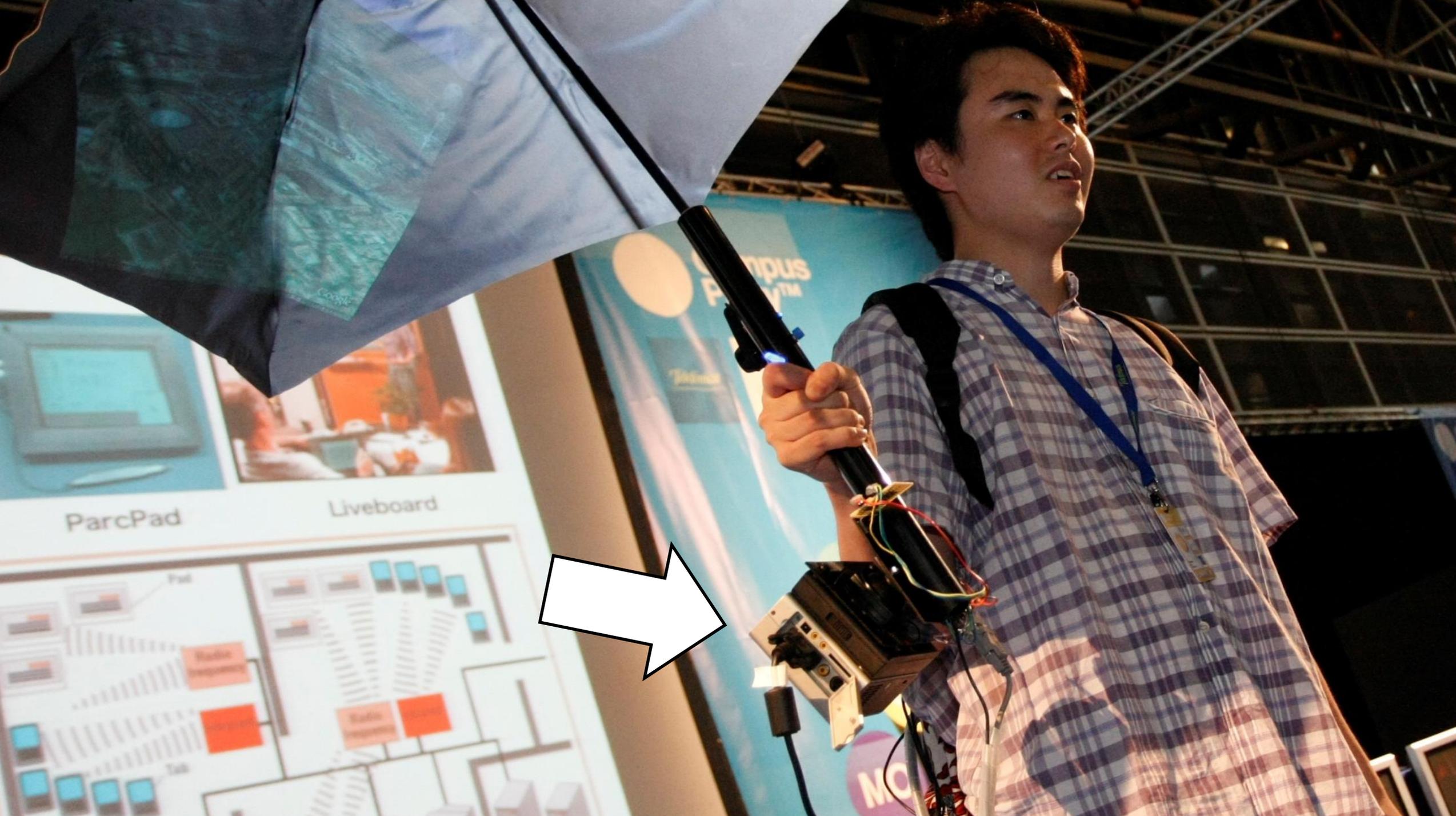
DESIGNERS: JIE QI & JOHN CLIFFORD



PILEUS: THE INTERNET UMBRELLA

DESIGNERS: SHO HASHIMOTO & TAKASHI MATSUMOTO





ParcPad

Liveboard

Campus Party™



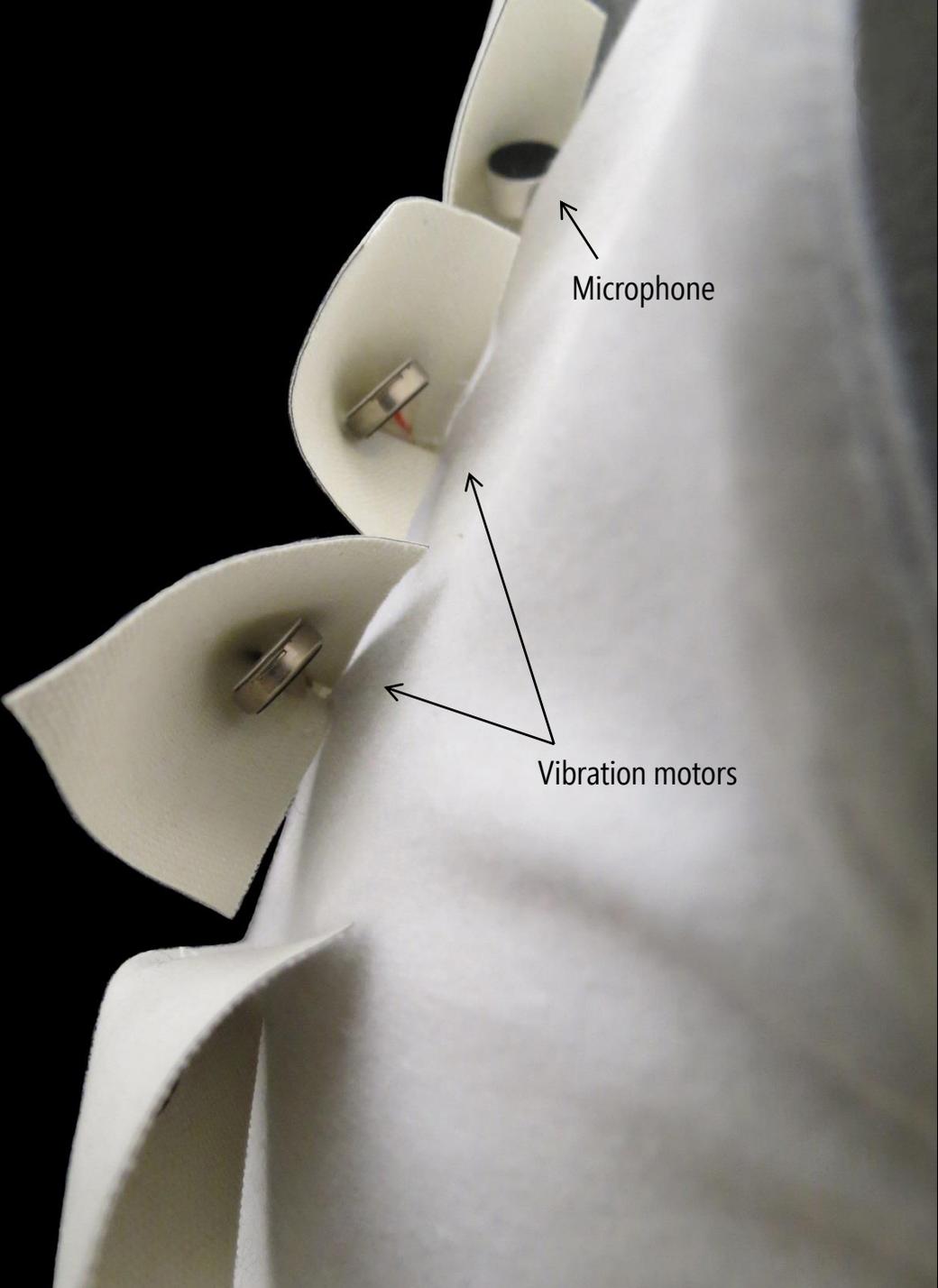
NO

FLUTTER

DESIGNERS: HALLEY PROFITA, NICHOLAS FARROW, NIKOLAUS CORRELL



Flutters in direction of sound



Microphone

Vibration motors

ELECTRO-MECHANICAL DRESS

DESIGNER: HUSSEIN CHALAYAN



STYL E.COM

T-SHIRT TETRIS

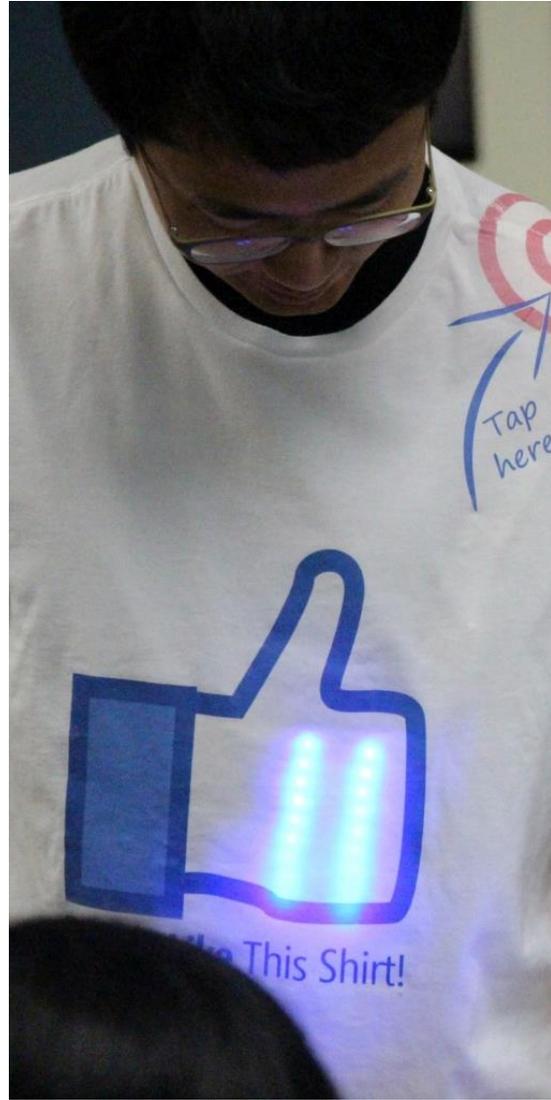
YOUTUBE USER: MARC KERGER



Some of our **e-textile** projects...



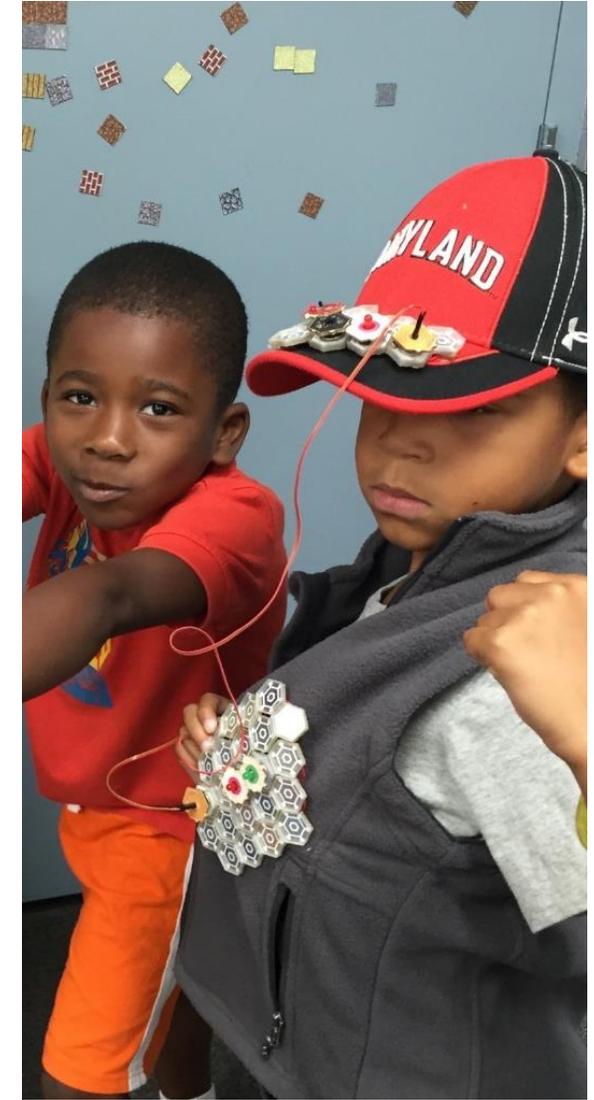
SOCIAL FABRIC FITNESS
[CHI'14]



I LIKE THIS SHIRT
[CHI'14]



BODYVIS
[IDC'13, CHI'15 Honorable Mention,
ICLS'16, IDC'16, CHI'17, ICLS'18]



MAKERWEAR
[IDC'15, CHI'16 Best Poster, CHI'17
Best Paper]

HEALTH & WELLNESS

SOCIAL FABRIC FITNESS

With Matt Mauriello and Michael Gubbels



What if...

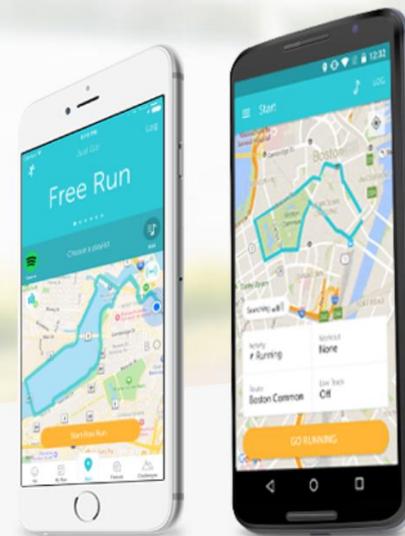
our clothes revealed information about our exercise? How would this change the fitness experience? For good or bad?

SOCIAL FABRIC FITNESS

[CHI'14]

Everyone. Every run.

Runkeeper is a top running app and a community that helps people get out the door and stick with running.

[Sign Up for Free](#)[Learn More](#)

50 million runners strong

Welcome to the community!



Jordan, 24
Waterlooville, U.K.

"I love that I can look through my Runkeeper app to see the progress I have made."



Kaylyn, 26
Cambridge, MA

"I love how user friendly Runkeeper is. From training plans to workouts, it makes organizing my runs a breeze."



Derek, 45
Lexington, VA

"Runkeeper helps me set and reach my goals, motivating me to stay ahead of my family history of poor health."

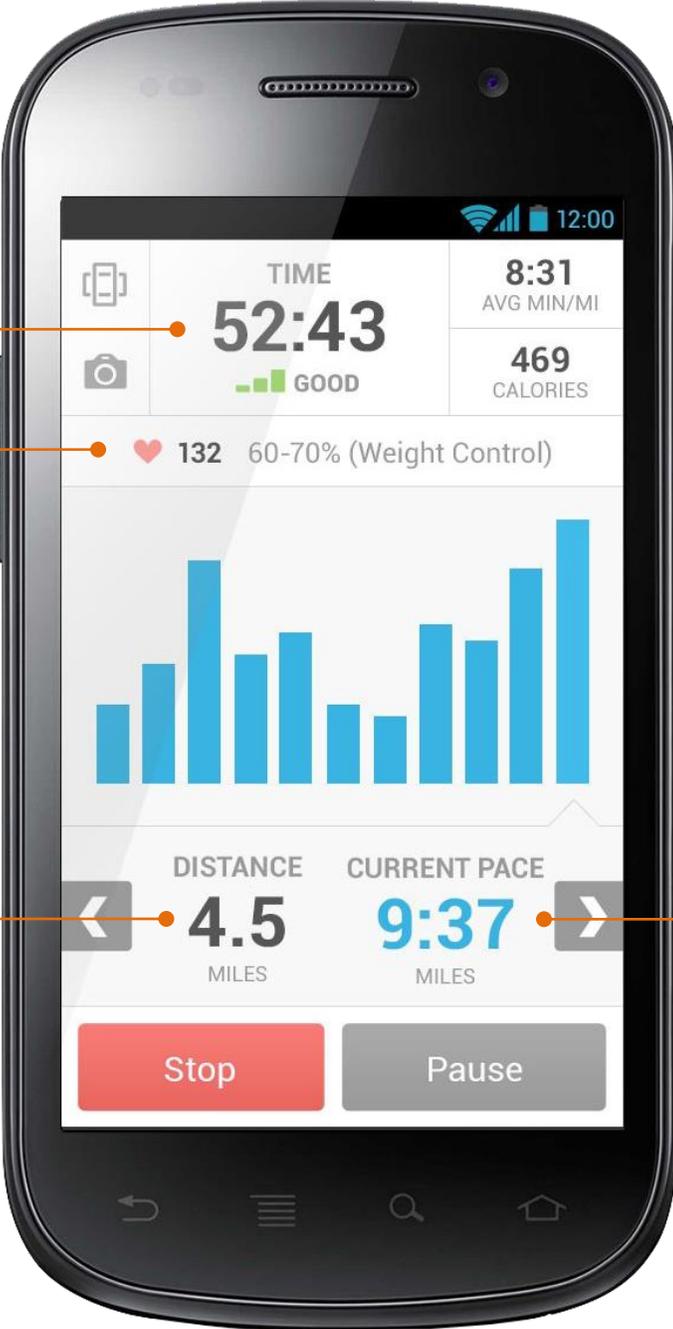
RUNKEEPER MOBILE APP

Total Run Time

Heart Rate

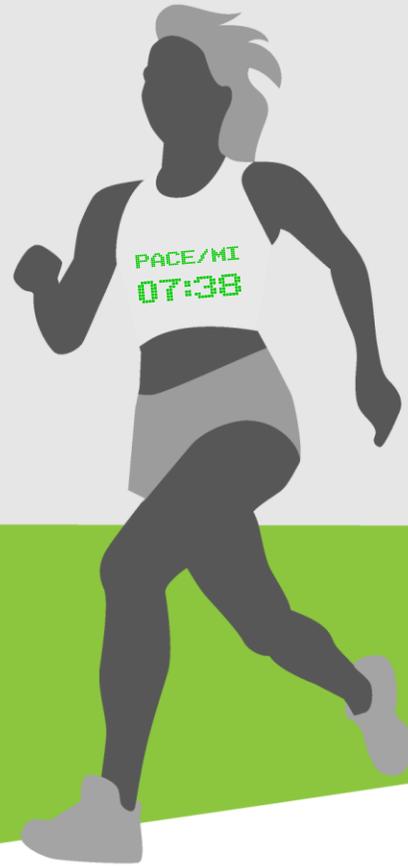
Total Run Distance

Current Running Pace



RUNKEEPER

DESIGN PROCESS



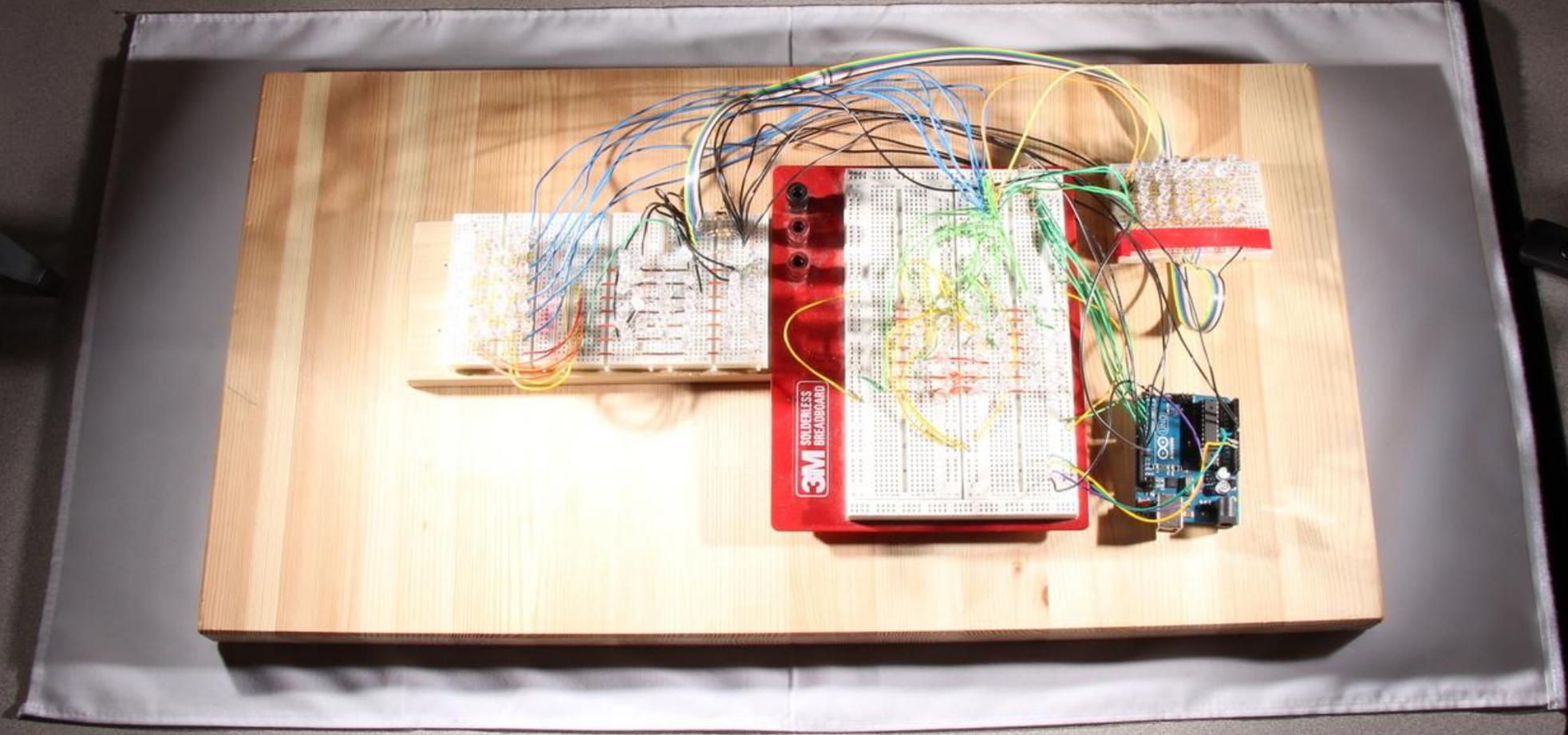
SOCIAL FABRIC FITNESS

LO-FI MOCKUPS



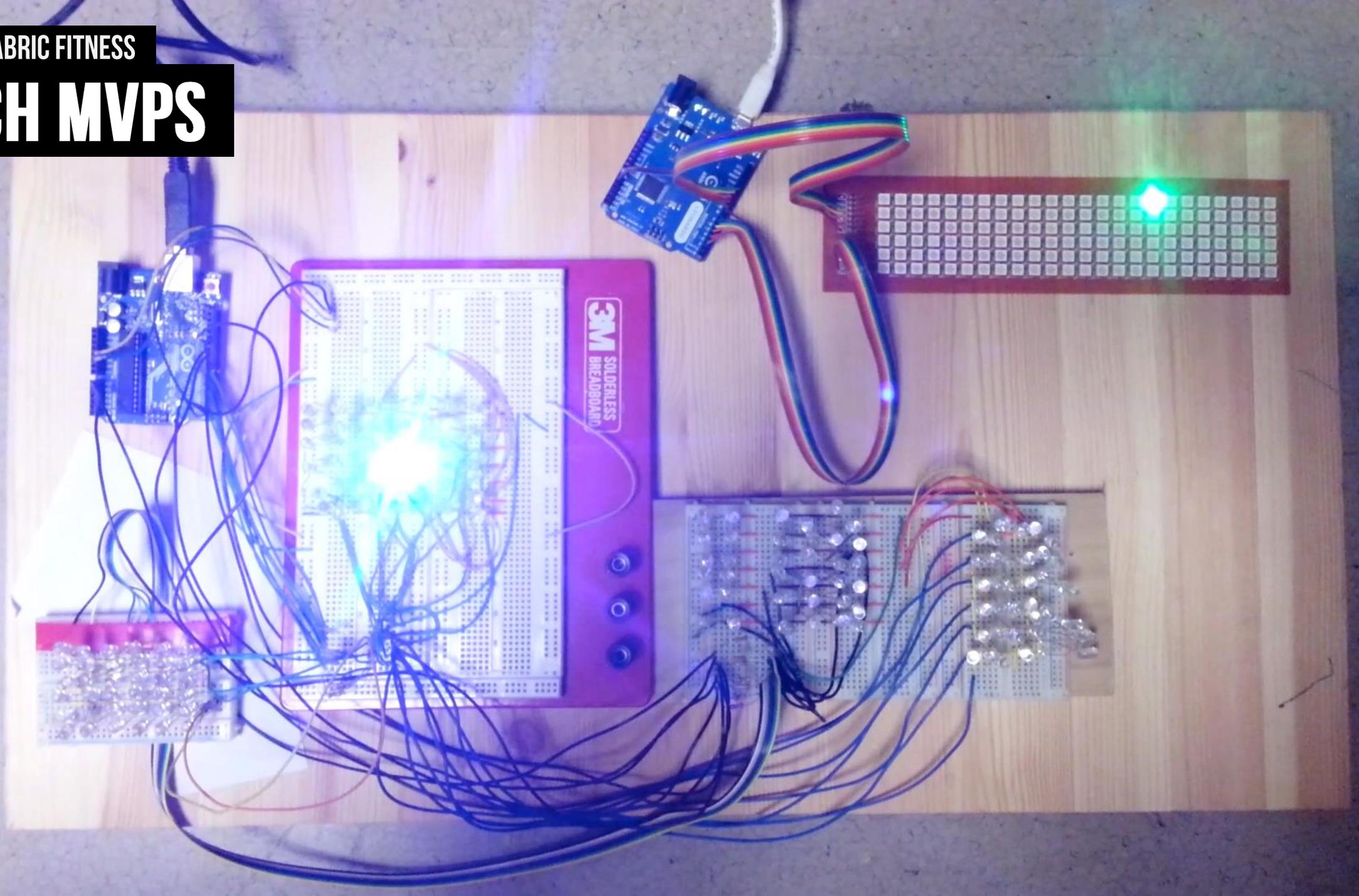
SOCIAL FABRIC FITNESS

TECH MVPs



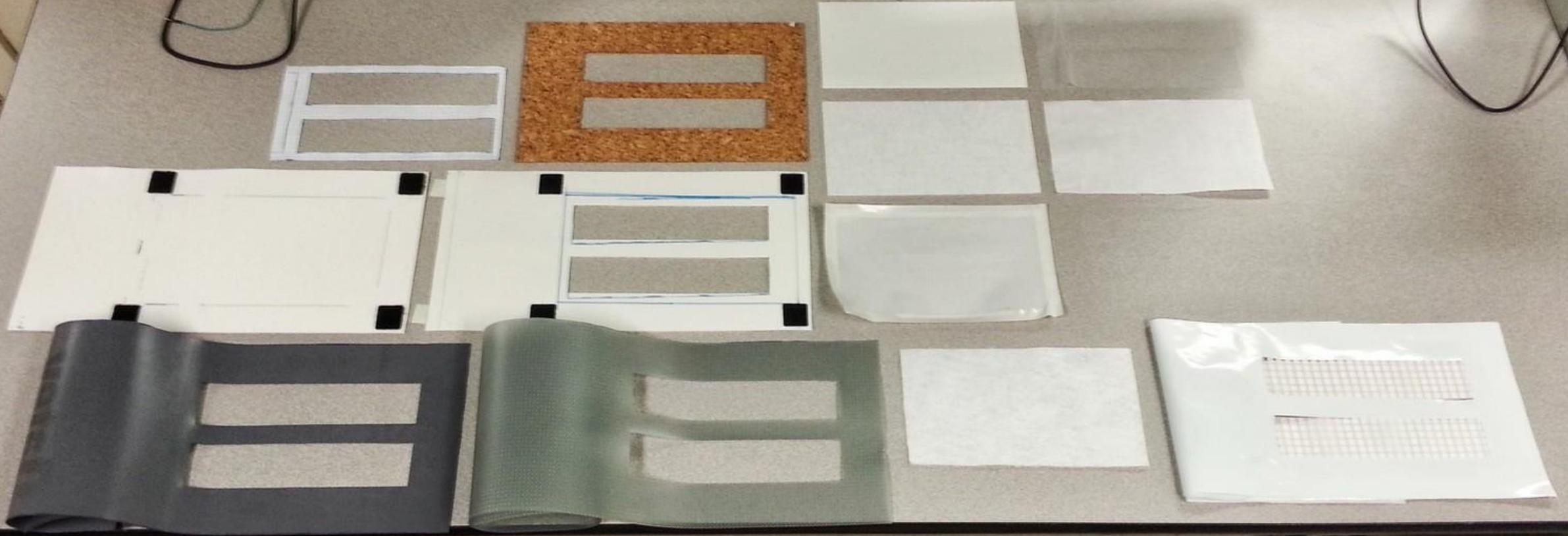
SOCIAL FABRIC FITNESS

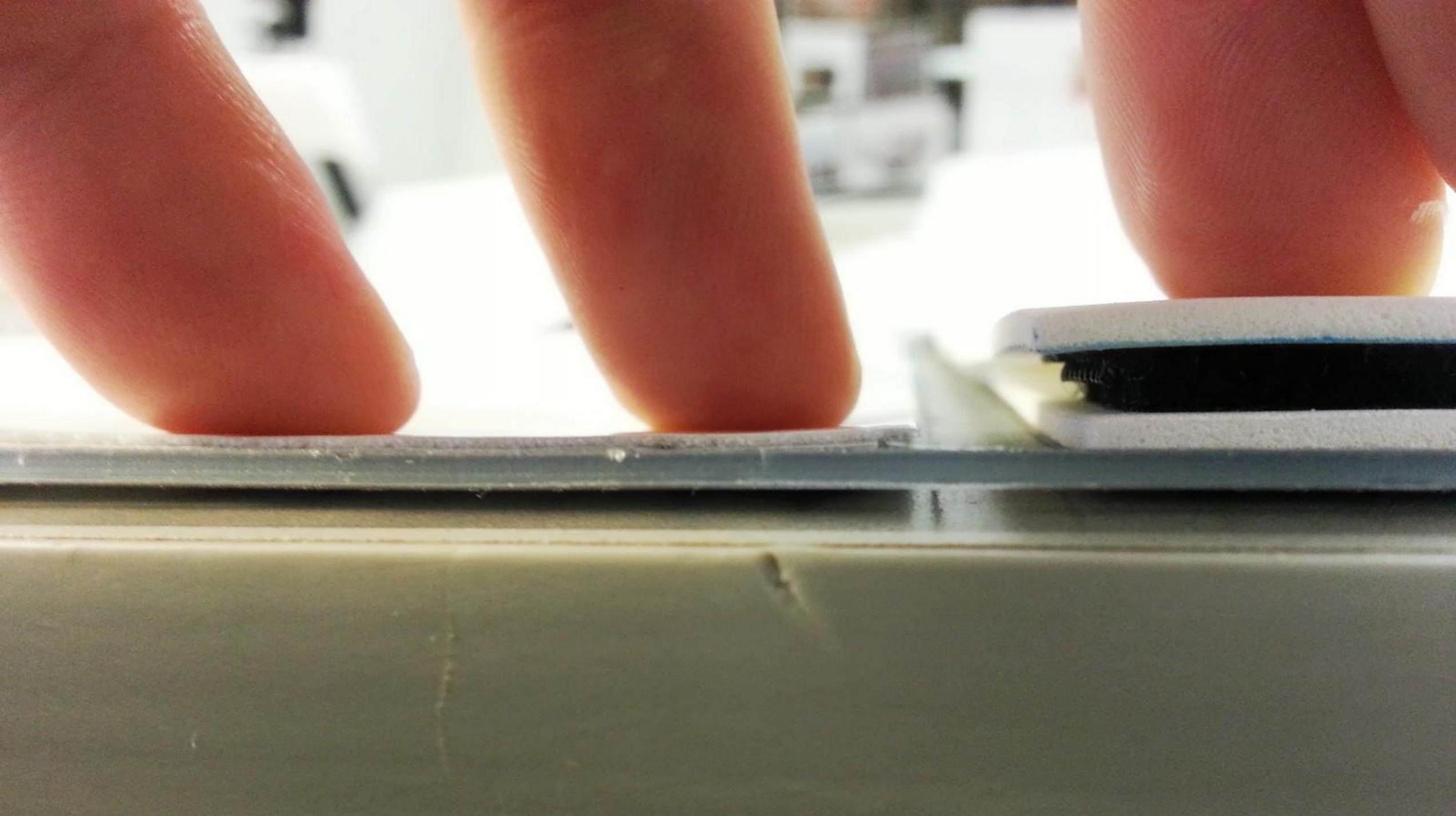
TECH MVPs

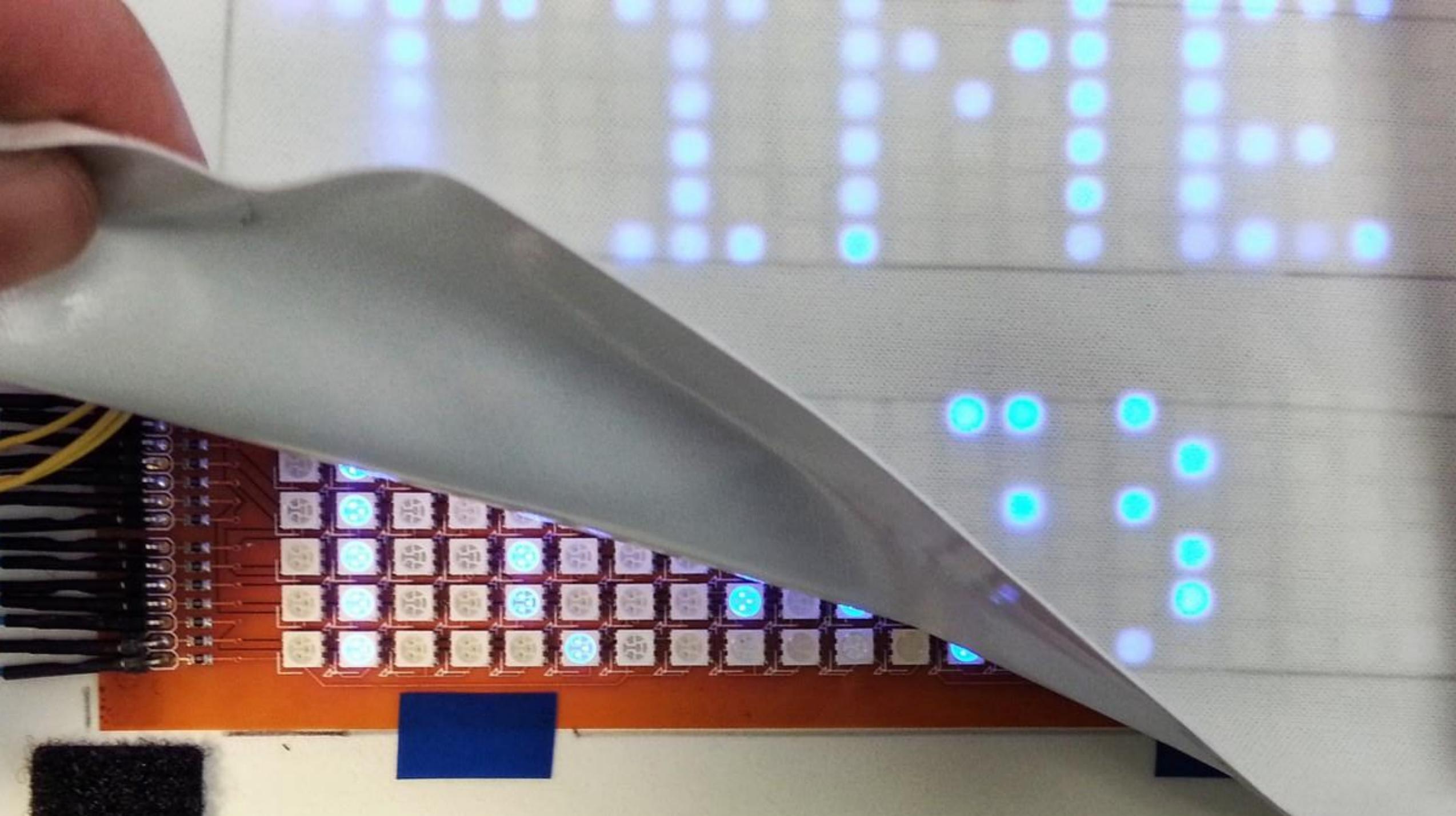


SOCIAL FABRIC FITNESS

MATERIAL EXPLORATIONS

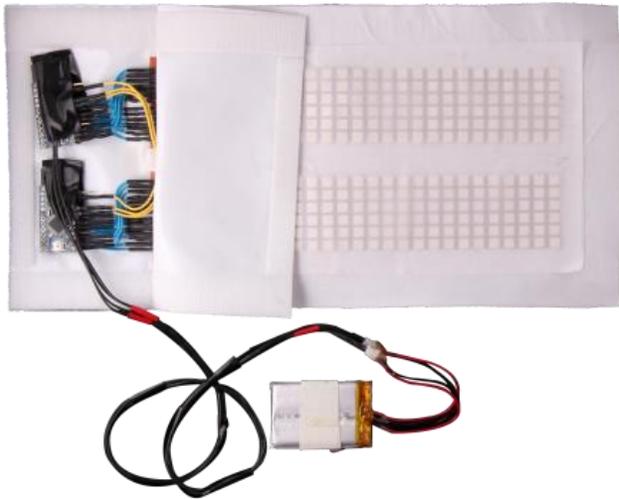






PROTOTYPE DISPLAYS

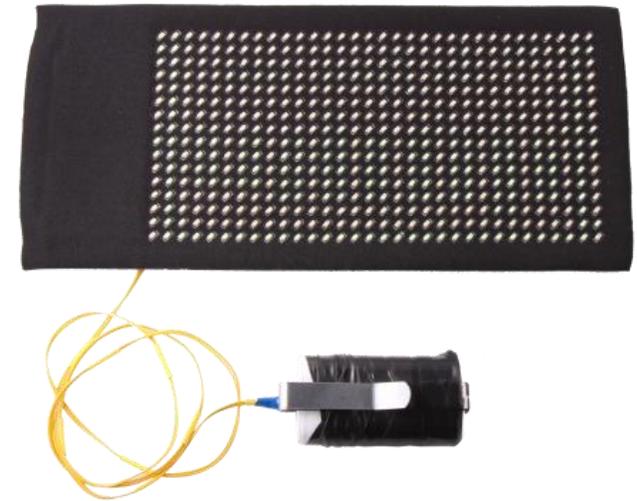
PROTOTYPE#1



PROTOTYPE#2



PROTOTYPE#3

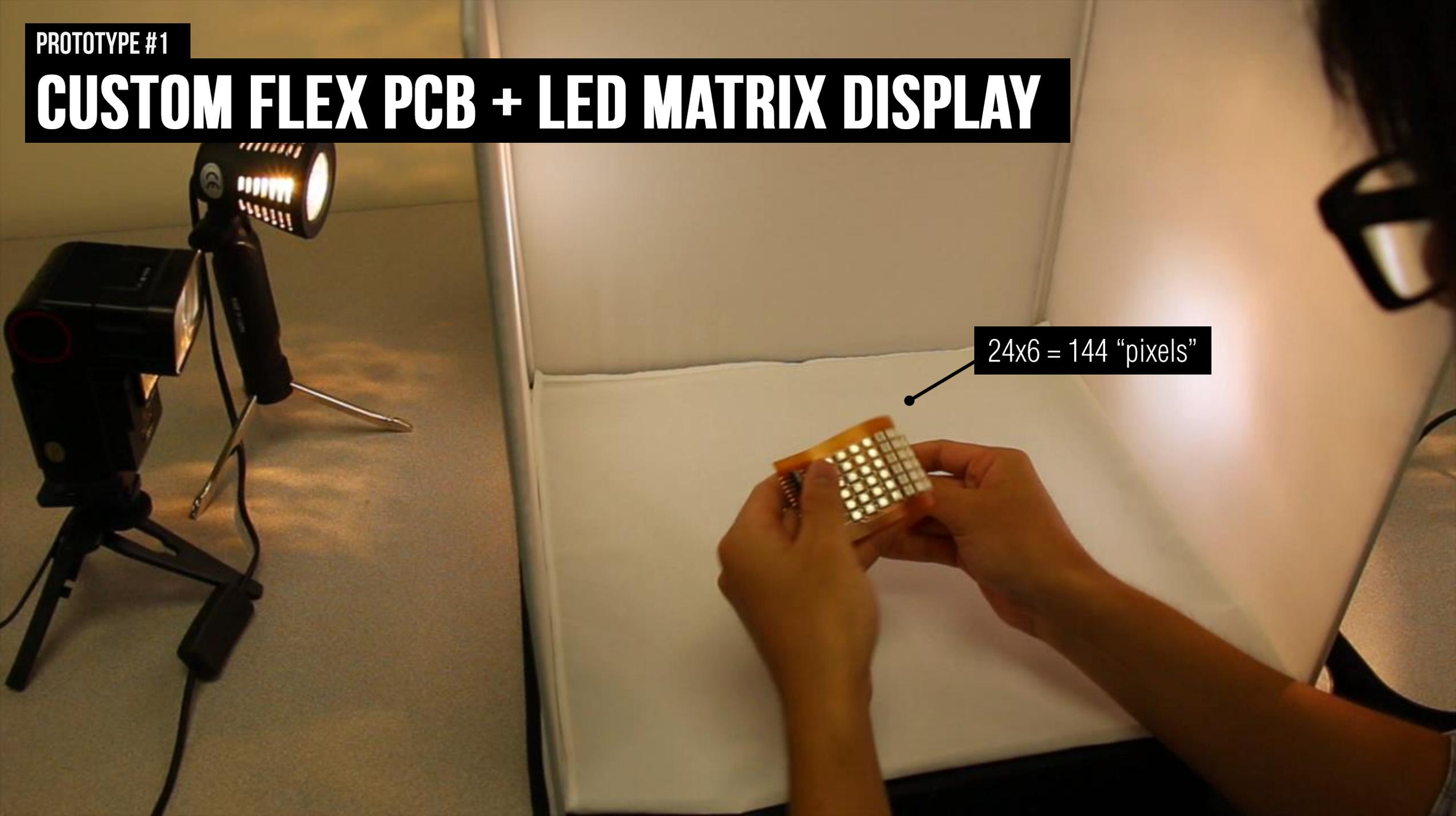


We created **three prototypes**, which differed in display technology, resolution, viewability, weight

PROTOTYPE #1

CUSTOM FLEX PCB + LED MATRIX DISPLAY

24x6 = 144 "pixels"



PROTOTYPE #2

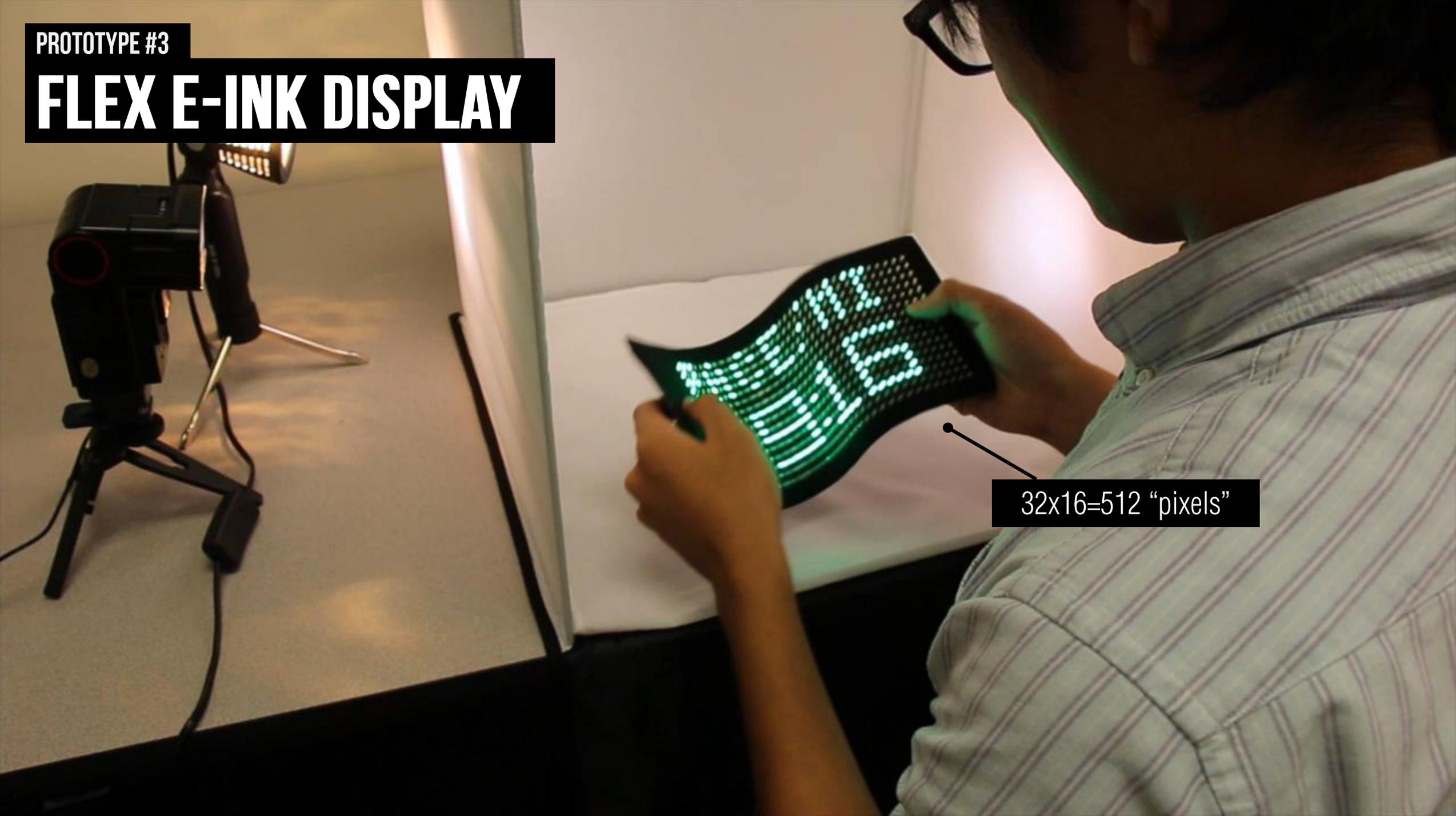
FLEX E-INK DISPLAY



Viewable in direct
sunlight & wide angles

PROTOTYPE #3

FLEX E-INK DISPLAY



32x16=512 "pixels"

SOCIAL FABRIC FITNESS

PILOT TESTS



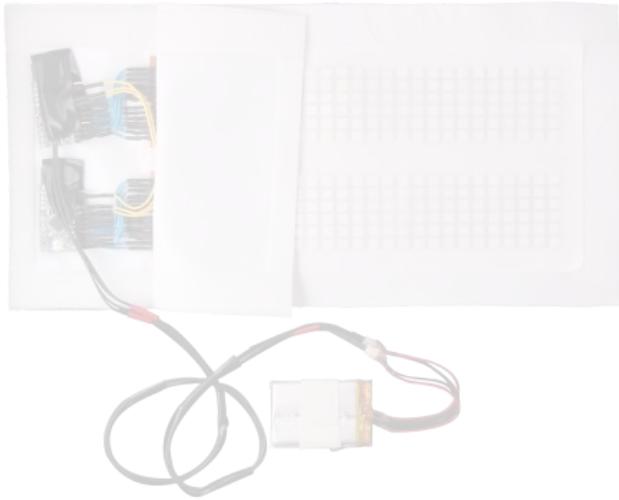
SOCIAL FABRIC FITNESS

PILOT TESTS



PROTOTYPE DISPLAYS

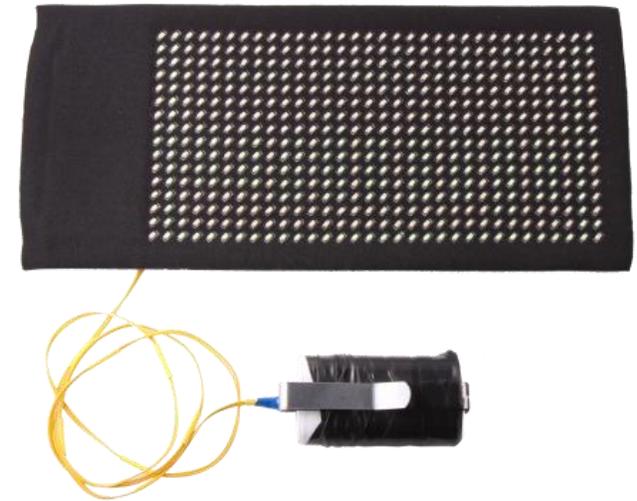
PROTOTYPE#1



PROTOTYPE#2



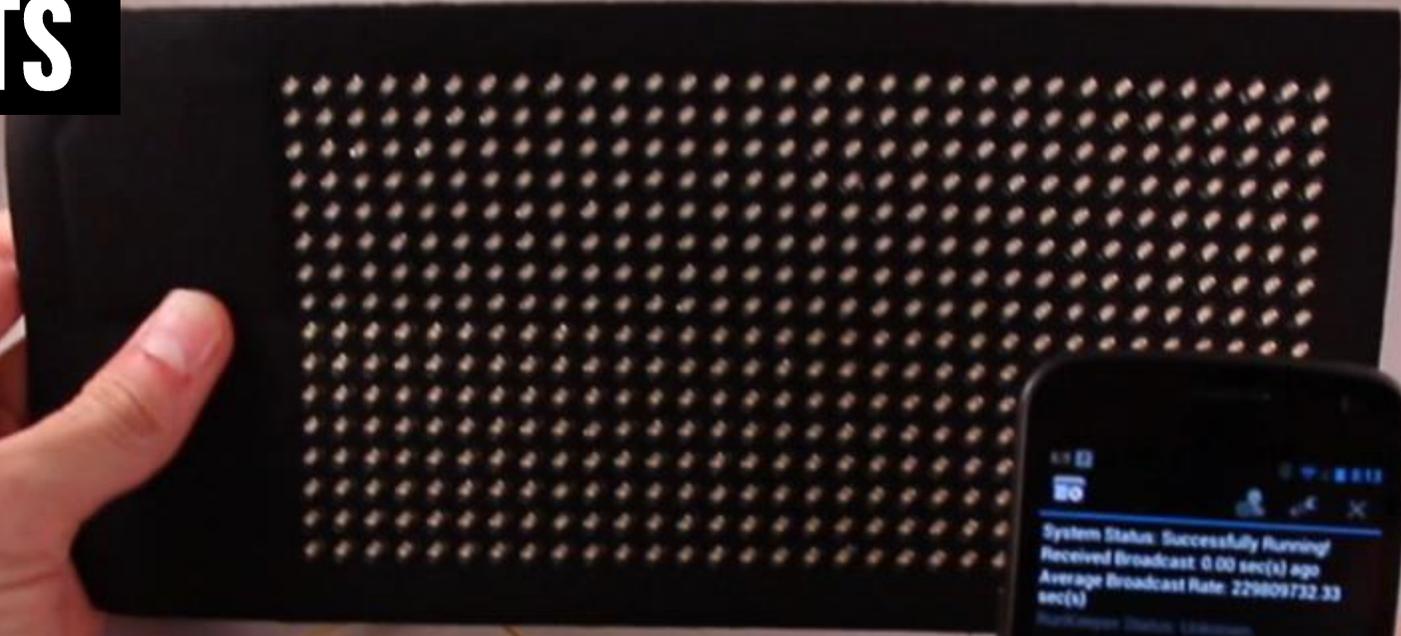
PROTOTYPE#3



Prototype #3 performed best in our pilots

SOCIAL FABRIC FITNESS

DISPLAY TESTS



FINAL VISUALIZATIONS



Wirelessly transmits via Bluetooth



SOCIAL FABRIC FITNESS

SOCIAL GOAL VIS





10 Groups:
52 runners

Avg Group Size:
5

Avg Age:
40.7

Avg Target Pace:
10:14

Avg Distance:
3.5 mi

SOCIAL FABRIC FITNESS

RACE DEPLOYMENTS



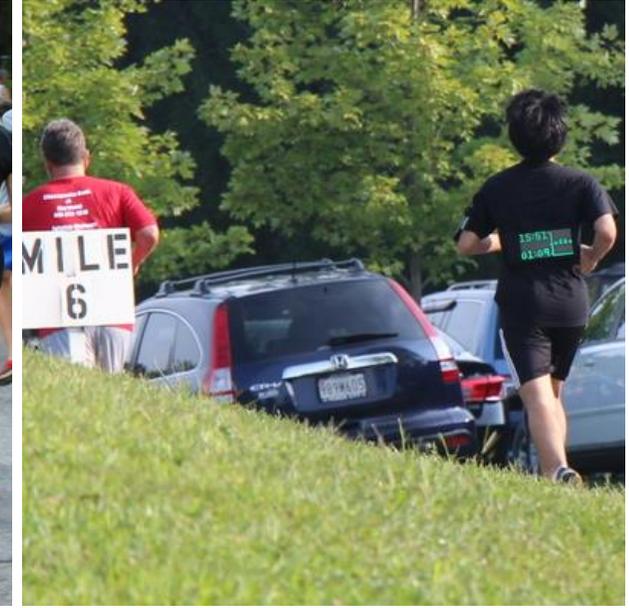
Male, 34
Target Pace: 6:10
County 8K



Female, 33
Target Pace: 8:20
County 8K



Male, 26
Target Pace: 7:45
Labor Day 10K



Male, 18
Target Pace: 8:30
Labor Day 10K



"It made me more aware of our
pacing and kept me more
focused on the run." -P4



"It motivated me to go faster than the pace displayed." -P17





Gold medal!

Step Away from Cancer
5K Run/Walk



prevent cancer
FOUNDATION

"It made me run faster because my performance was on display"

Gold medal!

Step Away from Cancer
5K Run/Walk



prevent cancer
FOUNDATION

Potential Dichotomy

Increased motivation
vs. increased anxiety

A photograph of four runners on a paved path surrounded by greenery. The runners are wearing athletic gear. Two of the runners in the back are wearing black t-shirts with a white sensor device on their backs. White arrows point from the text 'SFF Externalizes Performance' to these two sensors. The runner in the front is wearing a white t-shirt and black shorts. The runner next to him is wearing an orange t-shirt. The runner in the middle is wearing a black t-shirt with a green sensor. The runner in the back is wearing a black t-shirt with a white sensor. The path is paved and has blue dashed lines. The background is filled with lush green trees and bushes.

SFF Externalizes
Performance



Source: <http://www.erogear.com/>



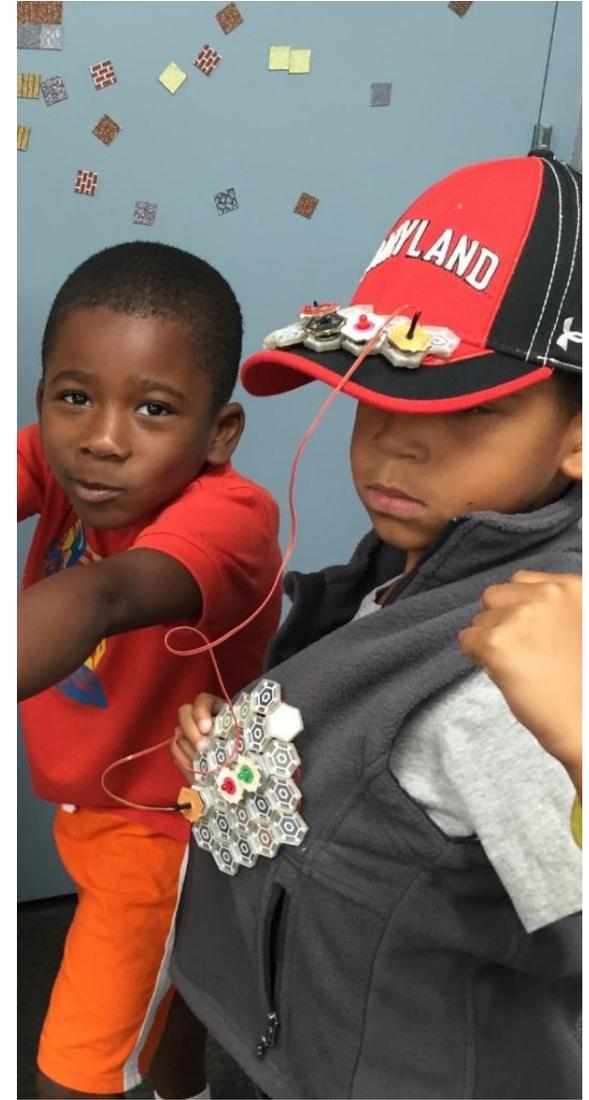
SOCIAL FABRIC FITNESS
[CHI'14]



I LIKE THIS SHIRT
[CHI'14]



BODYVIS
[IDC'13, CHI'15 Honorable Mention,
ICLS'16, IDC'16, CHI'17, ICLS'18]

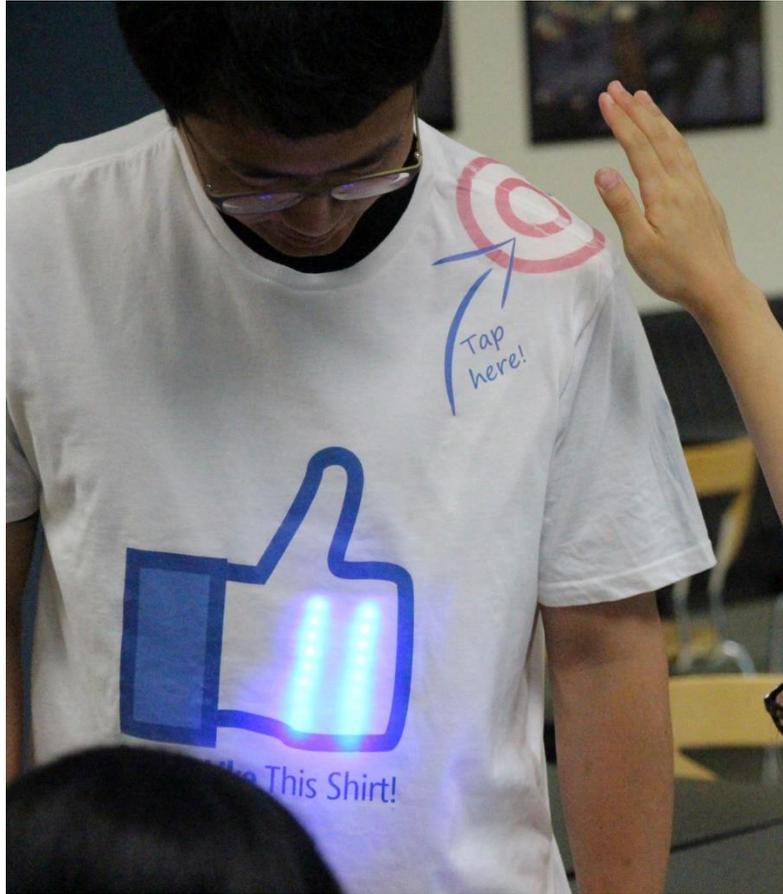


MAKERWEAR
[IDC'15, CHI'16 Best Poster, CHI'17
Best Paper]

FUN/SILLY

I LIKE THIS SHIRT

With Ladan Najafizadeh and Seokbin Kang



I LIKE THIS SHIRT

[CHI'14]

What if...

we translated the dynamics of lightweight social interactions that arose in social media to the physical world?



Jon Froehlich
Edit Profile

- News Feed
- Messages 20+
- 16 Events 1

GROUPS

- Arts District Hyatts... 20+
- REU-Combinatorial ... 4
- Workshop on Incon... 6
- CHI2015 in Seoul 20+
- Personal Informatics 13
- NSF CISE 2012 C... 14
- dorkbot seattle 20+
- Mobile Living Labs!...
- Manage Your Groups
- Create Group
- Find New Groups

FRIENDS

- Washington, Distric... 16
- University of Washi...
- University of Califo...
- HCIL, UMCP
- Microsoft Research
- Intel Research
- Intel Research

Update Status | Add Photos/Video

What's on your mind?



Sarita Yardi Schoenebeck

1 hr · 🌐

Reposted my anonymous prof yaks on the UW campus and they were all immediately downvoted. I guess UW students don't want faculty in their Yik Yak. I blame James Fogarty

Like · Comment

James Fogarty, Julie Kientz, Meredith Ringel Morris and 9 others like this.



James Fogarty Maybe they just don't like reposts?

1 hr · Like · 2



Sarita Yardi Schoenebeck Well one of them called me a liar before it was downvoted. A skeptical bunch!

1 hr · Like · 2



Julie Kientz Well, if you were claiming to be a UW prof they weren't wrong... Maybe they could smell the wolverine blood in your post 😊

1 hr · Like · 4



Write a comment...



June Ahn

3 hrs · Twitter · 👤

Excited to give my featured talk at #NSTA14 about @I_UMD work in informal science learning. Come by at 12:30: <http://t.co/soE5VsLDff>



National Science Teachers Association

16 1 event invite

Amanda Marisa Williams and 1 other

TRENDING

- Michael Dukakis:** Former presidential candidate testifies for defendant in trial linked to Boston Marathon bombing
 - Selena Gomez:** Boom! Selena Gomez Puts Her Grown-Up Haters In Their Place
 - Apple Inc.:** Company unveils thinner iPads, new Mac operating system and 'Retina 5K' high-res display at live event
- See More



PEOPLE LIKE THIS SHIRT



Tap here!

his Shirt!



Tap here!



Like This Shirt!



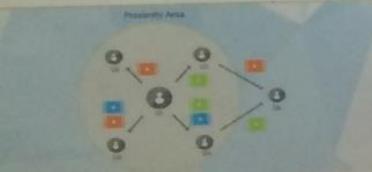
es: a Playful Concept of ction

ervices using Wi-Fi Direct
d friends and strangers
ollaborative Video Challenges

Pass it forward



Interact with nearby users



Future work

Implementation of the prototype is in progress
A large-scale user study will be organized with it
in order to understand its user experience and
social impact
More concepts for proximity-based playful so-
interaction will be researched

nikova, Thomas Olsson
land

"I LIKE THIS SHIRT"

EXPLORING THE TRANSLATION OF SOCIAL MECHANISMS IN THE VIRTUAL
PHYSICAL EXPERIENCES

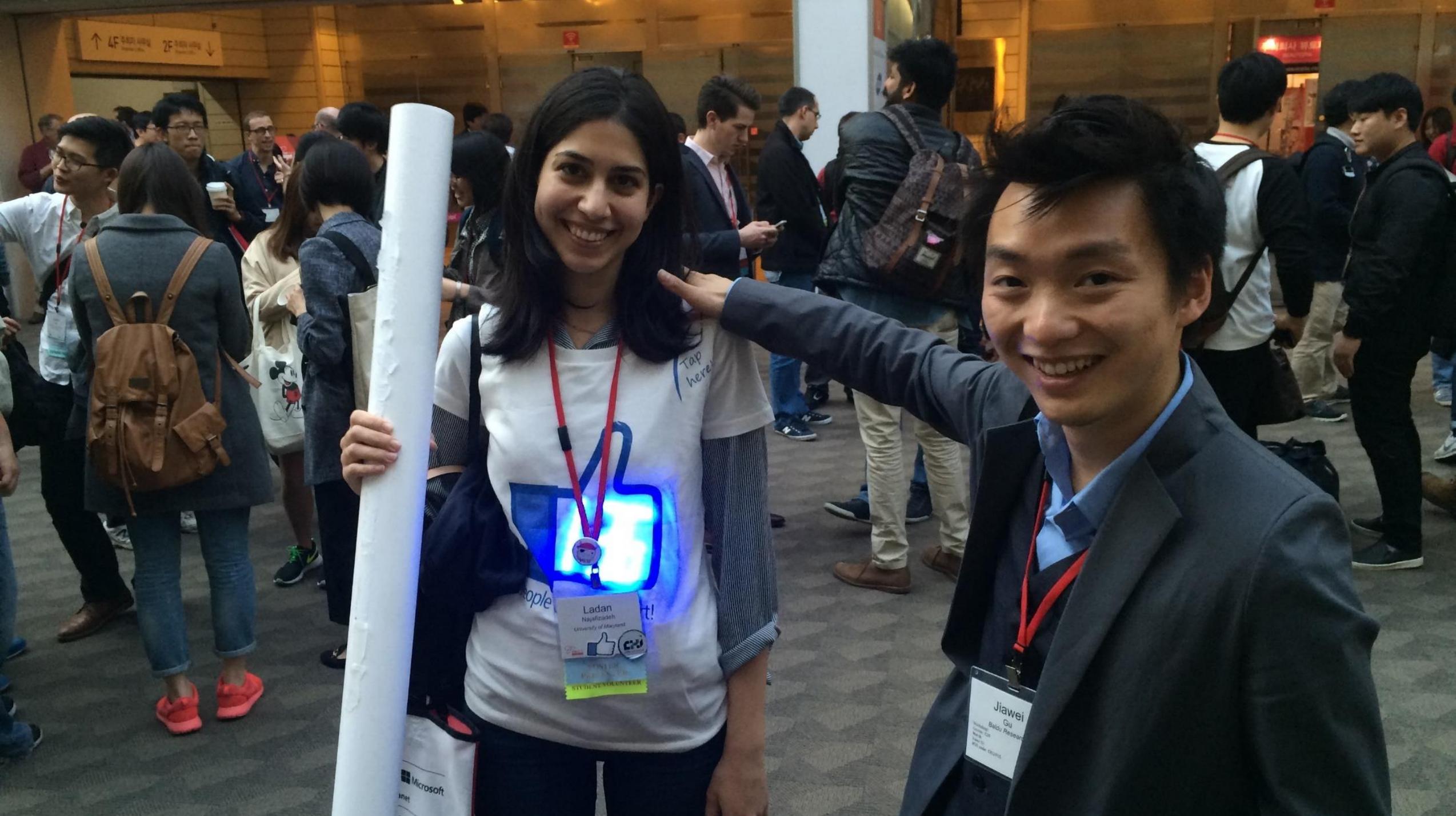


GOAL

What if you could instead of clicking
the "like" button in the virtual world

EMPLOYMENT RESULTS





Ladan
Nayafzadeh
University of Isfahan
STUDENT VOLUNTEER

Jiawei
Gu
Baidu Research

↑ 4F
↓ 2F

Microsoft
net



Tap here!



Brad
Myers
Carnegie Mellon University
CHI
SIGCHI
CHI Academy
ACM Fellow
PRESENTER

↑ 4F 展示会場 ↓
2F 展示会場 ↓



James
Landay
Stanford University

Ladan
Nejadcahen
University of Maryland
THINKERS
TECHNOCENTERS



Tap here!



People Like This Shirt!



Glasses

Kerry
Proehlich

Tap
here!



People Like This Shirt!

Tap
here!

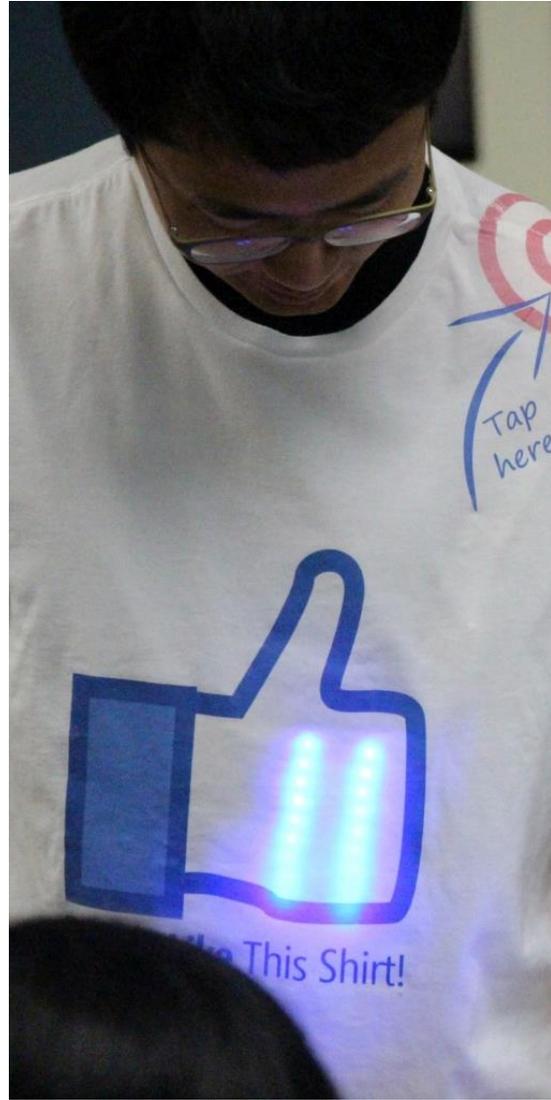


People Like This Shirt!





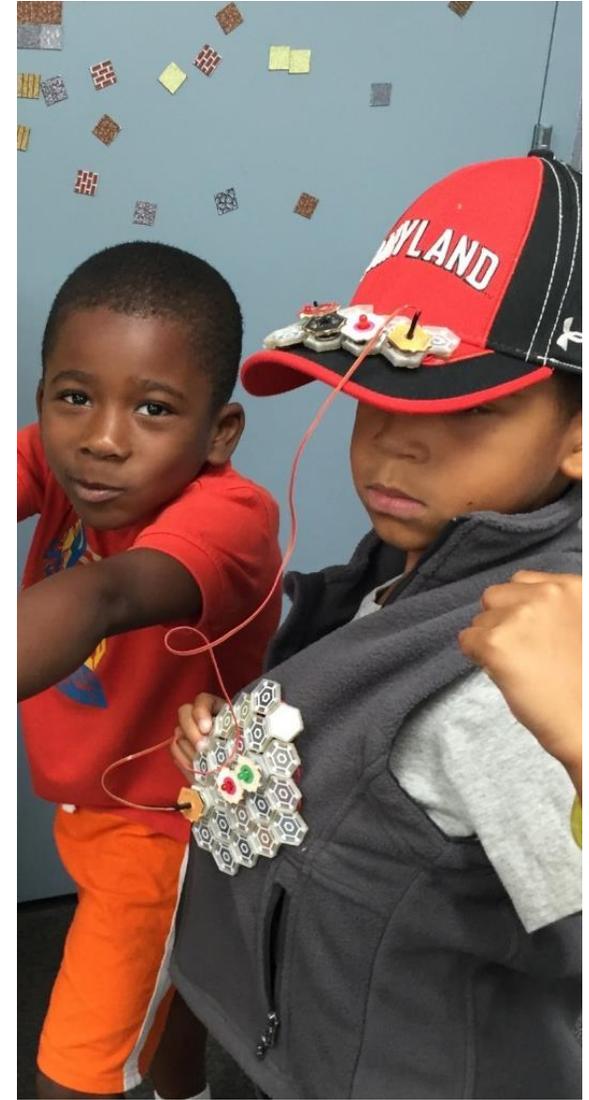
SOCIAL FABRIC FITNESS
[CHI'14]



I LIKE THIS SHIRT
[CHI'14]



BODYVIS
[IDC'13, CHI'15 Honorable Mention,
ICLS'16, IDC'16, CHI'17, ICLS'18]



MAKERWEAR
[IDC'15, CHI'16 Best Poster, CHI'17
Best Paper]

STEM EDUCATION

BODYVIS

With Tamara Clegg, Leyla Norooz, Seokbin Kang, and many others



How can we...

design wearables that use the human body and physical activity as a platform for experimentation & scientific inquiry?

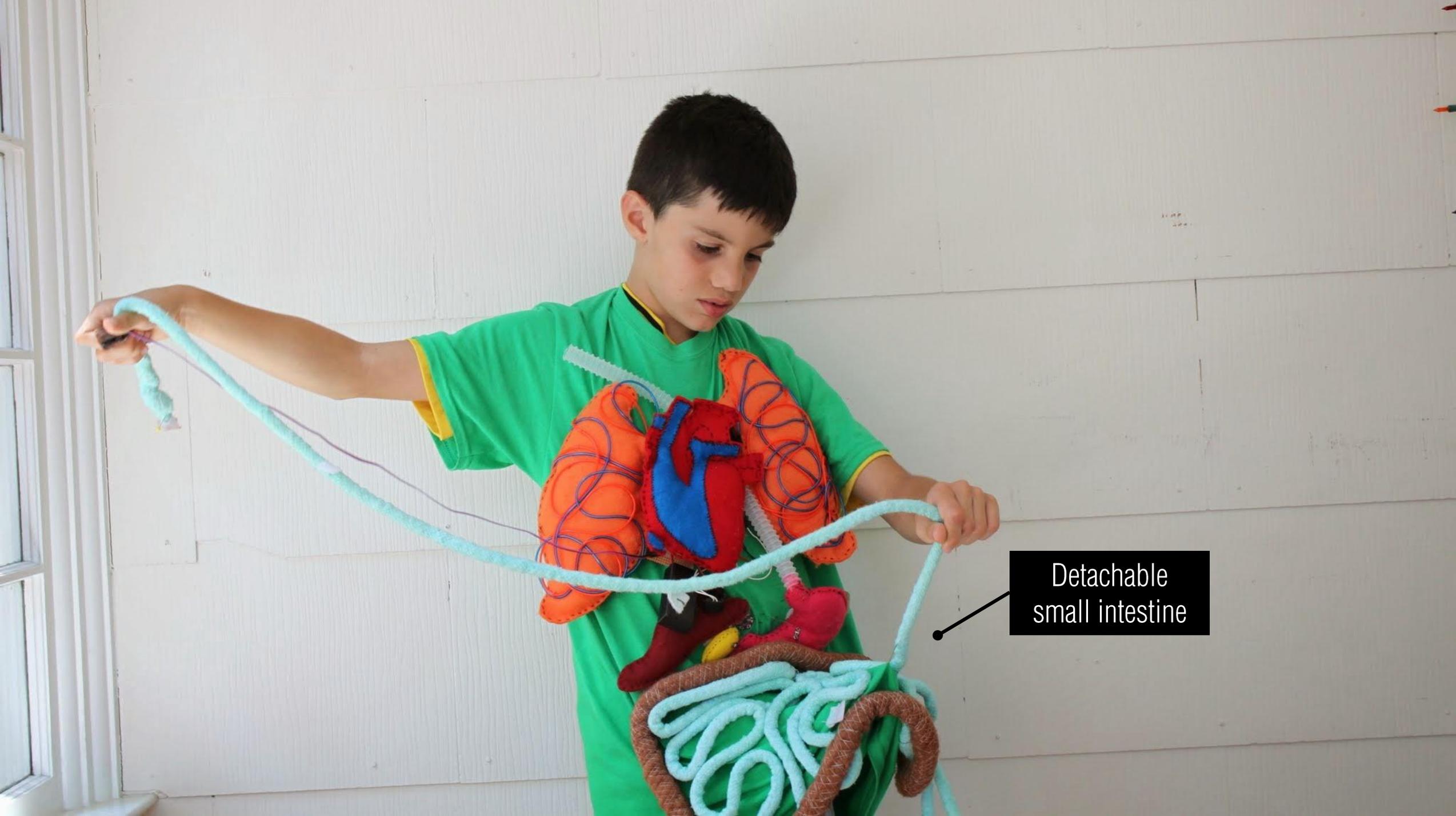
BODYVIS

[IDC'13, CHI'15 Honorable Mention, ICLS'16, IDC'16, CHI'17, ICLS'18]

“Does my heart beat faster when running vs. reading a book? Why?”

“How does my breathing rate compare to my classmate’s and why may this be?”

“How does food travel through my body?”



Detachable
small intestine

BODYVIS PROTOTYPES



PROTOTYPE 1: MID-FI

Stuffed fabric organs
Heart rate Only
LEDs, EL-Wire
Arduino Uno



PROTOTYPE 2

Improved Anatomy
Heart rate, Breathing
LEDs
LilyPad Arduino



PROTOTYPE 3

Labeled, Removable Anatomy
Heart rate, Breathing, Digestion
LEDs, Sound, Touchscreen
Arduino Uno, Smartphone



PROTOTYPE 4: HI-FI

Added Organs (*e.g.*, Bladder)
Heart rate, Breathing, Digestion
LEDs, Sound, Haptics, Touchscreen
Arduino BLE Mini, Smartphone

BODYVIS PROTOTYPES



PROTOTYPE 1

Stuffed fabric organs
Heart rate Only
LEDs, EL-Wire
Arduino Uno



PROTOTYPE 2

Improved Anatomy
Heart rate, Breathing
LEDs
LilyPad Arduino



PROTOTYPE 3

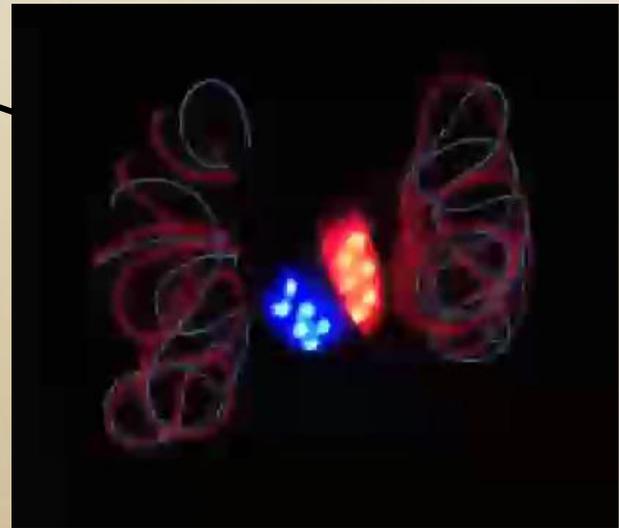
Labeled, Removable Anatomy
Heart rate, Breathing, Digestion
LEDs, Sound, Touchscreen
Arduino Uno, Smartphone

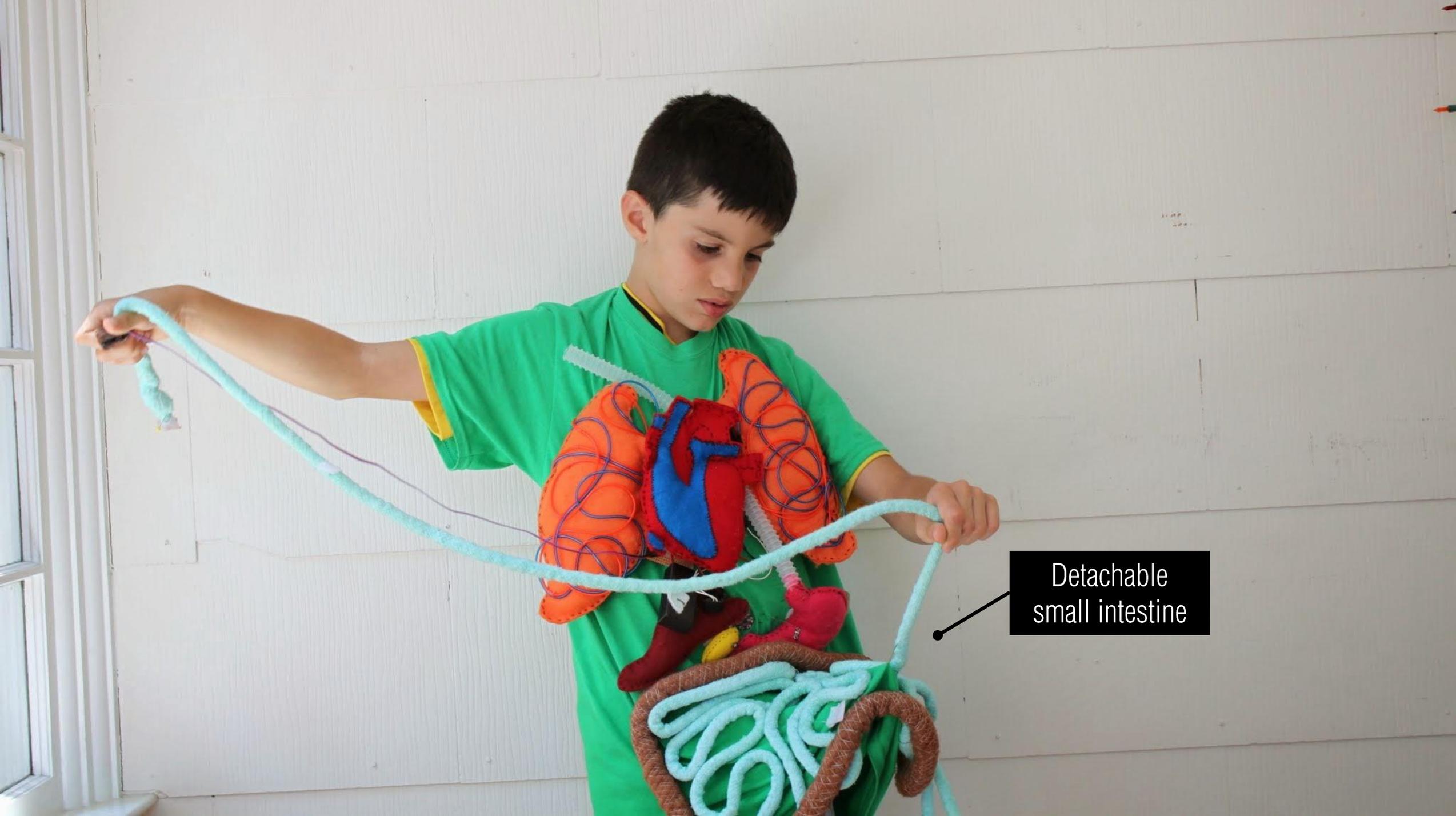


PROTOTYPE 4

Added Organs (*e.g.*, Bladder)
Heart rate, Breathing, Digestion
LEDs, Sound, Haptics, Touchscreen
Arduino BLE Mini, Smartphone

Optical heart rate sensor





Detachable
small intestine

BODYVIS: FOUR GENERATIONS



PROTOTYPE 1

Stuffed fabric organs
Heart rate Only
LEDs, EL-Wire
Arduino Uno



PROTOTYPE 2

Improved Anatomy
Heart rate, Breathing
LEDs
LilyPad Arduino



PROTOTYPE 3

Labeled, Removable Anatomy
Heart rate, Breathing, Digestion
LEDs, Sound, Touchscreen
Arduino Uno, Smartphone



PROTOTYPE 4

Added Organs (*e.g.*, Bladder)
Heart rate, Breathing, Digestion
LEDs, Sound, Haptics, Touchscreen
Arduino BLE Mini, Smartphone



Snack time! →

Esophagus

Lung

Lung

Liver

Large Intestine

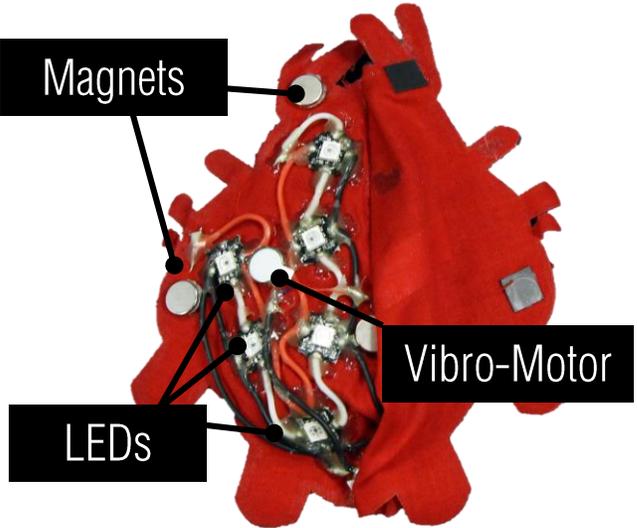
Small Intestine



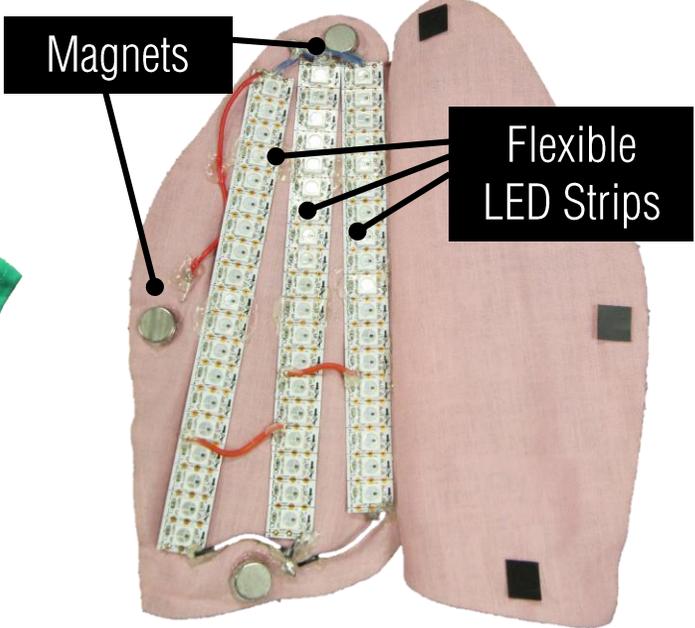
BODYVIS

HOW IT WORKS

HEART



LUNGS



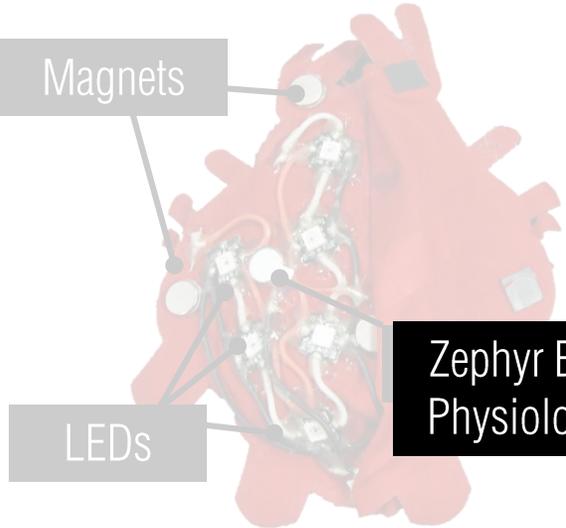
STOMACH



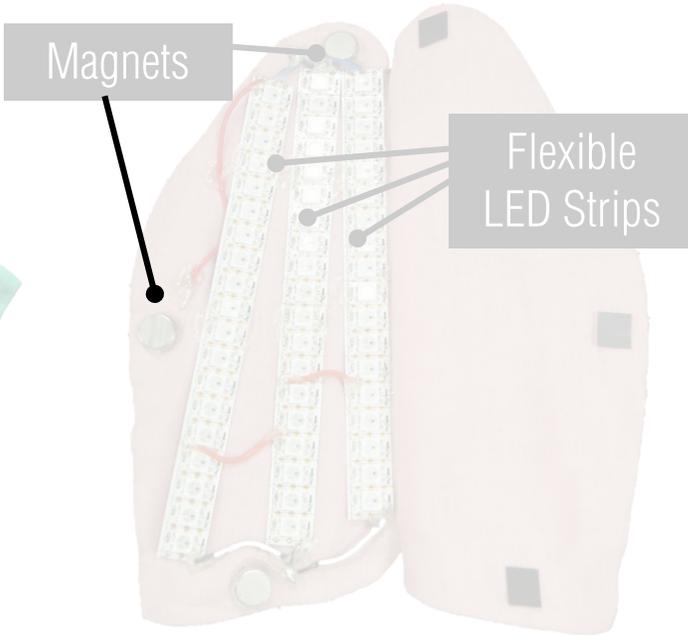
BODYVIS

HOW IT WORKS

HEART



LUNGS



STOMACH



BODYVIS SENSING SYSTEM



Wirelessly transmits
via Bluetooth



Wirelessly transmits
via BLE



ZEPHYR BIOHARNESS 3

Worn directly on skin
Senses heart, breathing, movement

SAMSUNG GALAXY S4 MINI

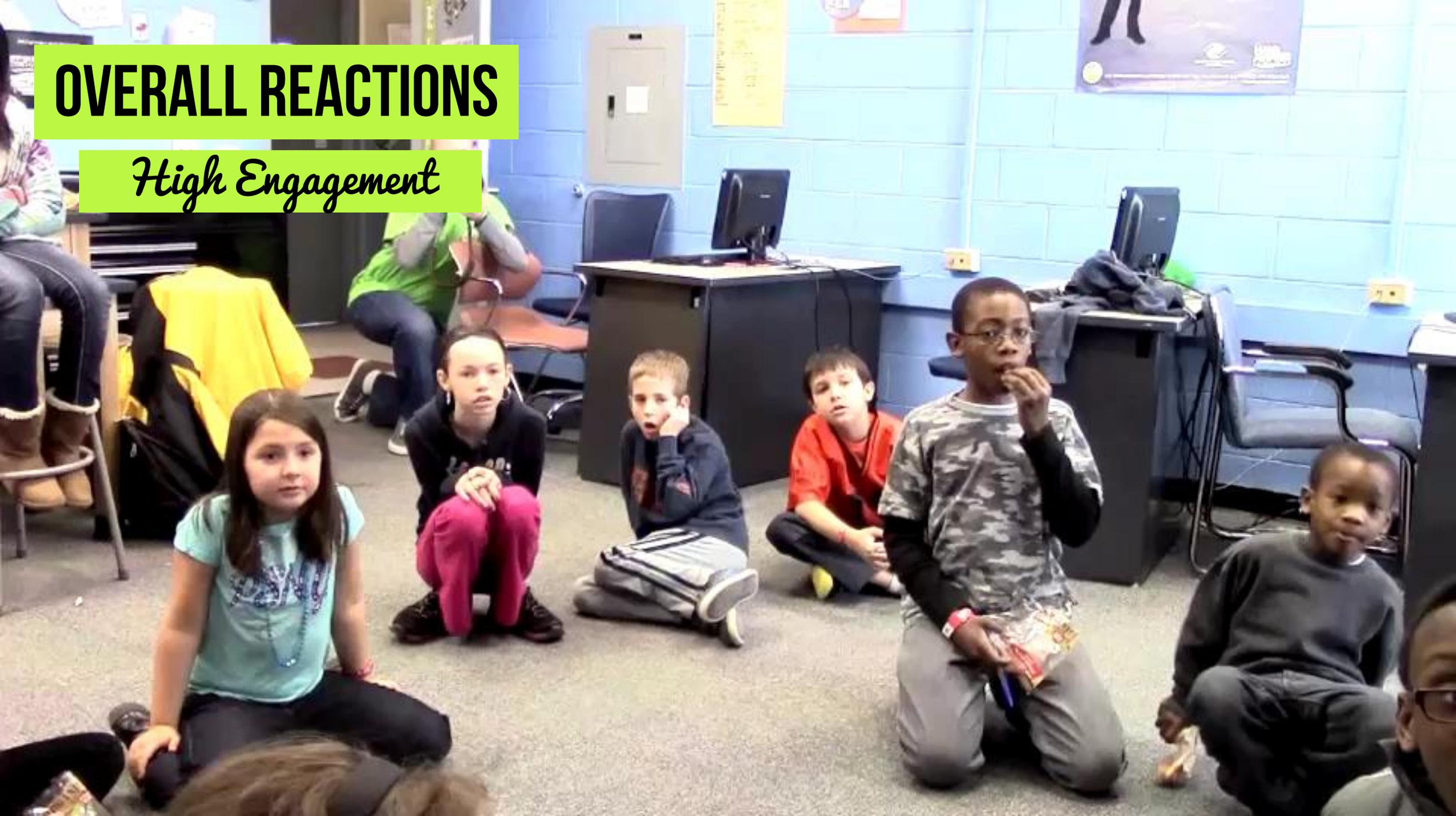
Serves as stomach
Processes physiological data
Plays sound & vibrates

REDBEARLAB BLE MINI ARDUINO

Sewn into shirt
Directly wired to LEDs, Vibro-motors,
digestion button, etc.

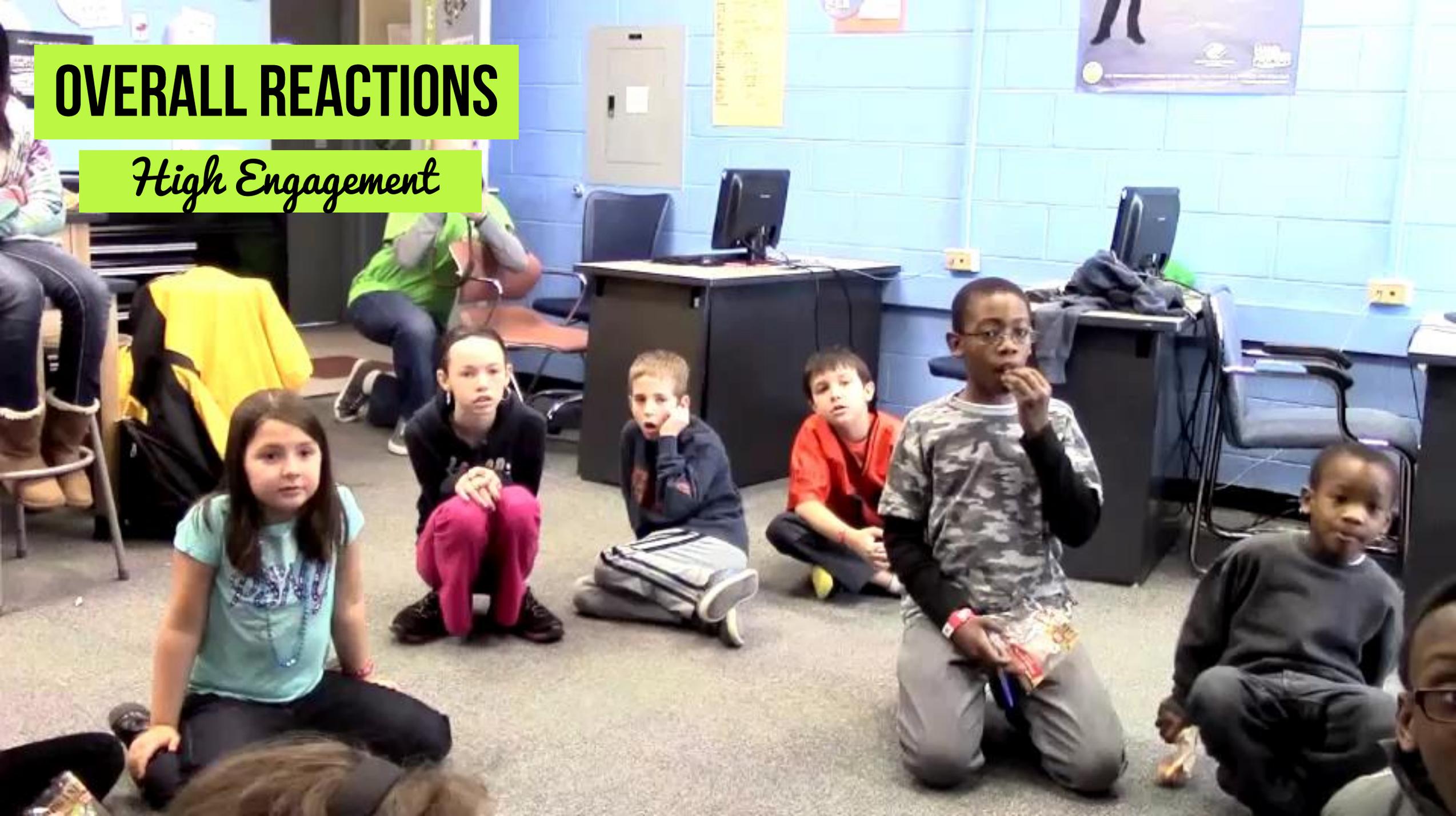
OVERALL REACTIONS

High Engagement



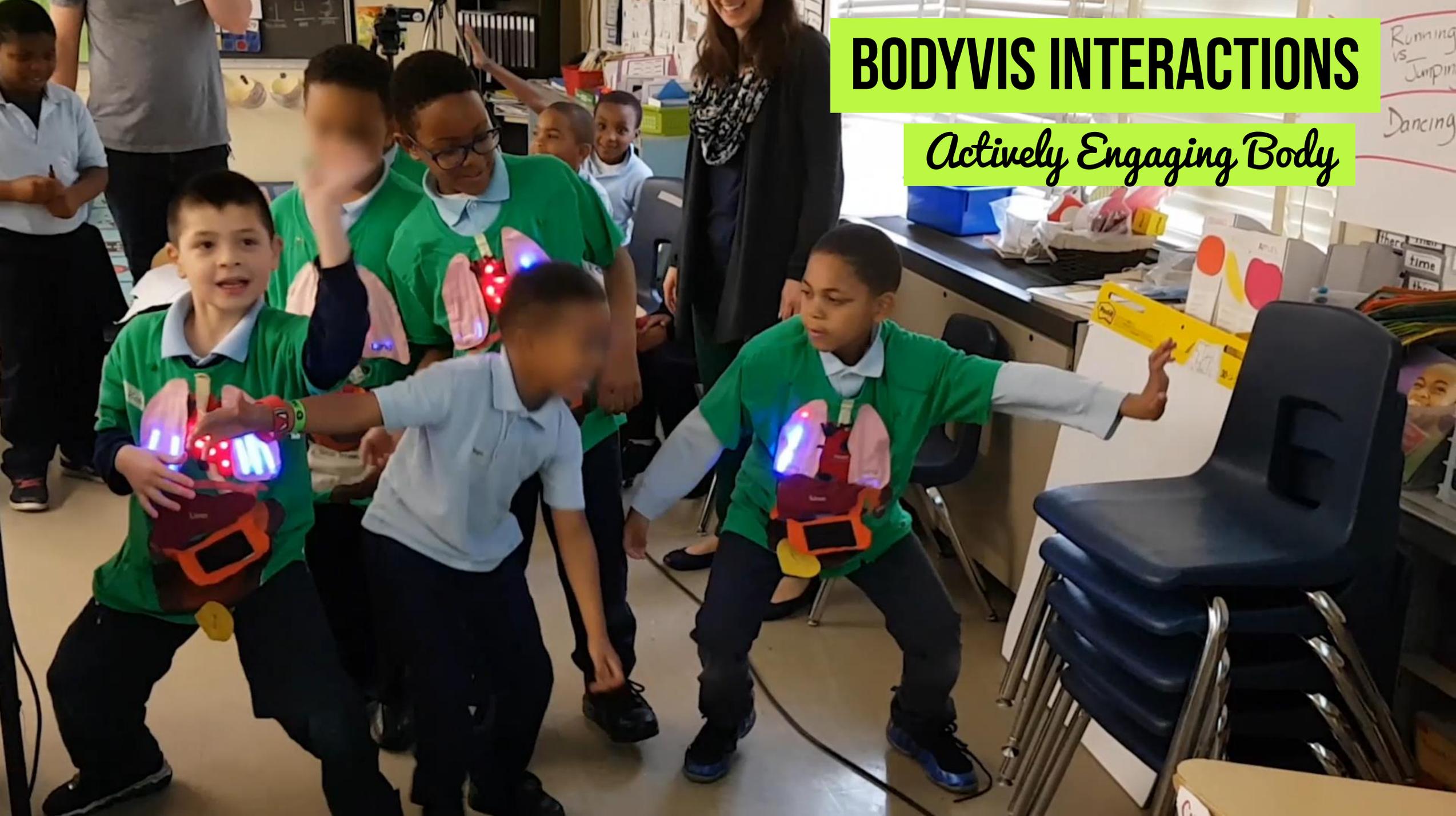
OVERALL REACTIONS

High Engagement



BODYVIS INTERACTIONS

Actively Engaging Body



UNEXPECTED FINDING

How Does It Work?





SOCIAL FABRIC FITNESS
[CHI'14]



I LIKE THIS SHIRT
[CHI'14]



BODYVIS
[IDC'13, CHI'15 Honorable Mention,
ICLS'16, IDC'16, CHI'17, ICLS'18]



MAKERWEAR
[IDC'15, CHI'16 Best Poster, CHI'17
Best Paper]

STE(A)M EDUCATION

MAKERWEAR

With Majeed Kazemitabaar and many others



How can we...

enable young children to build their own interactive wearables?

MAKERWEAR

[IDC'15, CHI'16 Best Poster, CHI'17 Best Paper]

LILYPAD ARDUINO

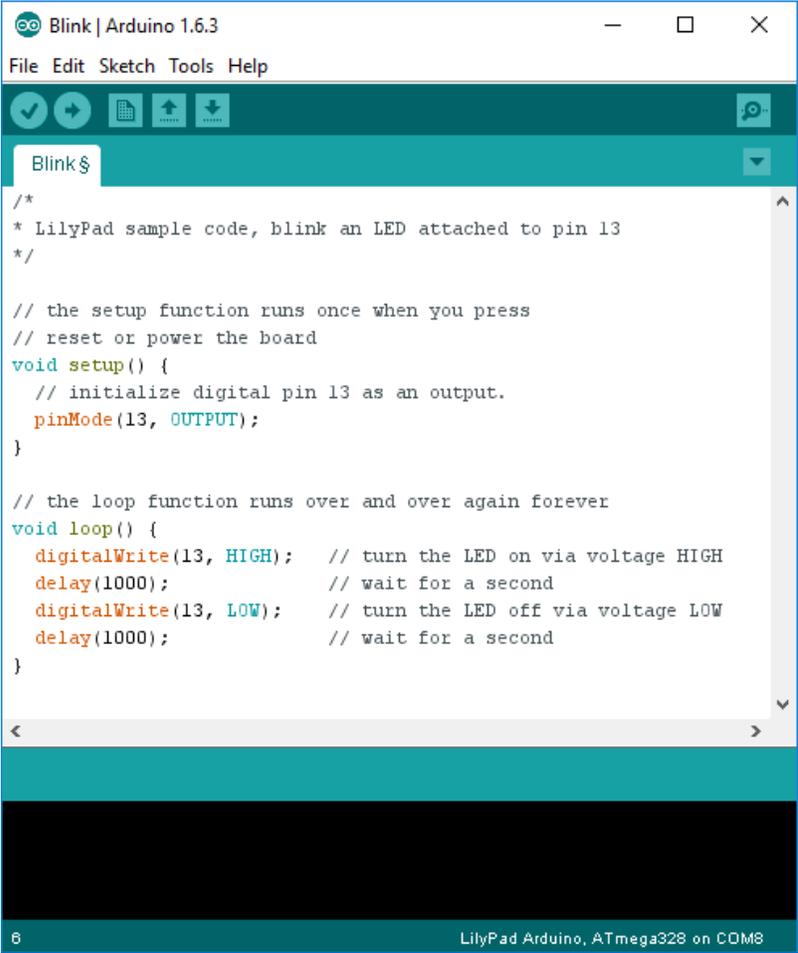




See: Buechley & Hill, 2010; Kafai, Lee, *et al.*, 2014; Kafai, Fields, & Searle, 2014

MAKERWEAR INTRODUCTION

CURRENT WEARABLE TOOLKITS



```
Blink | Arduino 1.6.3
File Edit Sketch Tools Help
Blink$
/**
 * LilyPad sample code, blink an LED attached to pin 13
 */

// the setup function runs once when you press
// reset or power the board
void setup() {
  // initialize digital pin 13 as an output.
  pinMode(13, OUTPUT);
}

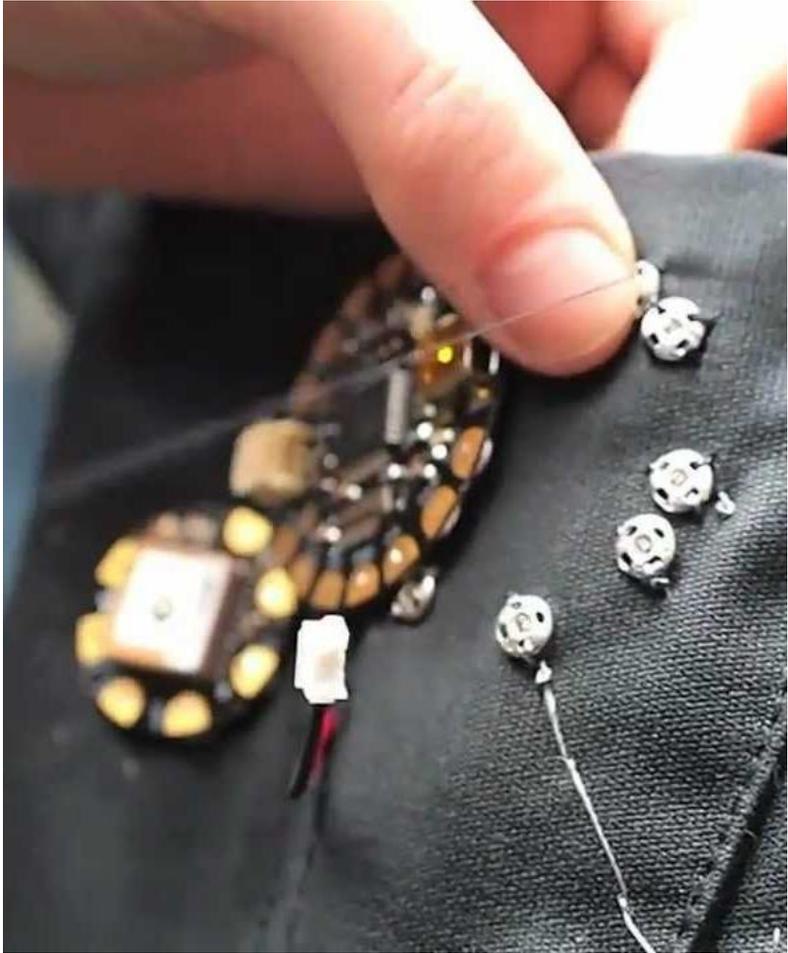
// the loop function runs over and over again forever
void loop() {
  digitalWrite(13, HIGH); // turn the LED on via voltage HIGH
  delay(1000);           // wait for a second
  digitalWrite(13, LOW); // turn the LED off via voltage LOW
  delay(1000);           // wait for a second
}
```

6 LilyPad Arduino, ATmega328 on COM8

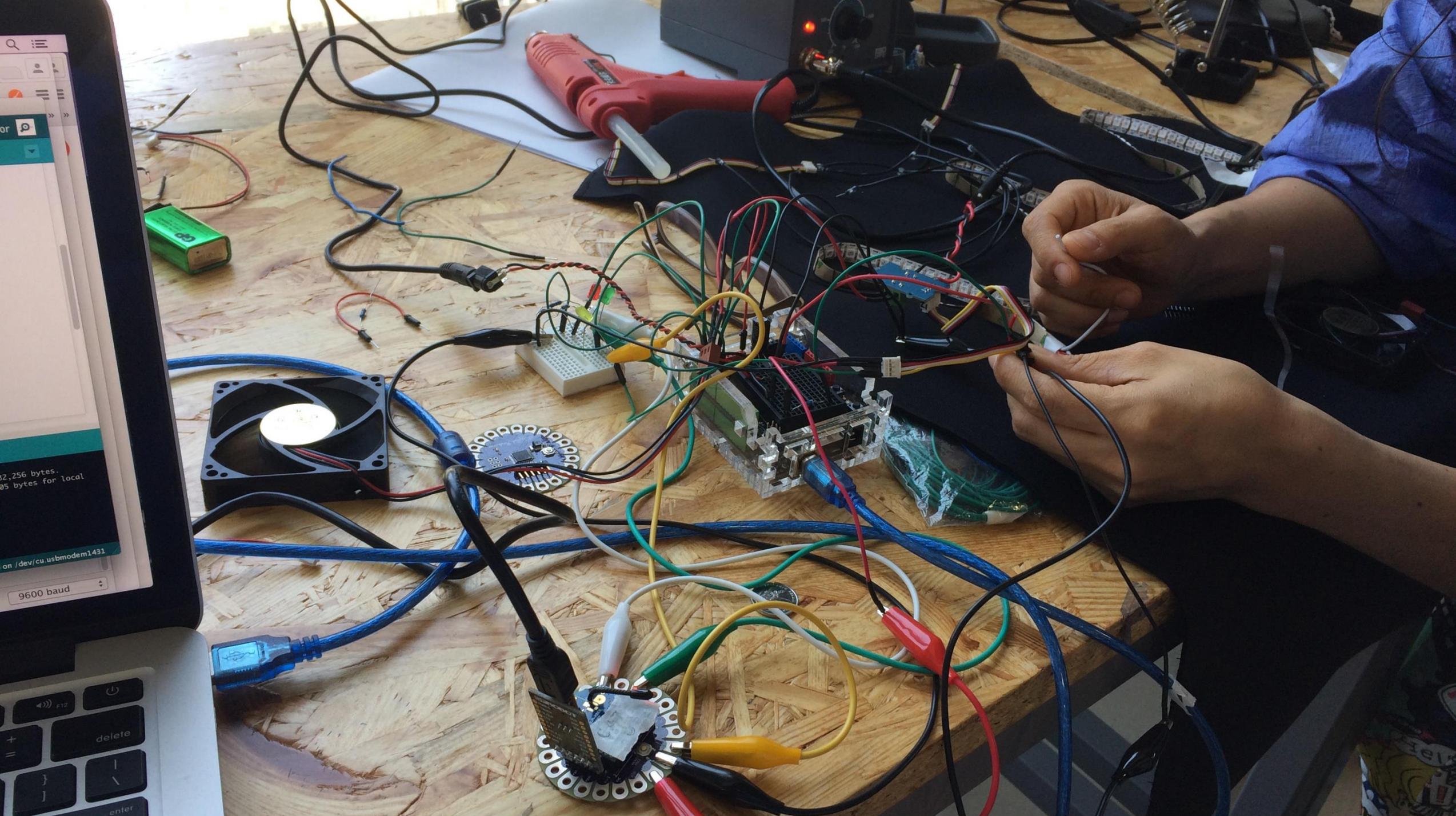
EMBEDDED PROGRAMMING



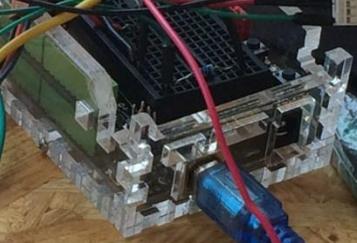
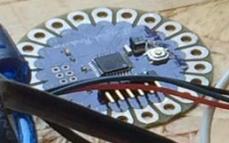
BASIC CIRCUIT & ELECTRONICS KNOWLEDGE



MANUAL SKILLS LIKE SEWING / SOLDERING



32,256 bytes.
95 bytes for local
on /dev/cu.usbmodem1431
9600 baud



A hand is shown interacting with a circular array of hexagonal sensor modules mounted on a dark fabric surface. The modules are arranged in a grid and feature various colored buttons and labels. A finger is pressing one of the modules. The background is dark and out of focus.

THE MAKERWEAR SYSTEM

<https://github.com/MakerWear>

1

MAKERWEAR SYSTEM TANGIBLE MODULES



2

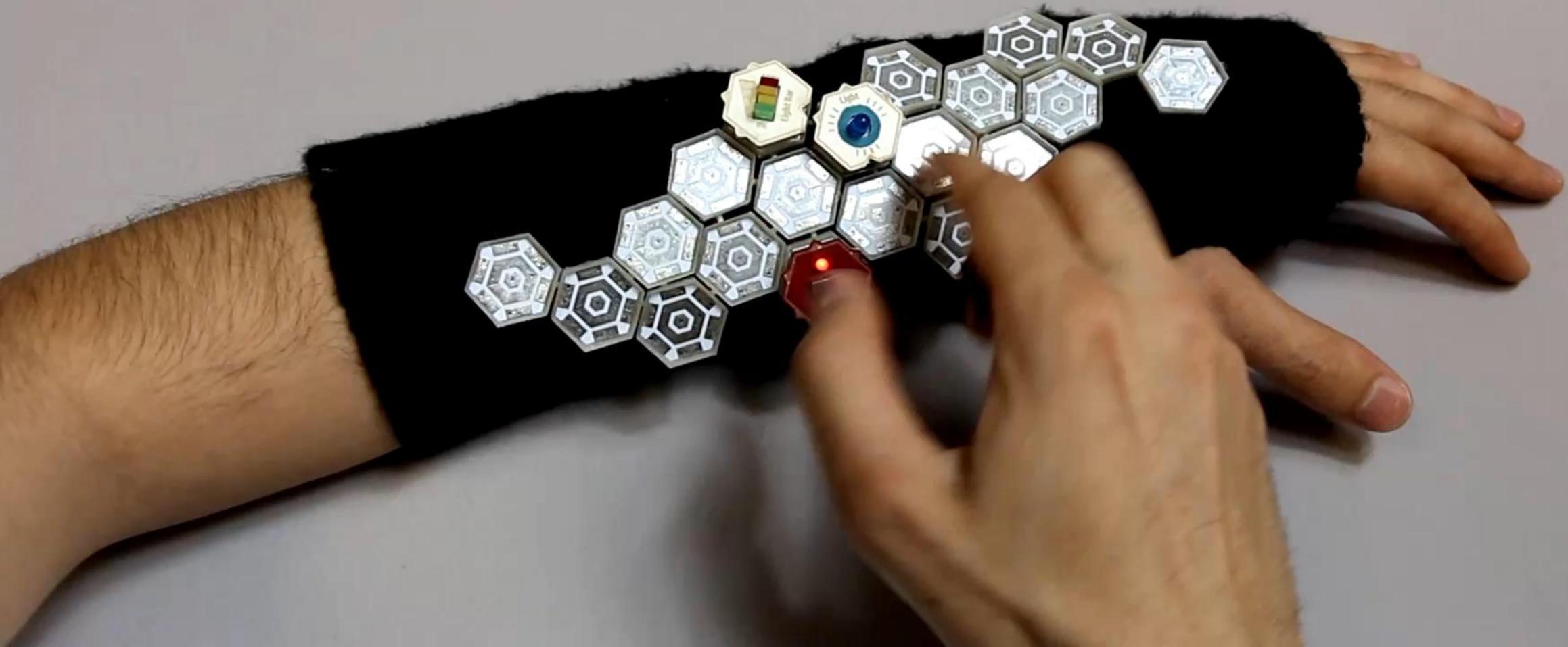
MAKERWEAR SYSTEM
MAGNETIC SOCKET MESH

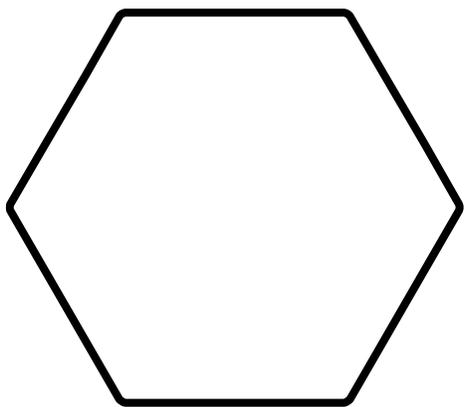


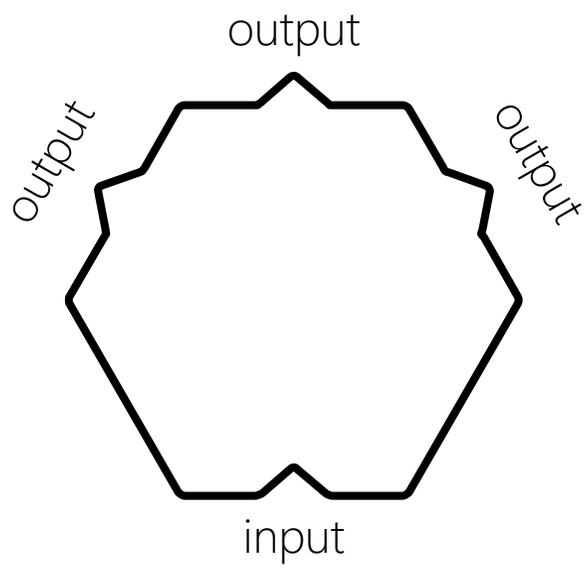
SOCKET MESH

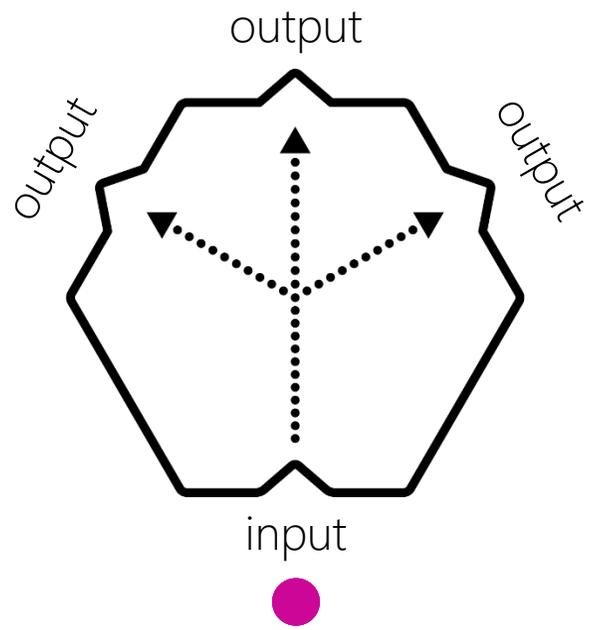


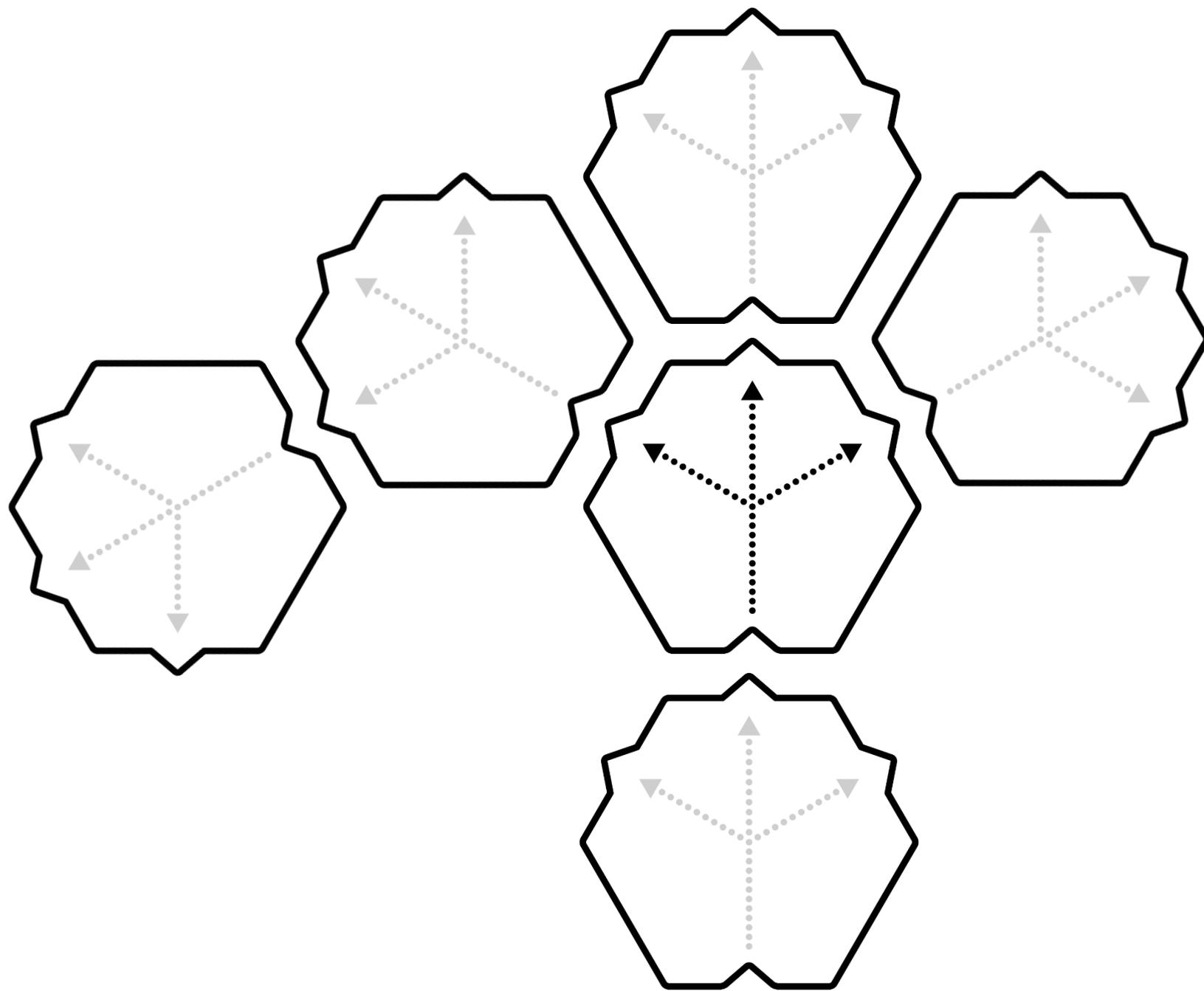
SOCKET MESH



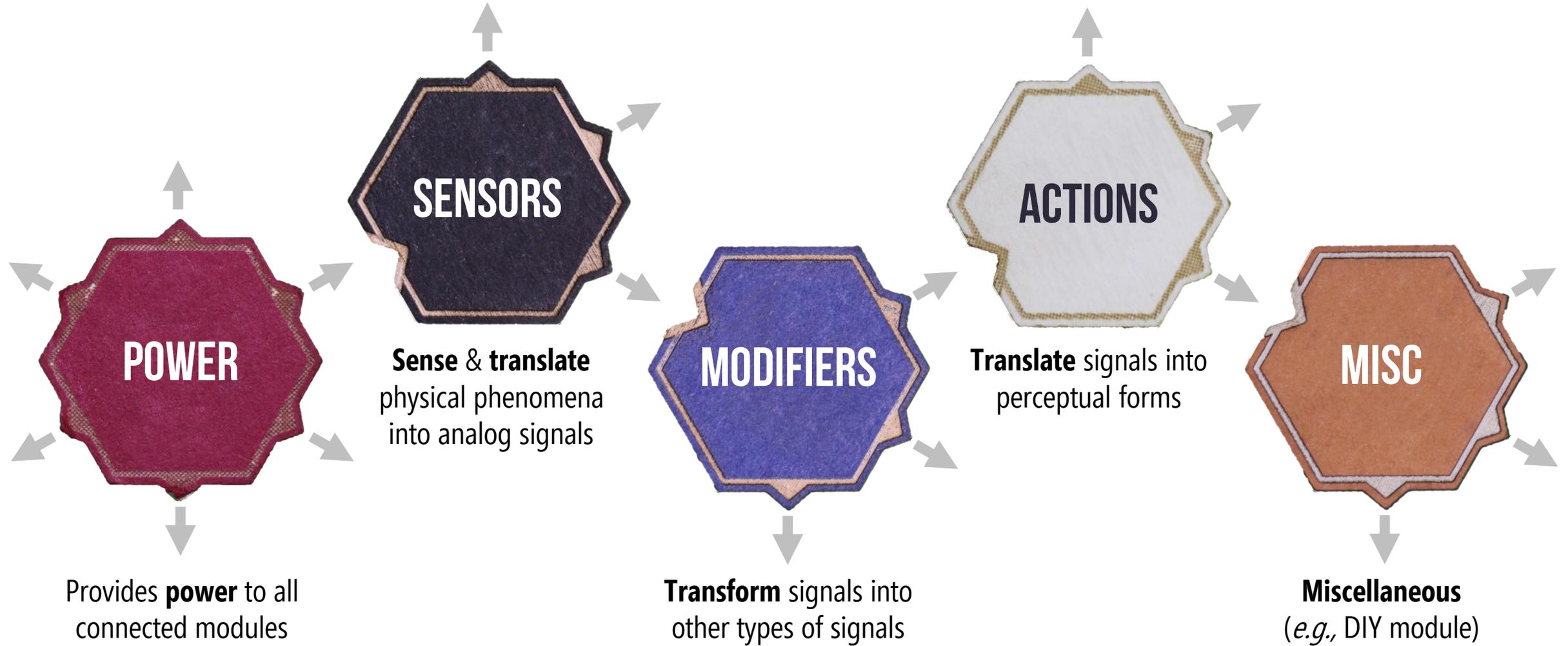








5 MODULE TYPES



MODULE LIBRARY: 33 MODULES

12 SENSORS



Motion Detector



Distance



Sunlight Detector



Tilt Sensor



Light Sensor



Receiver



Impact Sensor



Color Detector



Heartbeat



Button



Temperature



Sound Sensor

9 ACTIONS



Light Bar



Yellow Light



Rotator



Green Light



MultiColor Light



Spinner



Blue Light



Number



Vibration



Red Light



Sender



Sound Maker

7 MODIFIERS



Volume Knob



Sine Wave



Threshold



Counter



Fade



Inverter



Square Wave

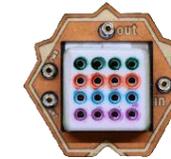
4 MISC



Wire Start



Wire End



DIY Electronic



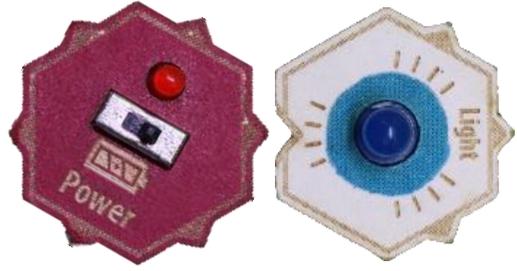
Bridge

1 POWER



Power







MAKERWEAR EXAMPLES

“MOTION-REACTIVE CLOTHES”



Motion-reactive clothes!

MAKERWEAR EXAMPLES

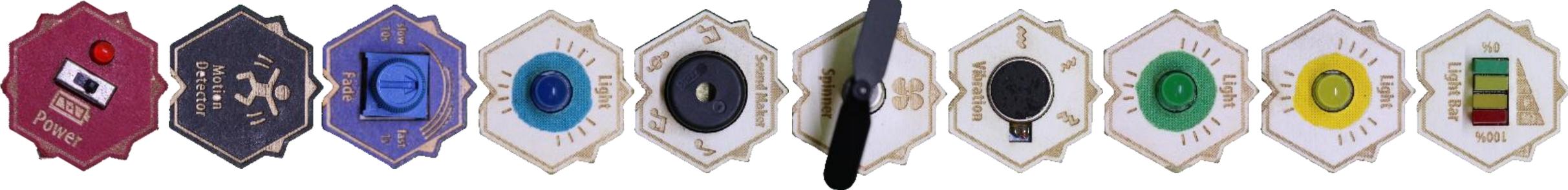
“MOTION-REACTIVE CLOTHES”



Now with fade effect

MAKERWEAR EXAMPLES

“MOTION-REACTIVE CLOTHES”



MAKERWEAR EXAMPLES

“MOTION-REACTIVE CLOTHES”



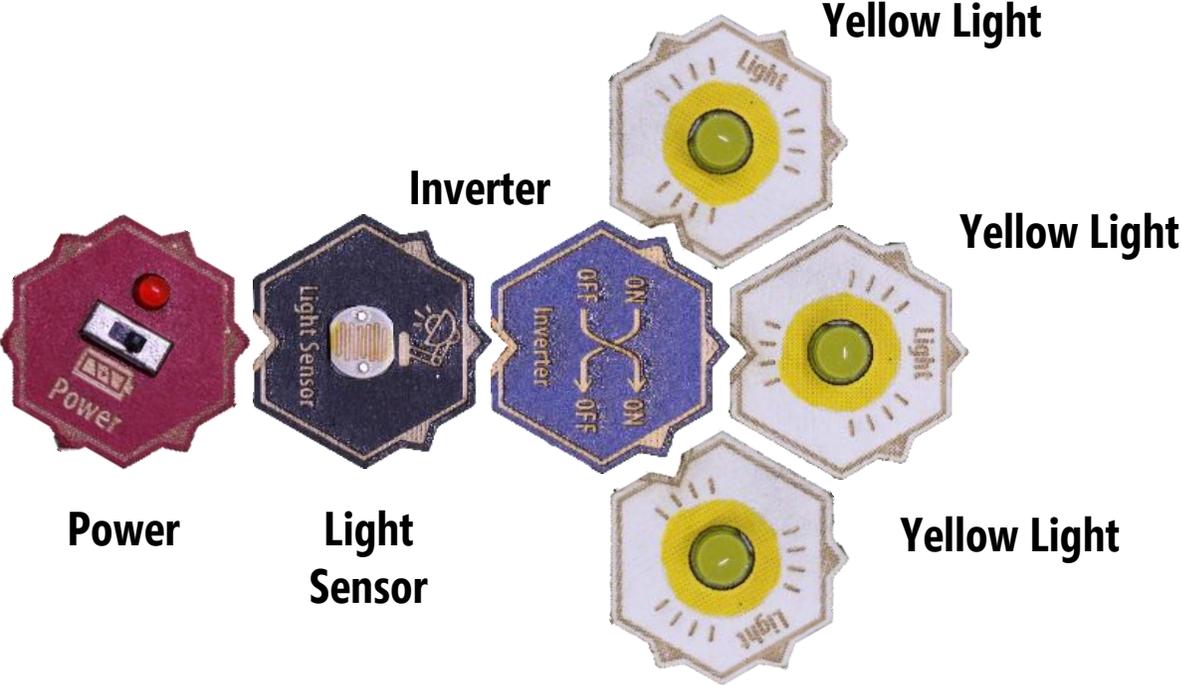
MAKERWEAR EXAMPLES

“MOTION-REACTIVE CLOTHES”



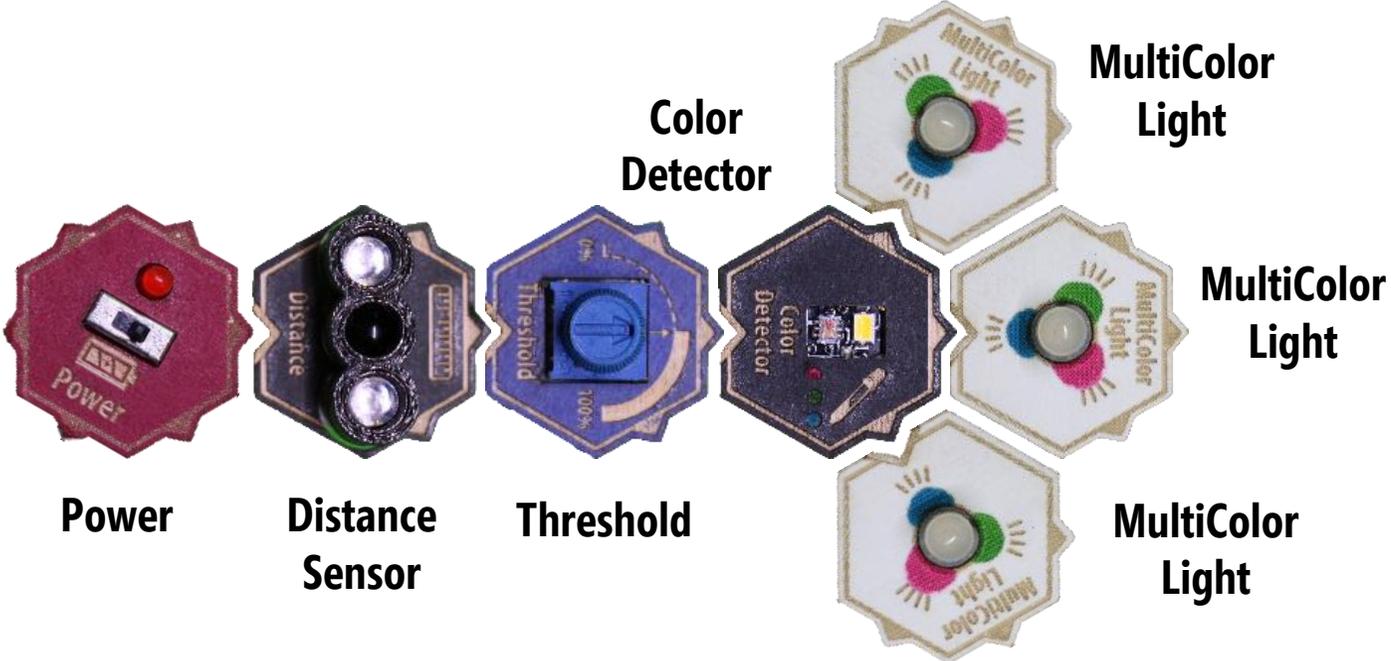
We can create a **diverse** set of designs **tangibly**

“AUTO-HEADLAMP HAT”



MAKERWEAR EXAMPLES

“CHAMELEON CLOTHES”



MAKERWEAR EXAMPLES

“LASER TAG ARMBAND”

When button pressed, shoots “laser”
(IR beam) and turns on blue LED



When “hit” by IR
beam, turns red

MAKERWEAR EXAMPLES

“LASER TAG ARMBAND”



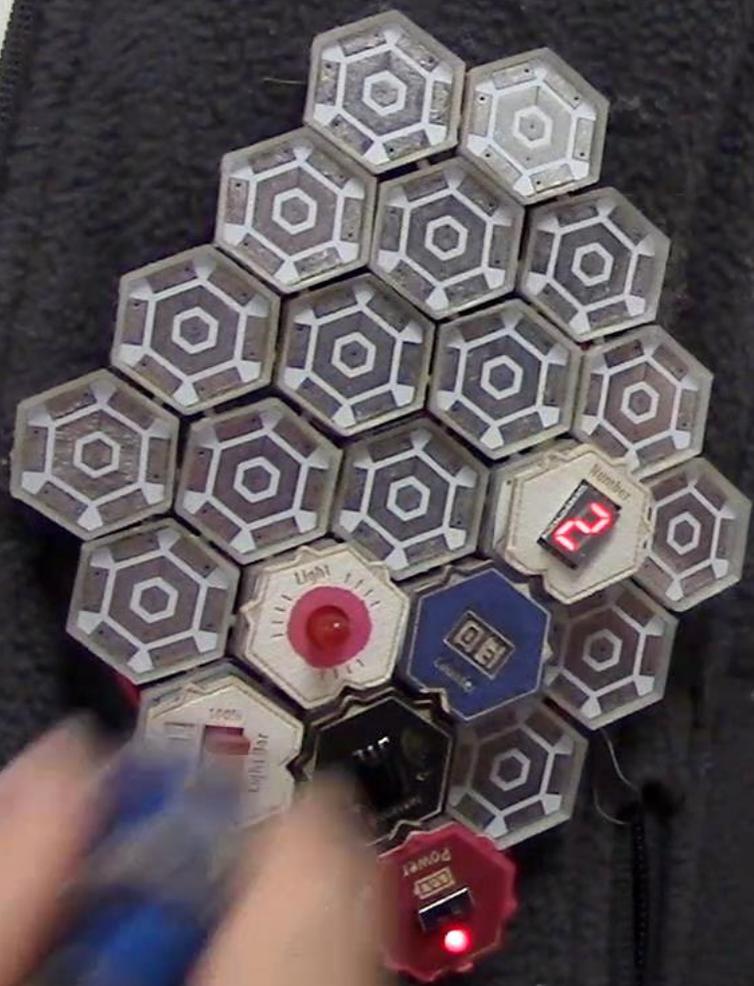
“LASER TAG ARMBAND”

Imagine that...

you also want to track the number of times you've been “hit” by a laser.

Now imagine that...

you want to add in an "end game" condition that activates an alarm when a max hit count is reached.





MAKERWEAR WORKSHOPS

MAKERWEAR FINDINGS
OVERALL

Highly engaged in making

Wide variety of designs

Applied computational thinking



MAKERWEAR FINAL PROJECTS

WHAT DID CHILDREN MAKE?



SPORTS/FITNESS

38%



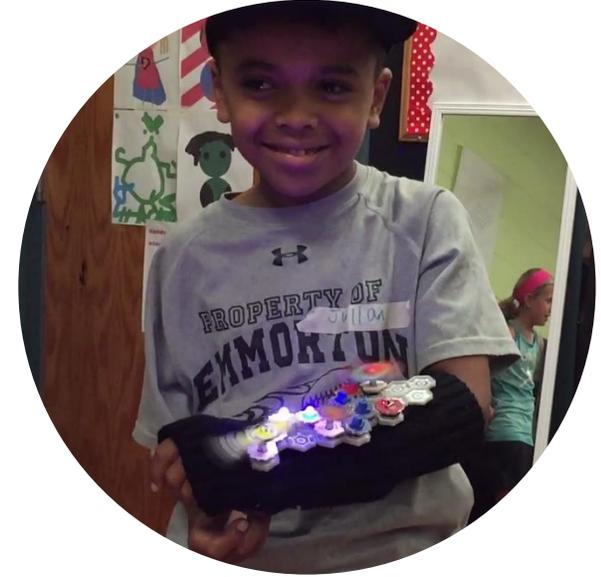
ROLE PLAY

31%



SOCIO-DRAMATIC PLAY

19%



OTHER

13%

MAKERWEAR FINAL PROJECTS

WHAT DID CHILDREN MAKE?



SPORTS/FITNESS

38%



ROLE PLAY

31%



SOCIO-DRAMATIC PLAY

19%

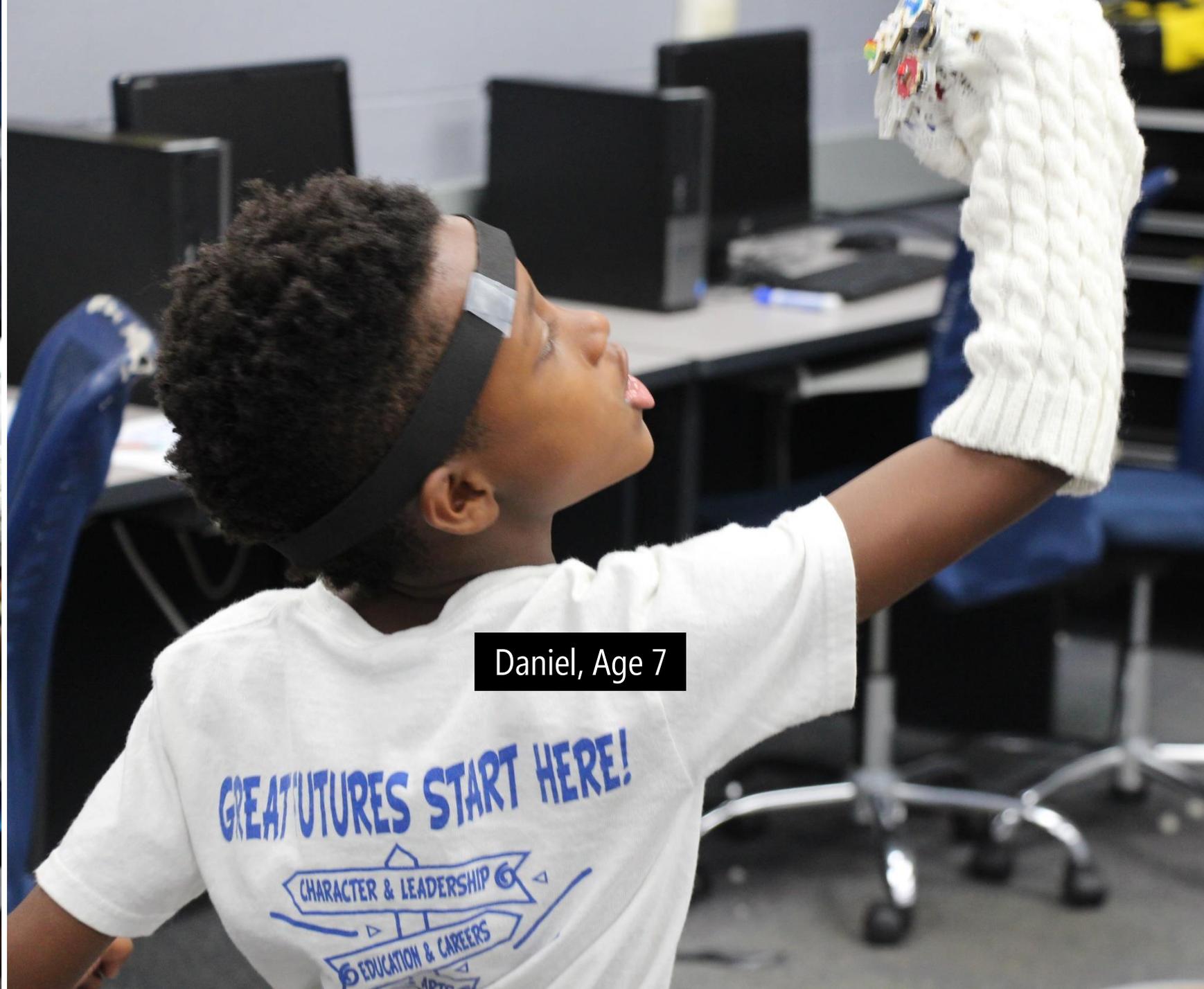


OTHER

13%

MAKERWEAR FINAL PROJECT

“SUPER NINJA”



Daniel, Age 7



SUPER NINJA

Maker: Daniel, Age 7

9 modules: 5 actions, 2 misc, 1 sensor

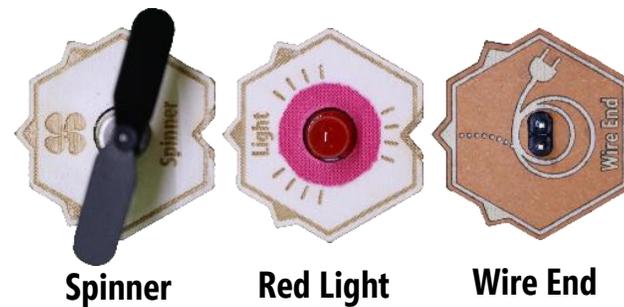
2 socket meshes

2 lo-fi pieces

“UPPER CUT” ARMBAND



“NINJA” BELT



MAKERWEAR FINAL PROJECTS

WHAT DID CHILDREN MAKE?



SPORTS/FITNESS

38%



ROLE PLAY

31%



SOCIO-DRAMATIC PLAY

19%



OTHER

13%

MAKERWEAR FINAL PROJECT

“MAGIC POKÉMON”



Austin, Age 9







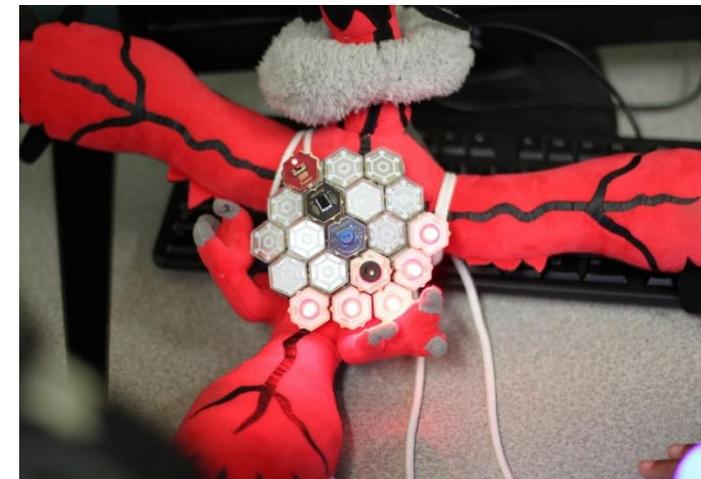
MAGIC YVELTAL POKÉMON

Maker: Austin, Age 9

14 modules: 9 actions, 2 sensors, 1 modifier

2 socket meshes

3 lo-fi pieces + pokemon



WHAT DID CHILDREN MAKE?



SPORTS/FITNESS

38%



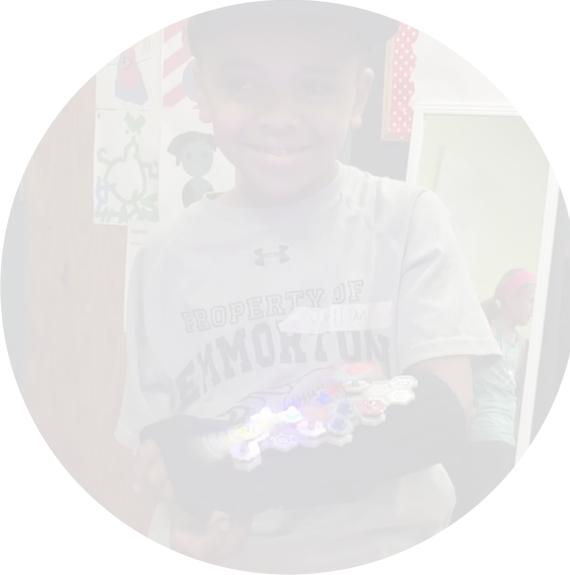
ROLE PLAY

31%



SOCIO-DRAMATIC PLAY

19%



OTHER

13%

MAKERWEAR FINAL PROJECT

“SMART LACROSSE STICK”



Sarah, Age 9



~~BAD AD'S~~

SUPERMAN LOVES STEM

KEEP GOING GOING GOING



SMART LACROSSE STICK

Maker: Sarah, Age 9

8 modules: 6 actions, 1 sensor

1 socket mesh

3 lo-fi pieces + lacrosse stick



MAKERWEAR FINAL PROJECT

“NEXT GEN RUNNING CLOTHES”



Amelia, Age 10





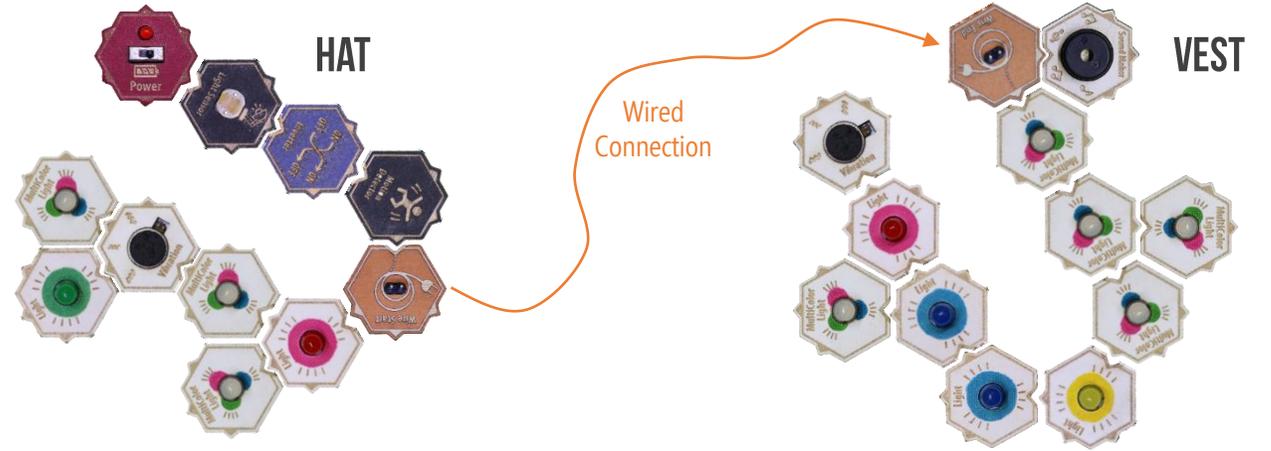
NEXT GENERATION RUNNING CLOTHES

Maker: Amelia, Age 10

40 modules: 25 actions, 3 sensors, 5 modifiers

4 socket meshes; 2 lo-fi pieces

MOTION-REACTIVE LIGHT-UP SAFETY HAT & VEST



“AIR CONDITIONING” ARMBAND



“HEART TRACKER” ARMBAND





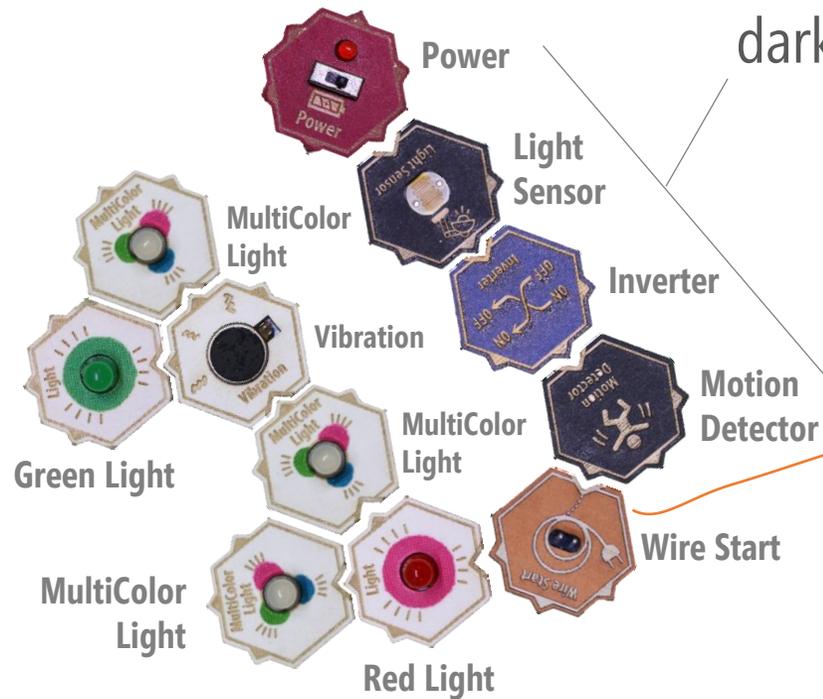
NEXT GENERATION RUNNING CLOTHES

Maker: Amelia, Age 10

40 modules: 25 actions, 3 sensors, 5 modifiers

4 socket meshes; 2 lo-fi pieces

MOTION-REACTIVE HAT



Activate hat & vest only when it's dark **AND** the wearer is moving

MOTION-REACTIVE VEST





NEXT GENERATION RUNNING CLOTHES

Maker: Amelia, Age 10

40 modules: 25 actions, 3 sensors, 5 modifiers

4 socket meshes; 2 lo-fi pieces

“HEART TRACKER” ARMBAND

Beeps & lights up on each heartbeat



Counts heartbeats up to 99

IN CLOSING

A photograph of a theater stage. The background is a large, closed red curtain. In the center of the curtain, the words "IN CLOSING" are written in a large, white, bold, sans-serif font with a slight shadow effect. The stage floor is visible at the bottom, and the silhouettes of red seats in the audience are visible in the foreground, all in deep shadow.

**E-TEXTILES ARE NOT JUST EMBEDDED
ELECTRONICS IN CLOTHING, THEY ARE
NEW OPPORTUNITIES TO AUGMENT AND
TRANSFORM THE HUMAN EXPERIENCE**

A RAPID TOUR OF MY

EXPLORATIONS IN E-TEXTILES

