Smart Textiles

Soft Fabrication Skills
What is it?

- Textile materials embedded with digital and electronic components
- Textiles that can react to environmental stimuli
- e-textiles, soft circuits, wearable tech, wearable electronics...
Materials Overview
Basic Circuit

- Battery or power source
- Switch or sensor
- LED or load/resistance
- Path/trace
Path: Making Connections

- **Conductive thread**
  (stainless steel / silver)

- **Conductive fabric**
  (wide variety!)

- **Conductive ink**
  (drawing/printing)
Switches

- zippers
- beads
- Buttons & snaps
Make sure you test!
Sensors

from top left: stroke sensor, knit/crochet sensor, soft push button, pom pom switch, fabric potentiometer

Kobakant: HOW TO GET WHAT YOU WANT
Adding Electronic Components

sewable components from Adafruit
Sewable Electronic Components

Sparkfun Lilypad sewable LEDs
(Adafruit also makes sewable LED sequins)
DIY Sewable Electronic Components

good for diodes, capacitors and other things with "legs"
For those with soldering experience...

Solder sewable connections onto SMD (surface mount) LEDs
Shape Memory Alloy
Thermochromic Ink and Dyes

Maggie Orth - Dynamic Double Weave

Nikolas Bentel - Aerochromic
- Leuco dyes - switch between two chemical forms (color and colorless)
Sewable Microcontrollers

Adafruit Flora

Arduino Gemma
Arduino Lilypad with FTDI plug-in!
Google Jacquard
Kobakant: Massage Me
Miu miu gloves

Anatomy of a Glove

**Electronics**
- High precision flex sensors over knuckles
- Haptic Motors
- IMU motion tracker
  - 32 channel I/O
  - Low latency Wi-Fi
  - OSC compatible
  - Gyroscope
  - Accelerometer
- Programmable RGB LED

**Optimised for Music**
- Open fingertips/palms for unrestricted use with instruments, touch screens

**Textiles**
- Designed for aesthetics and comfort, thin, stretchy, breathable fabrics
- Robust
- Hand washable
- Beautiful!
T.Ware’s T. Jacket
Social Body Lab: Prosthetic Technologies of Being (Nautilus)
Haley Profita + Microsoft Research: Lightwear
For Seasonal Affective Disorder
Cute Circuit + EasyJet: Engineer uniforms for airplanes
Kombocha Leather

SCOBY: Symbiotic Culture of Bacteria and Yeast
Tina Gorjanc: Pure Human

Symbiotica: Victimless Leather
Jae Rhim Lee: *Mushroom Burial Suit*
https://vimeo.com/142208383  Biologic - Lining Yao
DEMO TIME!
Sewn LED Patch
Important note!
Design it

- Draw out what you want to make!
- Make sure you include placement of traces and components
Important note!

Do not connect the legs of the LEDs or both sides of the battery pack together. When this happens, you are creating a short circuit!

Current likes to flow through the path of least resistance and will not provide current for your components if they are connected this way!

Yes you will have to tie and knot off your thread.
Sew it
Sew it some more
Adding More Lights: Series & Parallel

**SERIES**

Battery

Lamp  Lamp

**PARALLEL**

Battery

Lamp  Lamp
Canvas fabric with battery and silver snaps

Design with cat paw as soft switch and LED eyes in parallel

Design with one LED in cat paw

- Ø = snaps
- O = soft switch
- _ _ = steel thread
- Ø = LED
- E = coin cell battery holder
Troubleshooting

● Is your battery and/or LED connected the right way?
● Do you have any short circuits? Are any of your threads touching each other?
● Is your thread making secure connections with components?
Additional Resources

Tutorials

- Kobakant: HOW TO GET WHAT YOU WANT
- Make: Wearable Electronics

Materials

- lessEMF
- adafruit
- sparkfun (conductive thread spool)