INTRODUCTION TO SOFT CIRCUITS

A two-session workshop of hands-on fun!
Background:

- IIT Computer Discovery Camp: 8-day, 40 contact hours of summer camp for middle school and high school girls
  - Every summer since 2010
  - Camp has grown from 20 students to almost 50
- Camp is staffed by STARS students
Background

- Unique 2-part curriculum each summer so students can return multiple summers
  - First part: Lego Mindstorms: teach programming concepts
  - Second part: HTML, AppInventor, Photo editing, Soft Circuits (summer 2017)
47 middle school and high school girls

- Most were unfamiliar with sewing with a needle
- A few had done soft circuits before in a different program
Training for Soft Circuits curriculum

- 6 staff members were given supplies and asked to make simple circuit, switch circuit, and a microprocessor circuit as camp ‘training’
- Staff meetings
  - Discuss progress & issues
  - Ask questions
Resources for staff:

NCWIT: e-textiles in a Box:
- [https://www.ncwit.org/resources/e-textiles-box](https://www.ncwit.org/resources/e-textiles-box)

MIT Soft Circuits:
2017 Camp Theme: “Dancing Queen”

- Campers asked to make:
  - Soft circuit personal accessory
  - Soft circuit accessory for dancing robot

- **SUCCESS!**
  - Amazingly creative results
  - Campers had a LOT of fun!
Workshop Caveat:

Most of your materials are gently ‘used’

OR surplus
What is a soft circuit?

“Soft circuits...are electrical circuits made from textiles. Soft circuit projects mix traditional textiles... with microcontrollers, sensors, and electrical components to create new and interactive projects and wearable designs." 

https://www.lib.ncsu.edu/softcircuits
Characteristics of soft circuits:

- Soft circuits are wearable
- Soft circuits are washable
- Soft circuits may be programmable
Some examples:
Circuit essentials:

- Power source
- Light source
- Conducting filament

For our workshop:
CR 2032 batteries
5 mm LED’s
Stainless Steel thread
Additional circuit components:

- Cell battery holder
- Microprocessor
- Felt, sew-on snap
Individual Supplies

- Sewing needle (in felt)
- 5 ft. conductive thread
- 1 sew-on snap
- Needle threader
- Plastic beads, charms, black stretch cord (mask)
- 6 LED’s
- LilyTiny microprocessor
- 2 alligator clips
- 3 coin battery holders
- 4 connector wires
- 1 CR 2032 button battery
- Small piece of felt (simple circuit)
Shared Common Supplies:

- Needle nose pliers
- Hot glue gun + glue
- Felt tip markers
- Felt squares, various colors/patterns
- Scissors
- Mask paper patterns
- Yarn
We will make 3 circuits:

1. **Simple circuit** - cell battery holder, cell battery, 1 LED
2. **Switch circuit** - wristband that lights when snapped together: cell battery holder, cell battery, 1 LED, sew-on snap
3. **Mask with blinking led’s** - half-face mask that blinks: cell battery holder, cell battery, >=1 LED, 1 Lily Tiny
Suggestions:

- Construct your circuit with alligator clips and/or connector wires to be sure it works BEFORE sewing.
- Do NOT let + and - threads touch (short circuit!)
- Cut dangling threads from knots.
SOFT CIRCUIT 1: SIMPLE CIRCUIT
SOFT CIRCUIT 2: SWITCH CIRCUIT
SOFT CIRCUIT 3: BLINKING MASK
PROS OF OFFERING SOFT CIRCUIT OUTREACH PROJECTS

- Hands-on experience
- Highly visible student wearables
- Highly creative
- Exposes students to basic circuitry concepts and tools
CONS OF OFFERING SOFT CIRCUIT OUTREACH PROJECTS

- Expensive*
  - Simple circuit: ~$1.25
  - Lily Tiny circuit: ~$6.25
  - Lily Arduino circuit: ~$25
- Supply-intensive
- Prep-intensive

*Sparkfun prices
QUESTIONS ?
RESOURCES

● IIT-STARS WEB PAGE LINK TO WORKSHOP

● NCWIT E-TEXTILES IN A BOX:
  https://www.ncwit.org/resources/e-textiles-box

● STEP-BY-STEP INSTRUCTIONS FOR PROJECTS: