

LED BRACELETS

Goal: To provide students with the technical understanding necessary to complete the project, while promoting the development of creative problem solving and design skills.

Scientific Significance

Understand how lights in a parallel configuration will receive the same amount of voltage and that switches interrupt electricity through circuit.

Key Terms

Circuit: uninterrupted path made from conductive elements that lets electricity flow between anode and cathode sides of a power source

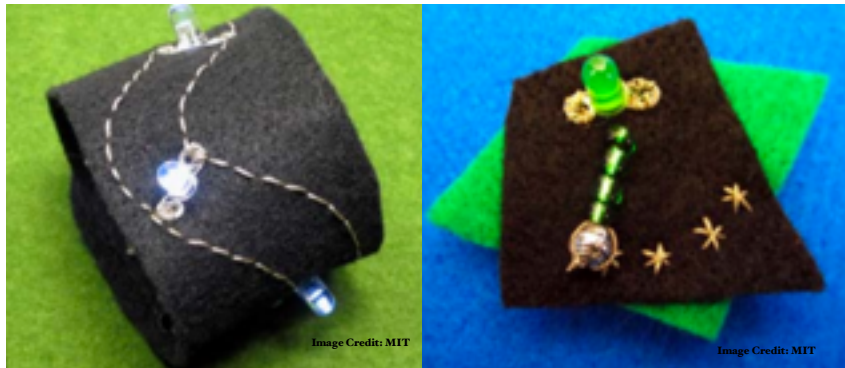
Polarity: batteries and LED lights have a "positive" and "negative" side

Anode: the positive side of the LED, the longer leg

Cathode: the negative of the LED, the shorter leg

Conductive: material that allows electricity to pass through it

Parallel: light's positive end must be connected to second light's positive end



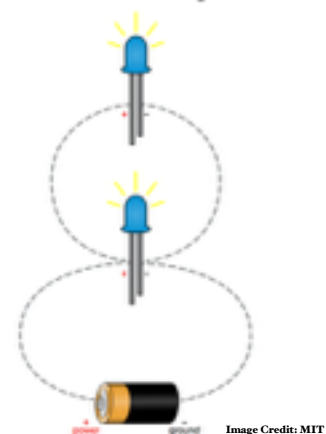
What are LED Bracelets?

Soft circuits are a form of e-textiles and are electrical circuits created using flexible conductive materials (conductive thread) in conjunction with lights, batteries, and switches.

Directions:

- 1) Share any examples with students while explaining the activity.
- 2) Draw simple circuit schematic for the lights on paper or the whiteboard. Explain that adding additional lights requires the lights to be arranged *parallel*.
- 3) Ask students to draw the electrical connections and placements of all the components of their project on paper. (where will the LEDs, snap, and battery holder go?)

Simple Circuit Schematic for Lights in Parallel



Supplies

- ◆ LEDS lights
- ◆ Felt strips (2" wide x 16" long)
- ◆ Conductive thread
- ◆ Coin battery
- ◆ Battery holder
- ◆ Metal snaps
- ◆ Regular thread
- ◆ Sewing needles
- ◆ Hot glue
- ◆ Scissors
- ◆ Needle nose pliers
- ◆ Sewing chalk

Facilitator Tips

- ◆ Encourage students to help each other
- ◆ Start each session by connecting to the previous section (summarize what they learned and created last time)
- ◆ Encourage the sharing of thoughts or motivations behind the design and how they got their circuit to function
- ◆ Encourage connecting what students learned with their daily lives

4) Distribute supplies to student: battery, battery holder, felt piece, LED lights.

5) Instruct students to curl the legs of their LEDs using needle nose pliers so they can be sewn into the fabric (**make sure to mark which is the positive and negative side**).

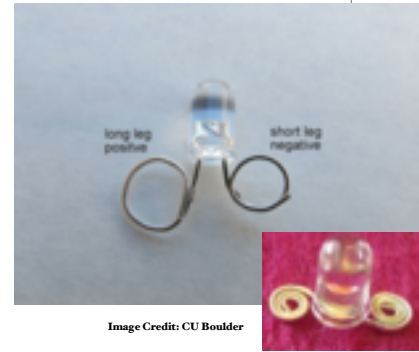


Image Credit: CU Boulder

6) Ask students to wrap the felt strip around their wrist and trim it to the correct length, including a 1-2" overlap for the snap and battery holder.

7) Have students use sewing chalk to draw their design on the felt, and place the LEDs and battery in place so they can begin the *conductive* thread pattern (**Suggest the use of a little bit of hot glue to keep the LED and battery holder in place, making sure that the conductive parts are exposed**).

8) Show students how to sew their snap to each end of their felt strip.

9) Show students how to insert the battery into the battery holder with the *anode* side facing up.

Image Credit: BitwiseTextiles.com



Troubleshooting Tips:

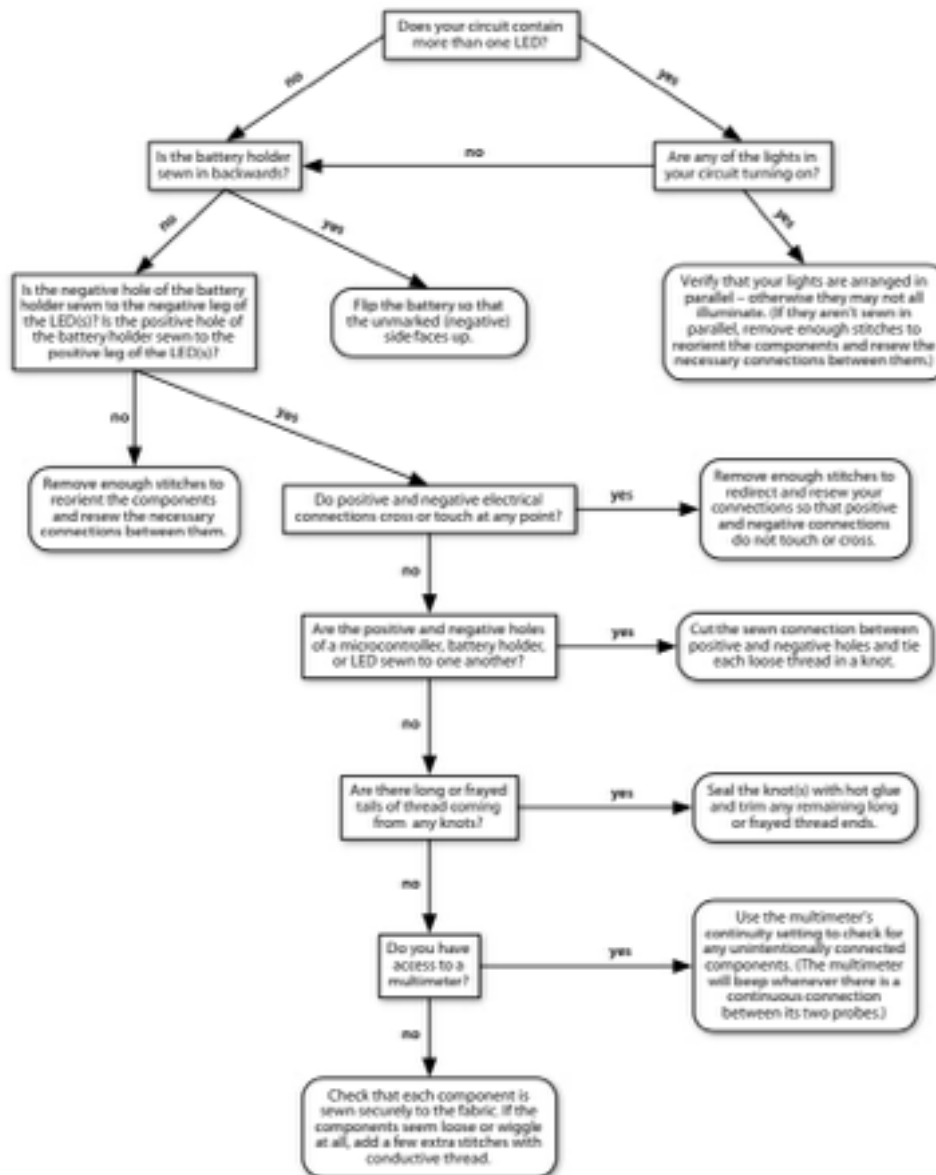
- Keep your stitches as close together as possible to keep them in place when you pull on the fabric
- Conductive thread tends to fray, so if circuit isn't functioning, check for spots where thread has frayed
- Remember to connect positive to positive and negative to negative
- Knots that are tied with conductive thread may not stay in place permanently on their own. Secure knots by dabbing them in hot

glue to insulate loose ends.

- Avoid cutting conductive thread over work because the fibers create shorts later
- For good connections, **make at least 3 loops of thread** through the attachment point, pulling the thread snug.
- Avoid short circuits by preventing positive and negative traces from touching or overlapping.

TROUBLESHOOTING

Image Credit: MIT



References:
<http://alumni.media.mit.edu/~emme/guide.pdf>
[http://www.instructables.com/id/LEDACuffABracelet\\$](http://www.instructables.com/id/LEDACuffABracelet$)