Hack Your Hoodie: an introduction to wearables

Instructions

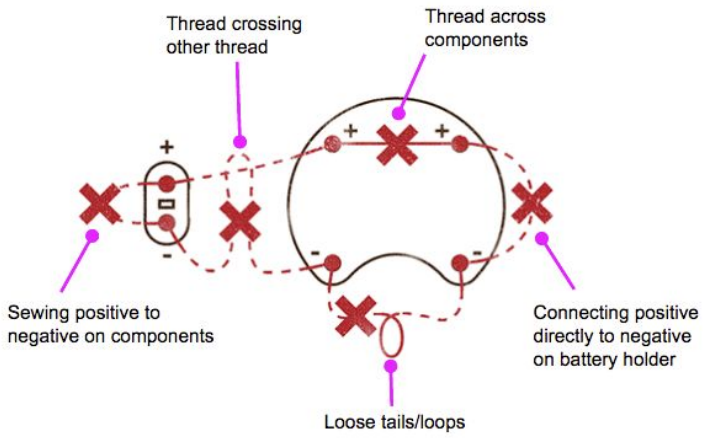
(borrowed heavily from https://learn.sparkfun.com/tutorials/ldk-experiment-1-lighting-up-a-basic-circuit -- many thanks to SparkFun, who also helped us acquire the materials for this hack)

Materials

- 9' conductive thread (https://www.sparkfun.com/products/10867)
- LED sequins (https://www.sparkfun.com/products/10081)
- Switchable battery pack (https://www.sparkfun.com/products/11285)
- Clothing to hack
- CR2032 "coin cell" battery (any drugstore)
- Needle & Scissors
- Puffy Paint (not necessary, but can be useful)

Things we're going to tell you upfront rather than embedding them in the instructions because they are **important**

- Most importantly: **Do Not Cross The Streams!** Basically, do not let the + trace (trace = thread = leg of circuit) ever cross the - trace. If you do, the circuit will short and things won't work! What does that mean? Don't do this:



- Use a relatively **short length of thread** – no more than 16"-18". Any more than this and everything will get all tangled up.

- Aim to run out of thread at a component. If that's not possible, you can just start a new length of thread by knotting it around the old one – remember each trace must be continuous.
- All the + must be connected. All the **-** must be connected. Even **the LEDs have + and - which makes things easy for you!**
- Any **metal can short your circuit** – this includes a metal button, a rivet, etc. So avoid those when you are sewing.
- Each time you attach a new component, you'll want to do at least **three loops** through the component and the fabric
- **Don't pull your thread too hard**! It is easy to snap.
- If you want to post pics to instagram or twitter or Facebook, hashtags to consider using are: #PearlHacks, #wearables, #sparkfun, @lintqueen (Gina), @ mrry550 (Jen) , and @redhat-- and we'd love that!

What to do

1) Plan the placement of your LEDs & Battery Pack

- Figure out where you want your LEDs to be placed.
- Figure out where you want your battery pack to be placed. You want to be able to easily reach the switch to turn your lights on and off.

Things to consider when planning:

- Length of conductive thread (you have ~4' to work with for each "trace", or leg of the circuit)
- All the + terminals of the LEDs will need to be connected to each other (in a row) and also connected to the + terminal of the battery pack. (e.g. This means that you can't cross a gap – like an open neckline – in between two LEDs.)

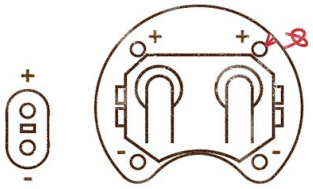
2) Prep your needle & thread

- Thread the needle. If you're having trouble, try moistening the eye of the needle (not the end of the thread) – surface tension of the water will help "pull" the thread through the needle. Also, try holding the thread still and moving the needle towards it.
- Make a small knot in the end of the thread opposite the needle.

3) Attach the battery pack to your clothing by sewing down the + terminal

We're going to do the + trace first. You'll continue to work with this trace until you've connected all 3 LEDs on the + side.

- Start with a small stitch through the fabric of your clothing to anchor your thread, then pass your needle up through the + terminal of the battery pack.
- Go through the terminal and through the fabric at least three times, like this:



4) Sew down each of your LEDs, on the + side only

- Use a running stitch (where you just go in and out of the fabric and you have approximately the same amount of stitching on the “top” and “bottom” of the fabric) to sew over to where you want to place your first LED.
- Go around the + terminal of the first LED and through the fabric (thereby attaching the LED to your fabric) at least three times
- Keep sewing towards the next LED
- Lather, rinse, repeat, until you get to the last LED. After attaching the last LED, knot your thread off, trimming your tail (it can cause a short if you leave a tail dangling!).

5) Repeat step 4, starting at the battery pack, but this time working on the **-** trace

6) Finish off the project!

- Make sure all your threads are clipped and double check that your traces are not crossing
- Put the battery in
- Flip the switch – glorious lights? Rejoice!
- Once you know everything is working you can use the puffy paint to paint over the traces on the outside. It will protect against wear and shorts on the outside of the fabric (but is really not necessary). You do not need to puff the paint (but you can with an iron, set on steam if you want, once you get home! I have also read that you can do it with a blow-dryer.

Oh no! What happens if your project isn’t working? Don’t panic! Call us over and we’ll figure it out with you together.