SquareWear
Intro to SquareWear and creating wearable electronics

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SquareWear is an open-source microcontroller board specially designed for wearable electronics projects. SquareWear was created by Rui Wang. Products can be found at http://rayshobby.net (The SquareWear given to you in class cannot be found on this website. They have been created for this course and cannot yet be purchased except by contacting Rui Wang)

Material List

A piece of clothing
LEDs (amount your choice. The more the harder)
Conductive Thread
Snap
Needle
Glue gun/ glue (optional)
SquareWear
Pencil/ marker
Scissors
needle nose pliers

Before you start!

• Plan out where you would like to place your LEDs on your fabric
  o Make small marks to indicate placement.

• Make sure that the wire connecting to the positive power cannot touch the negative.
  o Leave a pathway for both of these threads.

• Keep your space clear. You will be working with sharp and hot objects. To avoid injury keep materials away from station when you are not working with them.
Let’s get started

- Using a 3V coin battery, test to make sure that all of your LEDs are working.
  - A coin battery is a great way to make sure you are connecting the LEDs correctly throughout your project.
- Once all LEDs are tested, you can begin by placing them in the positions chosen.
  - If the fabric is thin you can just push the LEDs through.
  - For thicker fabric you can take your needle and makes holes for the lights.
- Make note of which side of the LED is positive and line up that side with the other LEDs.
- Then curl the LED legs with needle nose pliers.
  - Make a note of which side is positive. You can do this by curling the positive larger and the negative side smaller.

Using conductive thread

When sewing the thread to the lights remember:
- Don’t cross wires
- Turn off all power sources when sewing
- Take care with the glue gun... trust me on this... It hurts
- Setting up connection to SquareWear
  - *This is written for the situation where you are controlling all LEDs the same way. If you decide to have several sets, you will need multiple positive pathways.*
  - You will need 2 pairs of snaps, one for controlled positive, the other for negative (ground).
  - Attach one part of each pair of snaps to your fabric with regular thread.
    - these are analogous to the “positive metal thingy” and “negative patch” from last week
  - The other part of each pair of snaps will be connected to SquareWear
- Start sewing the positives!
  - Place thread through needle and tie knot at one end
    - do not double thread
  - Sew thread through curled LED legs connecting all positive leads together.
  - Use 3V coin to make sure the correct legs are getting sewn together.
  - When finished, leave the extra thread and connect to the positive snap halves.
- Repeat for the negative leads and negative/ground snap half.
**Programming SquareWear**

For this project, you do not have to program your own code for the SquareWear. Once you have unzipped and added the given files (URL to download located in moodle course 105) to your Arduino folder, located in your home directory, you will have example code to work with.

- Open your Arduino application. From there select the menu option
  File->Examples->SquareWear2/
  o Here you will find a few example programs ready to use with your SquareWear!
- You are also welcome to create your own program – Audrey and the TAs are here to help!

**Reminder:** The following error is okay to have

`Binary sketch size: 1,242 bytes (of a 28,672 byte maximum)
avrdude: warning: cannot set sck period. please check for usbasp firmware update.
avrdude: error: usbasp_transmit: usb_control_msg(DeviceRequestTO): pipe is stalled`

Moving forward, you can reprogram your SquareWear to have your LEDs do a lot of fun things!

So have fun and be creative 😊

**Attaching SquareWear**

Because you may want to be able to your SquareWear again for future projects, we will make it so that the microcontroller is removable.

- Decide which pins to use for your project and program your microcontroller, testing with single LEDs.
- Now, take the remaining snap halves and use conductive thread to attach the remaining snap halves to the pins on SquareWear
  o When attaching to the snap, make sure to sew it on so that the snaps can still connect together.
- You may want to use Velcro to help secure the microcontroller to your fabric.

**Warning! Be very careful that your conductive thread does not connect things you don’t want connected!!! This includes**

- ground pins to the positive side of the 3V button battery

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