Nudgeables Accessory Kit User's Guide



USER GUIDE V2 APRIL 2013

Introduction

Sometimes we use secret codes to communicate with our friends, partners, or colleagues while in the company of a larger group of people: a nudge, a cough, a scratch of the nose; something that says "save me from this conversation", "let's get out of here", or "I'm thinking of you". What if our clothing could communicate these messages for us?

The Nudgeables Accessory Kit is a modular hardware kit developed for use in creating paired sets of wireless wearable accessories. A Nudgeables device employs a radio transceiver, a "Nudger", and a "Notifier" to enable a pair of people to nudge each other from across a room. Because the kit takes care of all the tech stuff like circuit design and radio configurations you can focus on the development of the design of your Nudgeable as well as when, where, how, and why you want to nudge!

The Kit

Each Nudgeables Kit includes the following:

(2) Main Boards
(2) Button Boards
(2) Vibration Boards
(2) 3.7V Lithium-Polymer batteries
(4) Connector Wires
(1) Micro-USB Cable (for charging)

This kit contains everything you need to create a set a Nudgeables designs for 2 people.



Main Board

The Main Board has a number of features:



Note: The XBee radio transceivers included in the Nudgeables kits come pre-configured for point-to-point communication with their pairs.

Nudger

The Nudger is the thing you use to send a Nudge. It can be a button, a switch, or any connection you create between two pieces of conductive material.



The kit includes a Button Board which can easily be connected to the Main Board.



You can also create your own switch out of conductive materials.

DIY Switches

You can also create your own soft switch. A switch is comprised of two pieces of conductive materials that connect or disconnect to enable or prevent the flow of electricity. You can create a switch using materials like copper mesh, silver fasteners, conductive fabric, or conductive thread. With soft conductive materials and some creativity, you can fully embed your switch into the garment and use unique gestures to send a Nudge!

Here are some examples of Nudgers that we've developed at the Social Body Lab:

Pom Poms



Two conductive thread pom poms create a connection when pressed together.

Scarf



Conductive thread is knitted into the pink patches, creating two sides of a soft switch.

When to Nudge?

The ability to nudge someone discretely, whether it be up close or from afar, can carry a wide range of meanings. When and why will you nudge someone? Is it simply to get their attention? Or have you developed a code based on the duration or frequency of nudges? Nudgeables can replace eye-rolls, elbowing and other physical indicators you and your partner may have exchanged in social settings. With Nudgeables, secret communication takes on a new dimension!



Pendant & T-Shirt



Conductive fabric on the back of the pendant bridges the connection between the conductive fabric patches on the shirt.

Working with Conductive Fabric

Conductive fabric is a woven or pressed textile coated with conductive metal alloys. When creating a Nudger for the Nudgeables Kit, we recommend using ShieldIt Super - a conductive fabric that is coated with an iron-on adhesive. This fabric is easy to cut and adhere to any fabric substrate. The silver side is conductive and the white side is adhesive.



To use conductive fabric, simply draw on the conductive fabric the shape you would like cut out.



Then, cut the shape out and position it on the garment or accessory that you will be using.



Pass an iron on low heat over the conductive fabric. It will adhere very quickly.

Keep in mind the adhesive side of the fabric is not conductive. If you need to join two pieces of conductive fabric together, make a small stitch with conductive thread create an electrical connection between the fabric pieces.

Warning: Be careful - the metals in the conductive fabric get very hot when ironed!

Notifiers

The Notifier lets you know when you've been Nudged.

The kit includes a Vibration Board which can easily be connected to the Main Board. You can also use an LED as a Notifier.





To attach a Lilypad LED, make note of the polarity of the Notifier sew tabs. Align the + on the Main Board with the + on the LED. Stitch your traces using conductive thread.

Sew Tab Connections

As an alternative to the Wire Connectors, the Main Board includes conductive sew tabs near the Nudger and Notifier sockets that allow you to make electrical connections using conductive thread. This means you can bypass the use of the sockets and make a soft connection to Nudger or Notifier if desired.

Tips for working with conductive thread:

• Use several tight stitches through the sew tab hole to make sure that you create a solid and secure connection between the thread and the solder pad.



- Conductive thread is a bit more slippery and has a higher tendency to fray than regular thread. Be sure to secure any knots with a dab of fabric glue, Fray Stop, or clear nail polish.
- Conductive thread is uninsulated. To prevent shorts, make sure the two lines of conductive thread are spaced far enough apart so as not to touch each other. Trim any excess lengths of conductive thread after knotting. If the stitches are likely to be folded onto each other when the Nudgeable is worn then insulate them with a layer of non-conductive fabric.
- If you need to cross over stitches, use the base fabric as a natural insulator and sew in the space between the stitches.



• Conductive threads have a varying range of resistance. Connections to switches & LEDs should be no problem but if you are planning to use conductive thread to connect a vibration motor please consult with the Social Body Lab team for advice.

Battery

The kit includes 3.7v 1000mAh Lithium-Polymer battery. To recharge the battery plug the micro-USB cable into the board and the other end into a computer or USB AC adapter. The CHG led will turn on to indicate that the battery is charging. When charging is complete, the led will turn off.



Connectors

Wire Connectors

The Nudgeables Kit uses a type of reusable connectors so that you can easily connect and disconnect your Button Board and Vibration Board.



Customizing Wires

Your kit includes Connector Wires of different lengths, but these can also be customized if you would like to change the length or type of wire.



First, release the wire from the connector. Look for the small rectangular holes on the face of the connector.



Press a sewing needle or tweezers into that hole to release the latch. Pull on the wire to remove it.



For our standard Connector Wires we use speaker cable because it is a tidy and flexible packaging for a set of two wires. But you can also use any other type of 22 or 24-gauge wire that fits your fancy.



Cut your wires to the desired length. Use a pair of small snips to separate the two conductors.



Using wire strippers, strip the sheath off the last one centimeter of each end of the wire.



If you are working with stranded wire, twist each wire so the strands are securely twisted. Then tin the wires to secure the twist and stiffen the wire so that it can be plugged into the connector.



Press the end of the wire into the circular hole on the face of the connector.



Plug the connector into one of the two black sockets on the Main Board. Make sure that your wires are not twisted in any way. The wires should lay flat. You are connected!

Bridging Soft and Hard Components

Sometimes your design will require you to make a jump from hard components like the Connector Wire to soft components like conductive thread. You can easily do this following the steps indicated below:

- 1. Attach connector to one end of your connector wire, as shown on Page 7.
- 2. Using wire strippers, strip the sheath off the last one centimeter of each end of the wire.
- 3. Twist each wire so the strands are securely twisted. Bend them into small loops.
- 4. Solder the junction where the wire connects to itself. Repeat for the other wire.
- 5. You can now sew through these loops with conductive thread and continue your trace!



Nudgeables X-Ray Diagram: Pendant T-Shirt



Securing the Boards

Sew Holes

The Main Board has sew holes for adhering the board to your garment or accessory. With standard sewing thread, pass a needle and thread through the hole two or three times. Tie a knot in the end of the thread, and trim any excess that may remain. The conductive Sew Tabs can also double as sew holes when not in use.



Pockets

The Main Board can easily be hidden in pockets already found in a garment or accessory or that you make yourself. A pocket can also protect the Main Board from snagging on other fabrics or scratching against the skin.





A little pocket can hold the Nudgeables Main Board and the battery together or individually. If the battery is placed flush with the Main Board include a piece of felt or cardstock between them to protect the battery.



Remember: Don't seal off your Main Board completely! You need to maintain access to the ON/OFF switch as well as the USB port for battery charging.

Protecting Connections

When sewing conductive traces or laying wire, you may want to consider hiding the traces or wire alongside seams, on the inner line of the body, under cuffs or parts that can hide and protect these connections. Alternatively, you can reveal and embellish them, making these electrical connections a part of your visual design.

Designing a Nudgeable

When it comes to constructing the Nudgeables board, the world is your oyster. However, we have a few tips to assist you in thinking through your design.

How to Nudge?

The gestures used to nudge someone can be as overt or discrete as you wish. It is helpful to think about the subtle or unconscious movements or gestures we make when we are in social situations. Touching the back of your neck, scratching your ankle, or fiddling with your tie can all be very interesting ways to nudge your partner. The richness of Nudgeables can be best expressed through clever gestures and strong design.

Where to be Nudged?

How would you like to be notified that you're being nudged? Our default notifier is the Vibration Board which is subtle in that it's not observable to others yet strong in its vibration so you know for sure when you're being nudged. Placement of the Vibration Board will greatly affect your experience of being nudged, whether it be placed on the wrist, on the hip, behind the ear, or wherever else you can be imagined.

If working with a visual notifier (an LED) it makes sense to place it somewhere where you will see it. But does it matter if others see it as well? Your design can help to make its inclusion more subtle so that only you know that you're being signalled.

You can also work with sound (a buzzer), but keep in mind that this throws subtlety out the window. In some contexts that can be called for!

Wearability

When creating your Nudgeables you need to keep in mind what makes something wearable. What is comfortable? What is stylish? What is practical in terms of maintaining access to different pieces of the Nudgeable system?

The Main Board tends to be more comfortable when worn closer to the core of the body. When thinking about placement, consider how the body moves in space. You wouldn't necessarily want to place the Main Board by a joint like the knee because the board is inflexible and it would be quite uncomfortable. Generally, the Main Board is best positioned on wide, flat areas such as the hips, back of the pelvis (sacrum) and the upper back.

The Satellite Boards (Nudgers & Notifiers) are lighter weight and can be extended all the way out onto the limbs. They can comfortably fit on the inner wrist, forearm and ankle.

Troubleshooting

Are your Nudgeables not working? Check the following:

- Is the ON/OFF switch set to ON and is the PWR LED lit? If not, you may need to recharge your battery.
- Is the RSSI light on, on both boards? If not, your boards aren't connecting properly. Check the power on both boards and try reorienting them or bringing them close together.
- Does the Nudge/Notifier relationship seem to not be working properly? Check to make sure your A board is set to A and your B board is set to B.
- Is your partner's Notifier always activated? Check to make sure there is not a short with your Nudger.