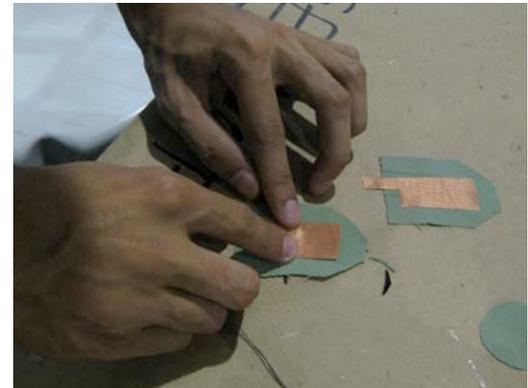




Handcrafting Textile Sensors from Scratch



Hannah Perner-Wilson

Conductive Materials

low resistance

Conductive fabrics

Stretch conductive fabric - Silver plated Nylon

Soft and Safe shielding fabric - cotton, bamboo, silver

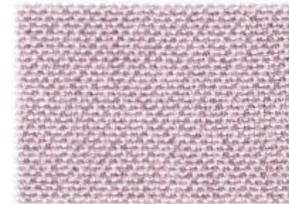
Nickel and copper plated ripstop fabrics



Conductive threads

117/17 2ply silver plated Nylon

234/34 4ply silver plated Nylon



Metal accessories

Beads

Snaps

Fasteners



Photos top, 2nd row left, 3rd row left and center © source unknown.
All rights reserved. This content is excluded from our
Creative Commons license. For more information,
see <http://ocw.mit.edu/fairuse>.

Resistive Materials

high resistance

Resistive thread

66 Yarn 22+3ply 110 PET



Resistive yarn

Schoeller - Polyester and Inox steel fiber



Anti-static materials

Velostat/Linqstat - Carbon impregnated Polyethylene film

Antistatic foam



Non-Conductive Materials

isolating

Neoprene

Felt, Foam

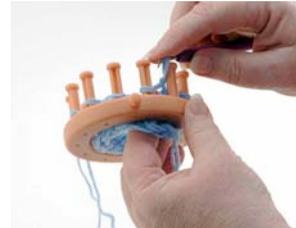
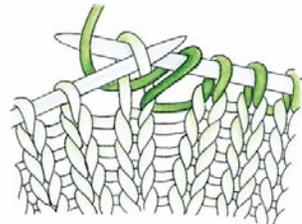
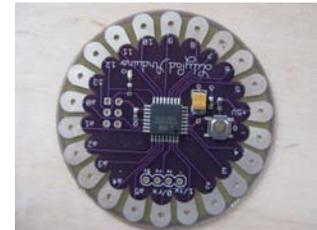
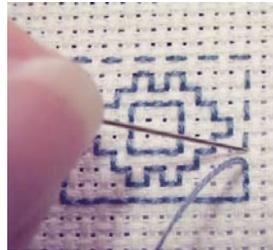
Fusible Interfacing - "Iron-on"

Anti-fray, Fabric glue, Nail varnish



Tools and Techniques

- Sewing
- Knitting
- Crochet
- Felting
- Circular knitting machine
- Spool knitter
- Needle felting tools
- Hole maker
- Iron
- Multimeter
- LilyPad Arduino
- Battery and holder, LEDs



Knitting drawing © source unknown. All rights reserved.
This content is excluded from our Creative Commons license.
For more information, see <http://ocw.mit.edu/fairuse>.

Fabric Sensors

- Fabric Button
- Conductive Thread Pressure Sensor
- Neoprene Bend Sensor
- Pressure Sensor Matrix
- Fabric Tilt Sensor
- Fabric Potentiometer
- Crochet Potentiometer
- Stroke Sensor
- Knit Stretch Sensors
- Knit Touchpad

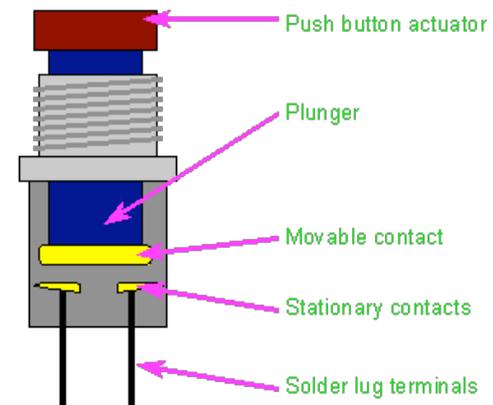
Fabric Button



Fabric Button vs. Push Buttons

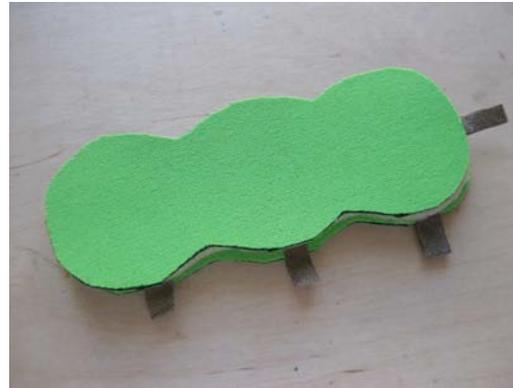
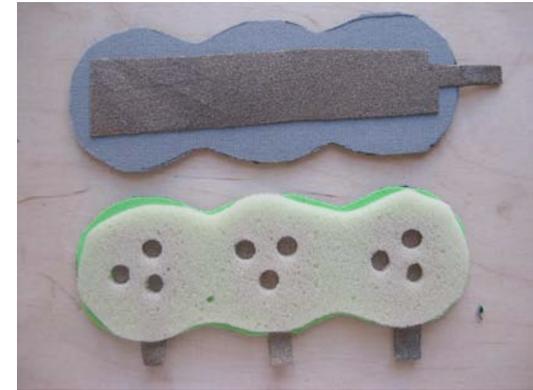
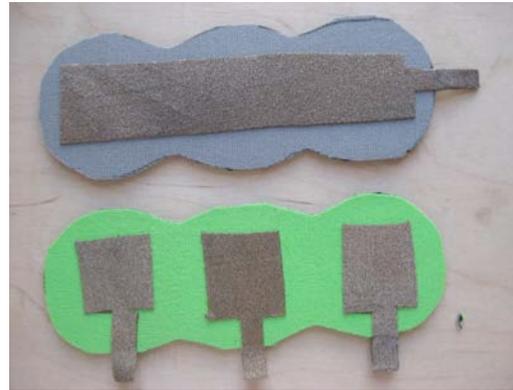


Push Button Switch (Normally Open)



Push button and switch photos (top right) © Focus Technology Co., Ltd.
Push button schematic drawing © source unknown. All rights reserved.
This content is excluded from our Creative Commons license.
For more information, see <http://ocw.mit.edu/fairuse>.

Fabric Button

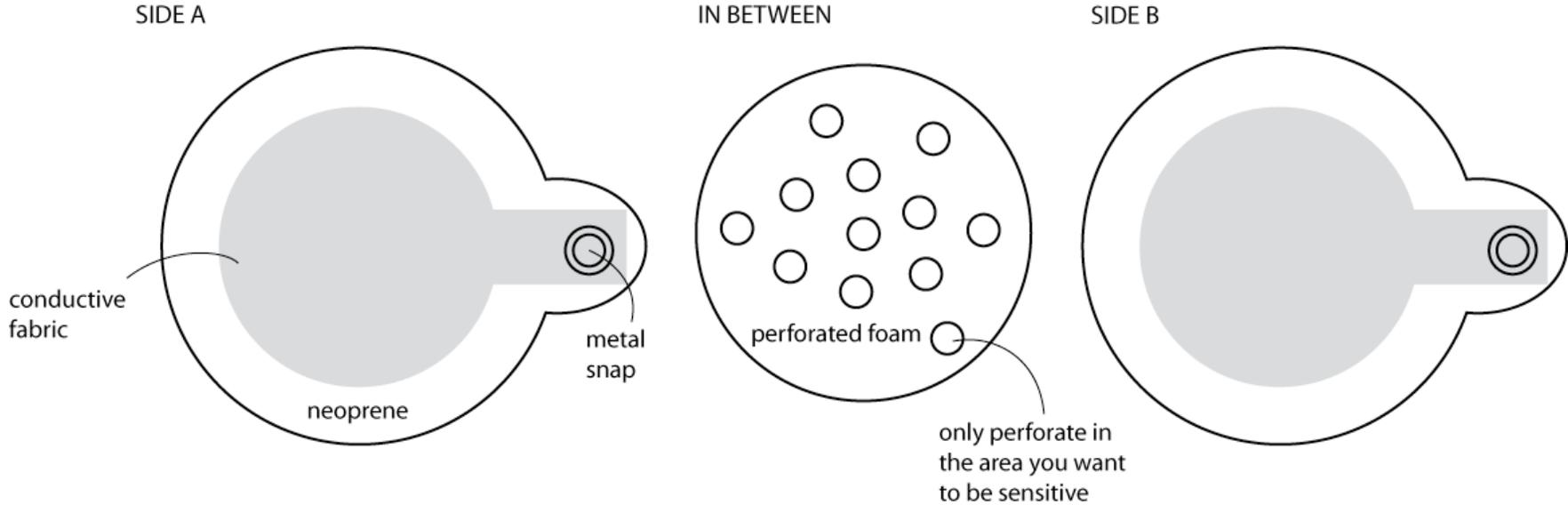


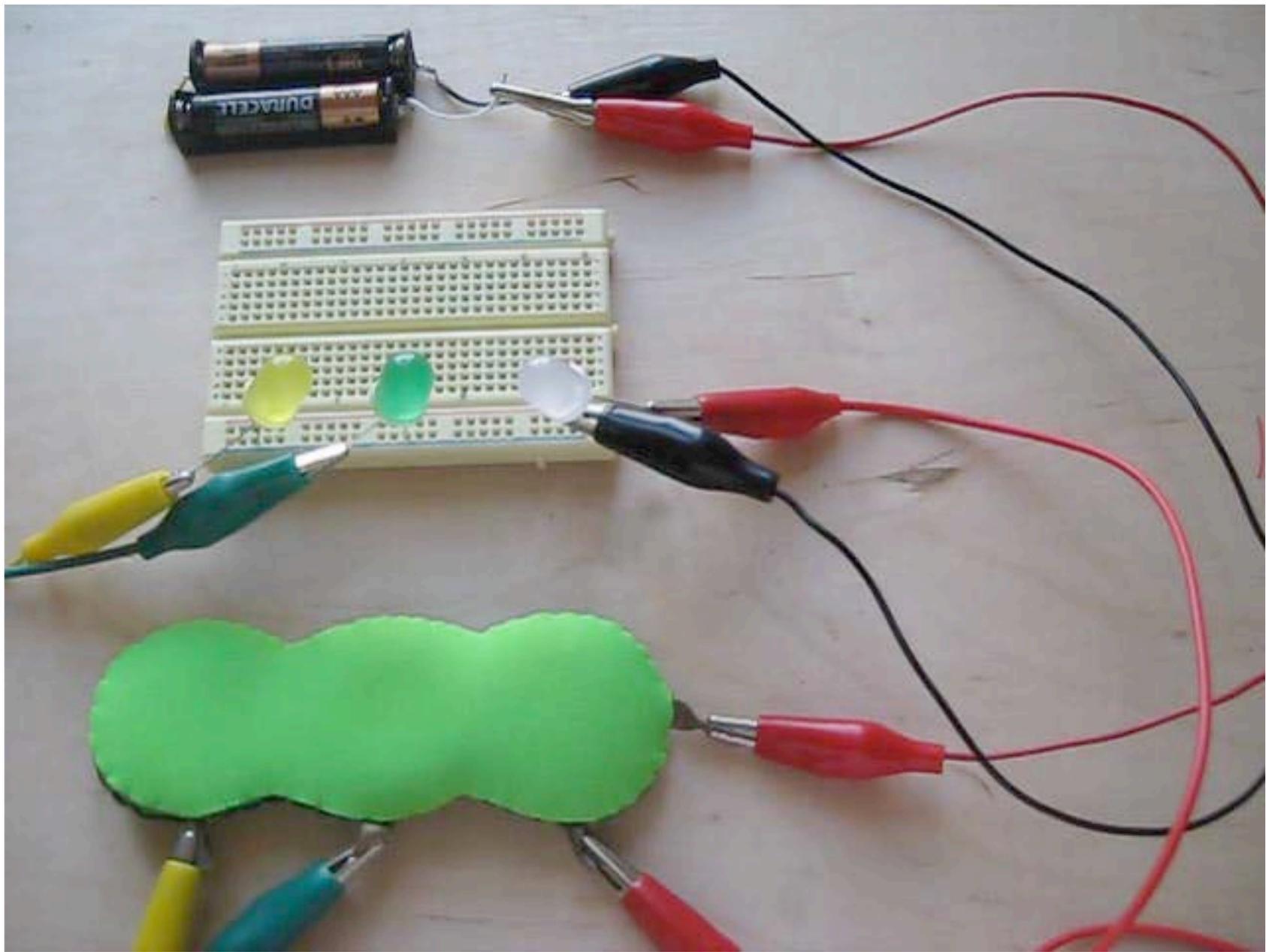
MATERIALS

- Neoprene
- Stretch conductive fabric
- Fusible interfacing
- Foam

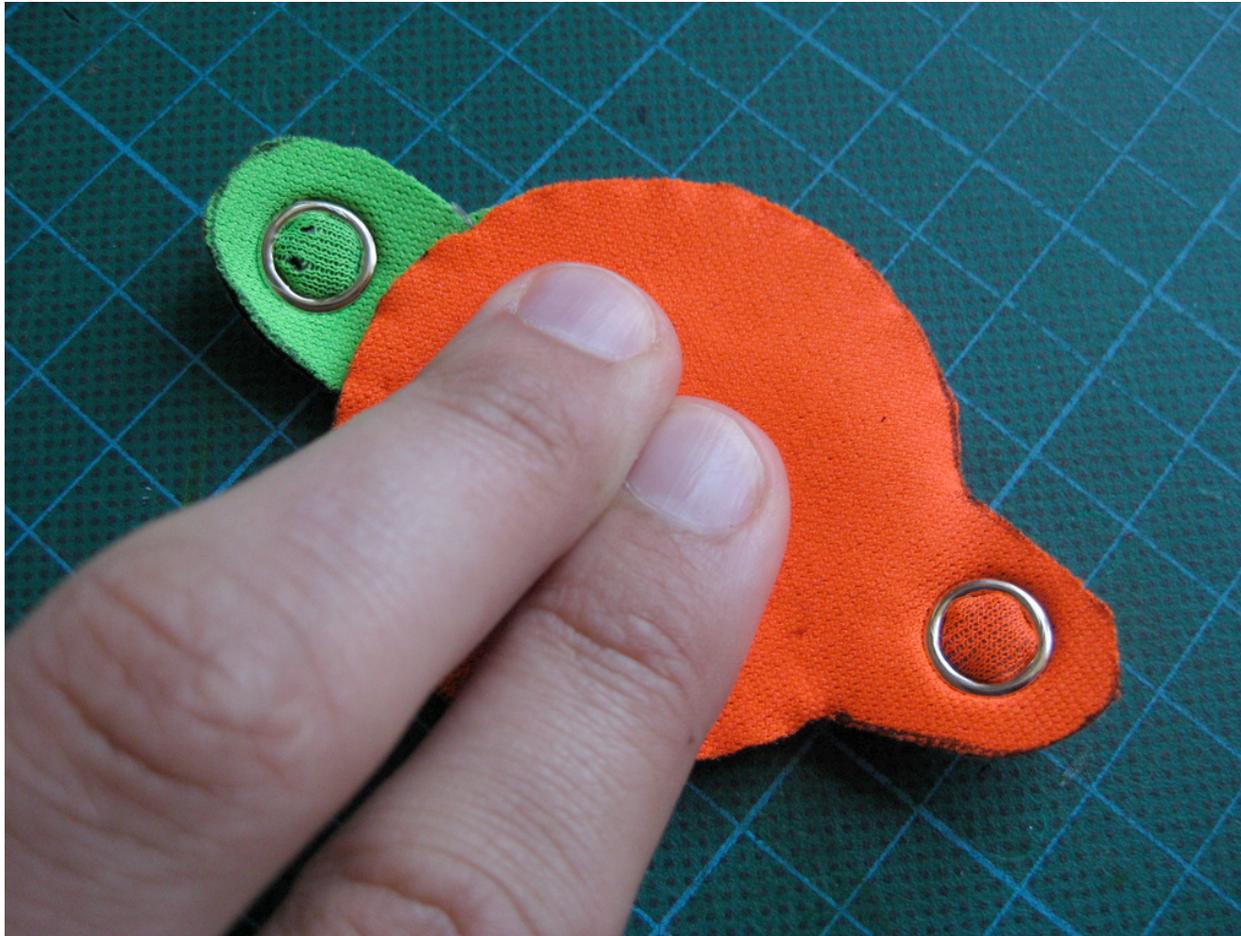


Fabric Button

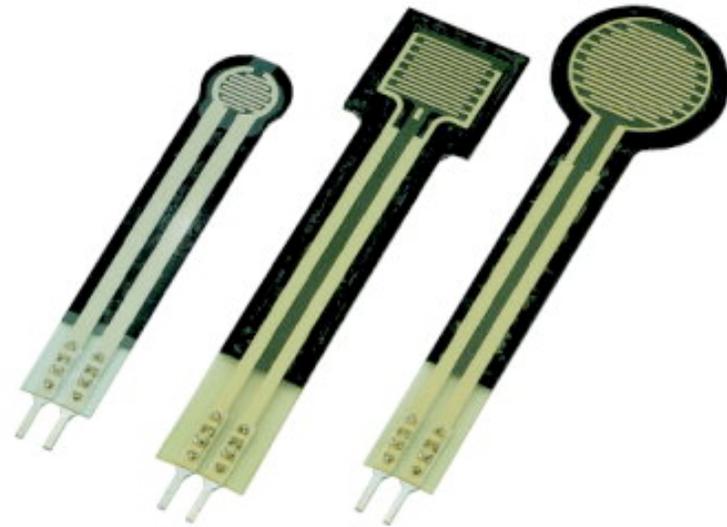
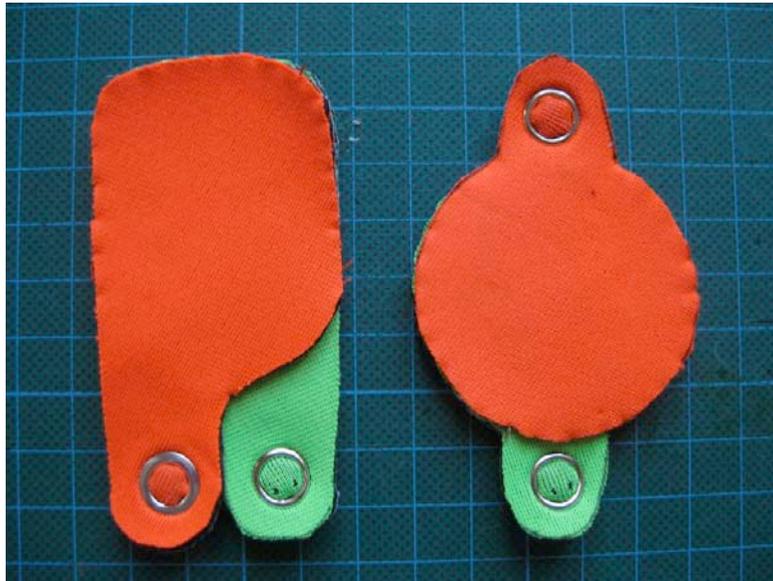




Conductive Thread Pressure Sensor

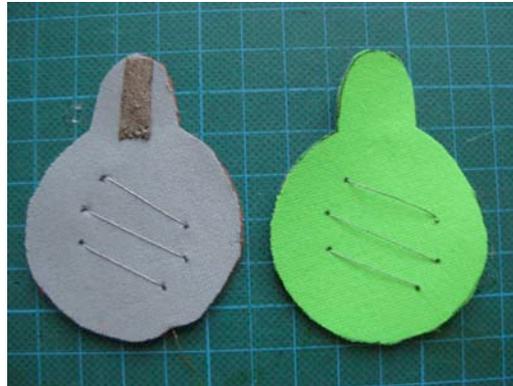
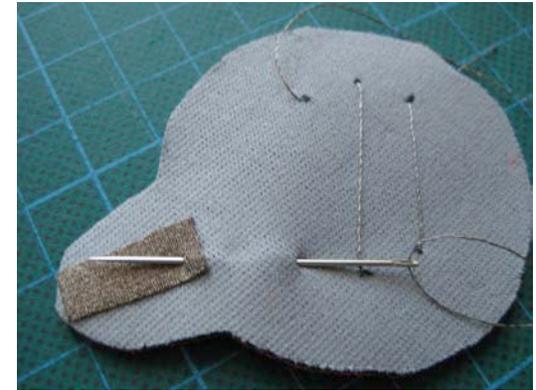
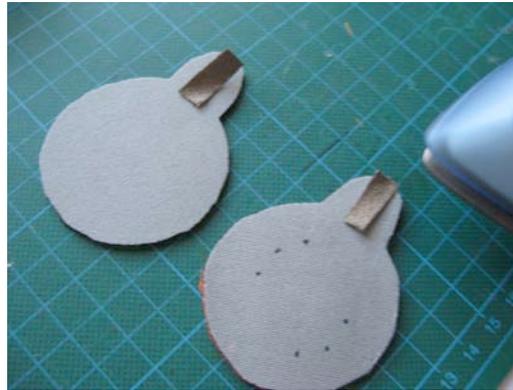


Conductive Thread Pressure Sensor vs. Force Sensitive Resistor (FSR)



Commercial force sensitive resistor photo © source unknown.
All rights reserved. This content is excluded from our Creative
Commons license. For more information, see <http://ocw.mit.edu/fairuse>.

Conductive Thread Pressure Sensor



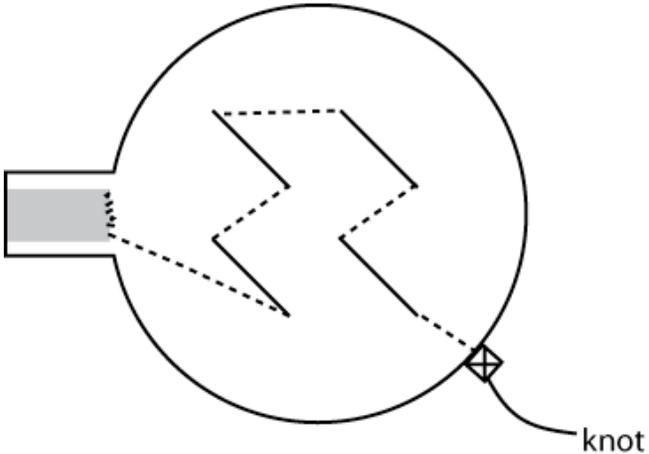
MATERIALS

- Neoprene
- Conductive thread
- Stretch conductive fabric
- Fusible interfacing
- Velostat

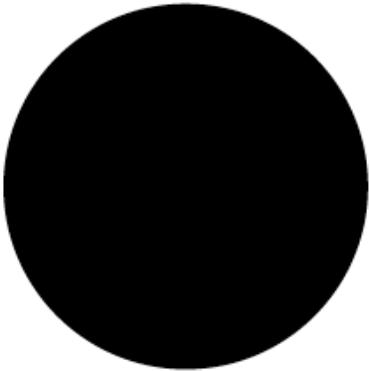


Conductive Thread Pressure Sensor

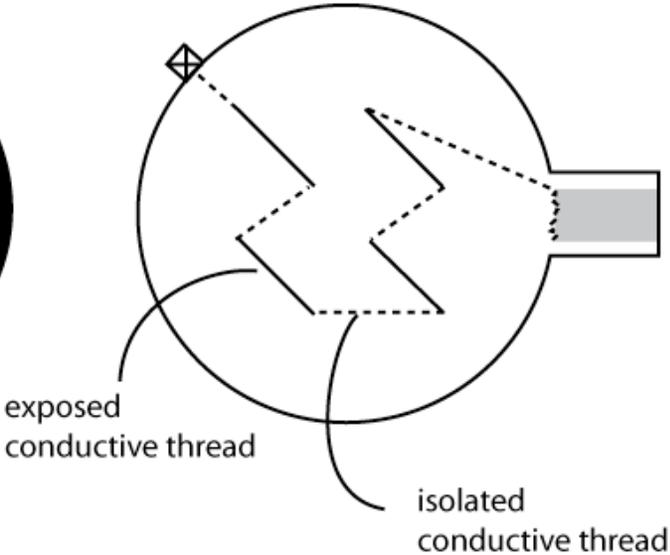
SIDE A



IN BETWEEN

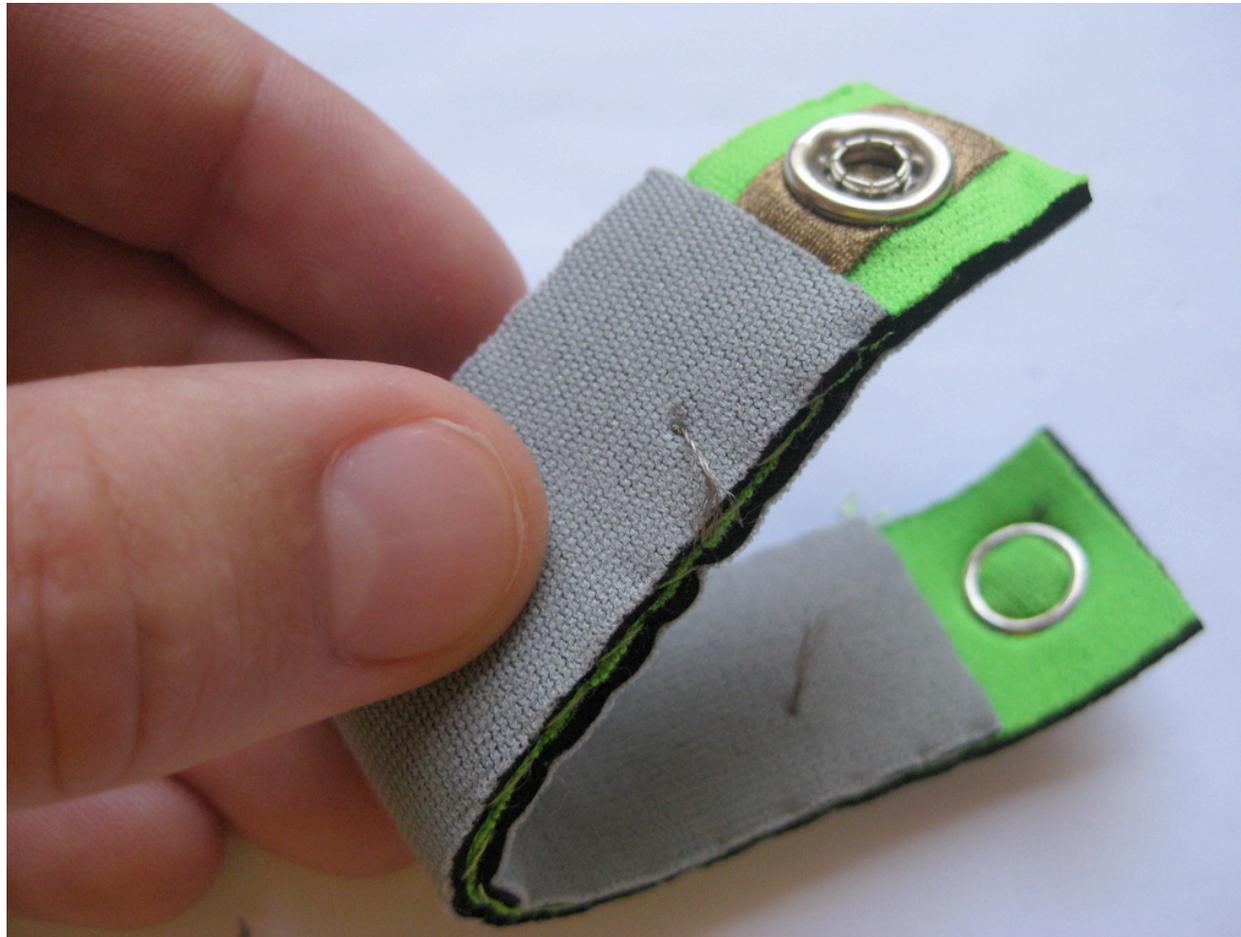


SIDE B

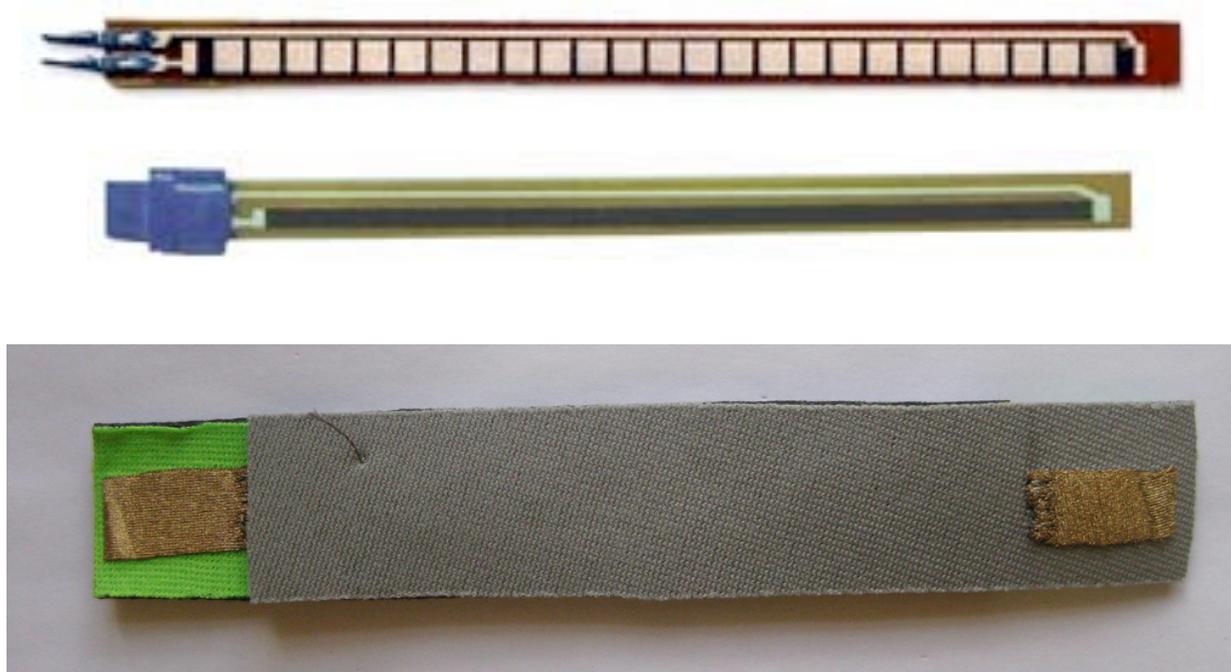




Neoprene Bend Sensor

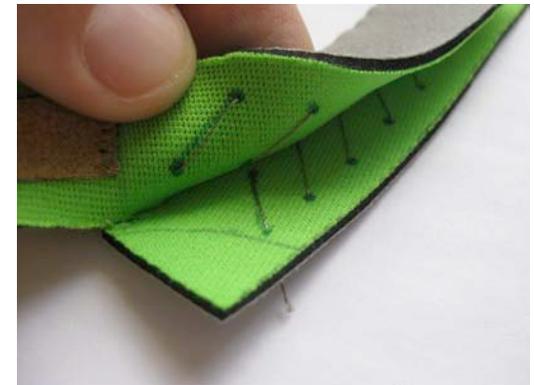
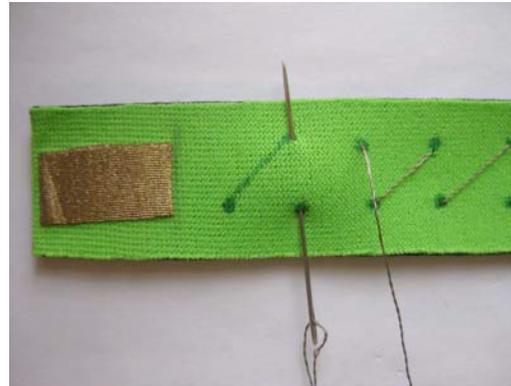


Neoprene Bend Sensor vs. Commercial Flex Sensors



Commercial flex sensor photos © source unknown.
All rights reserved. This content is excluded from our
Creative Commons license. For more information,
see <http://ocw.mit.edu/fairuse>.

Neoprene Bend Sensor

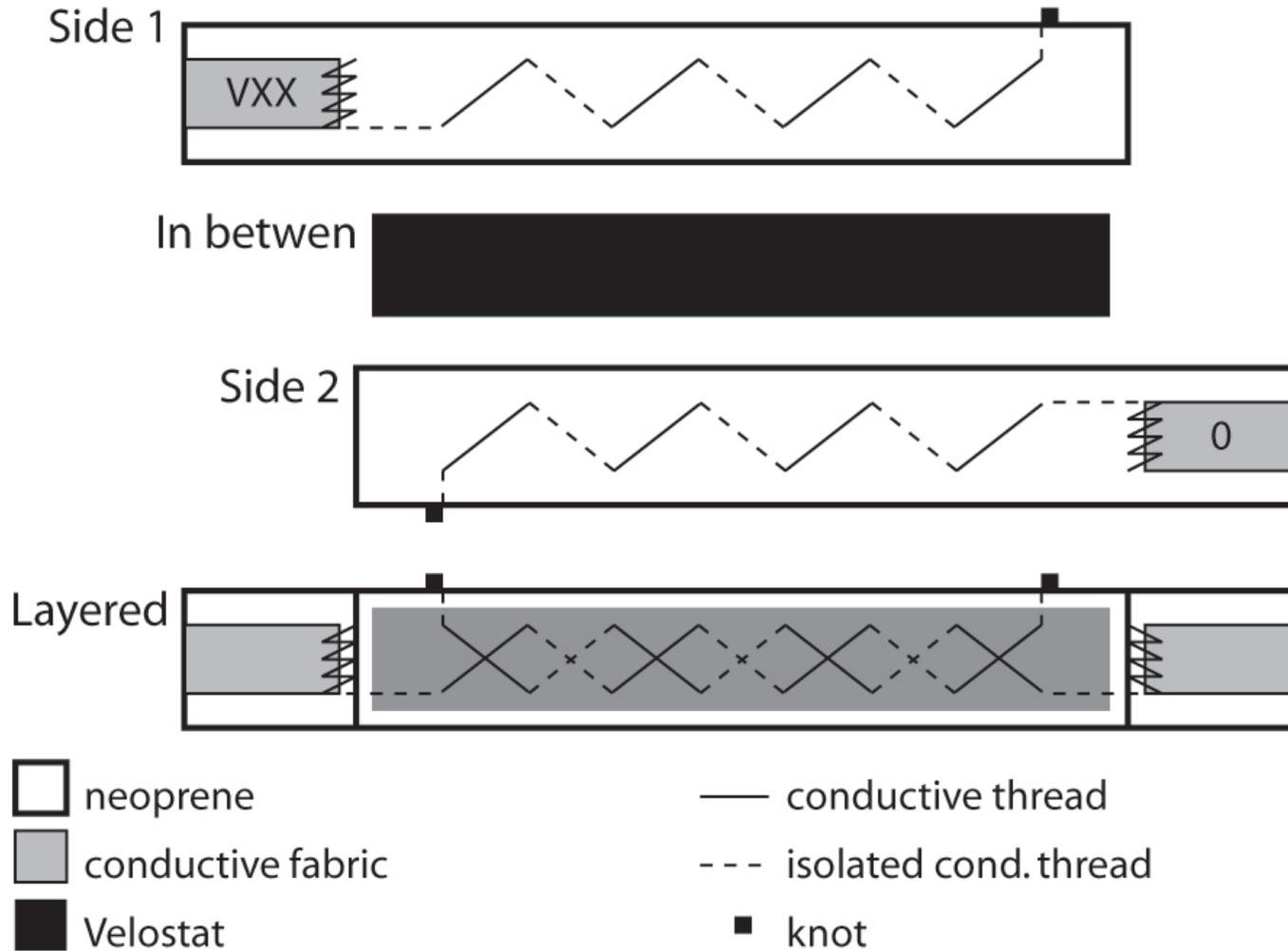


MATERIALS

- Neoprene
- Conductive thread
- Stretch conductive fabric
- Fusible interfacing
- Velostat

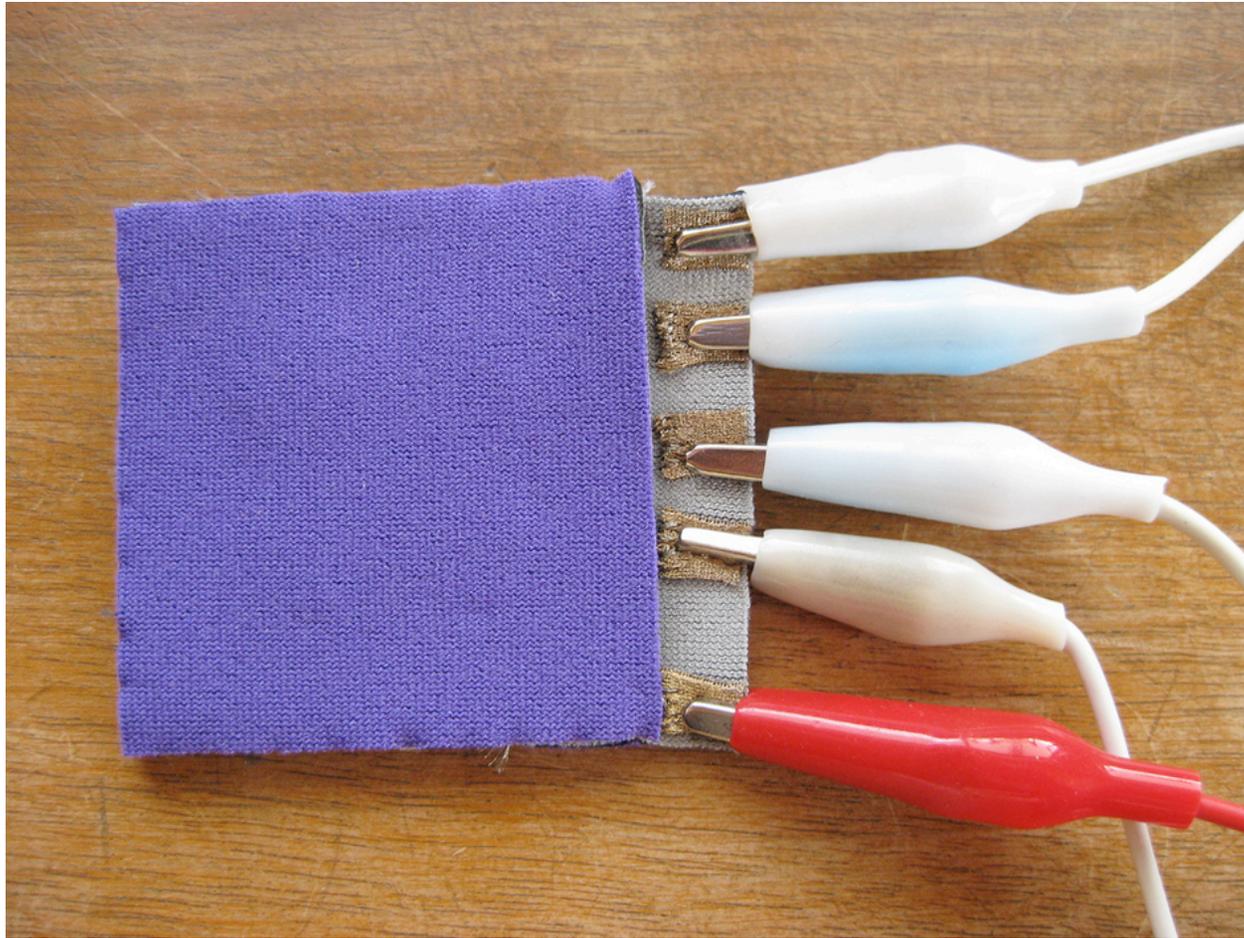


Neoprene Bend Sensor

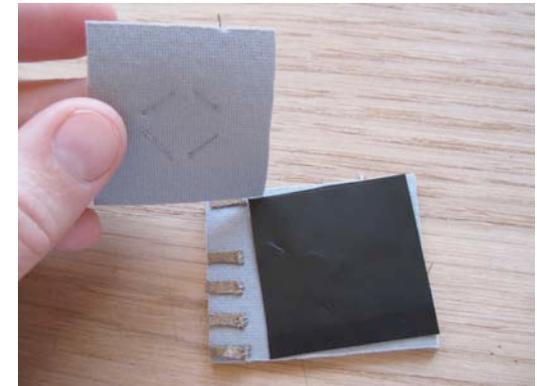
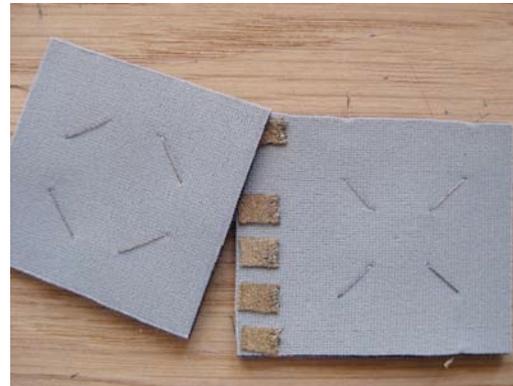
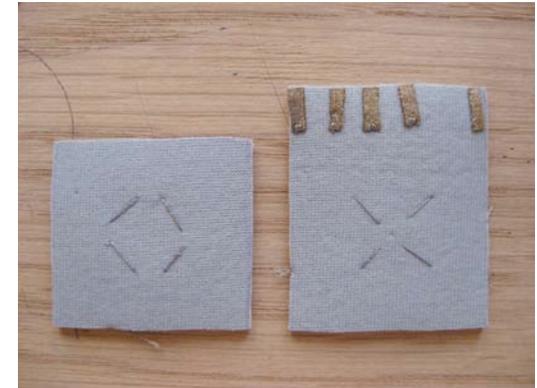
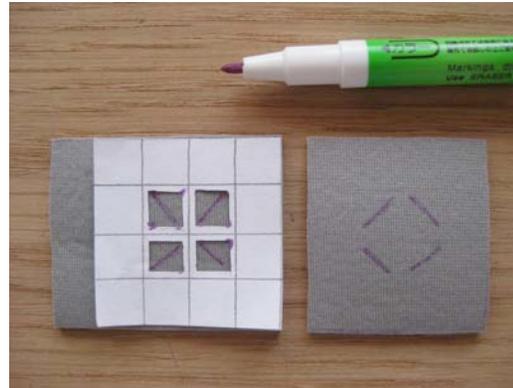




Pressure Sensor Matrix



Pressure Sensor Matrix

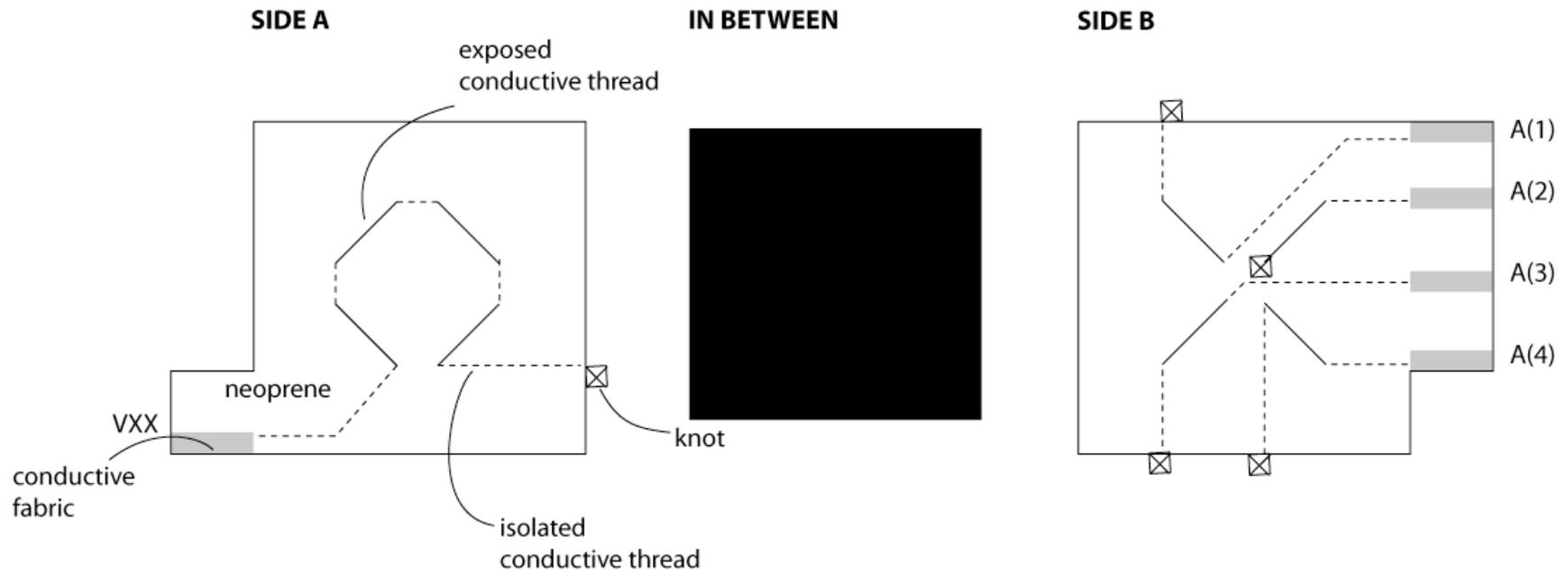


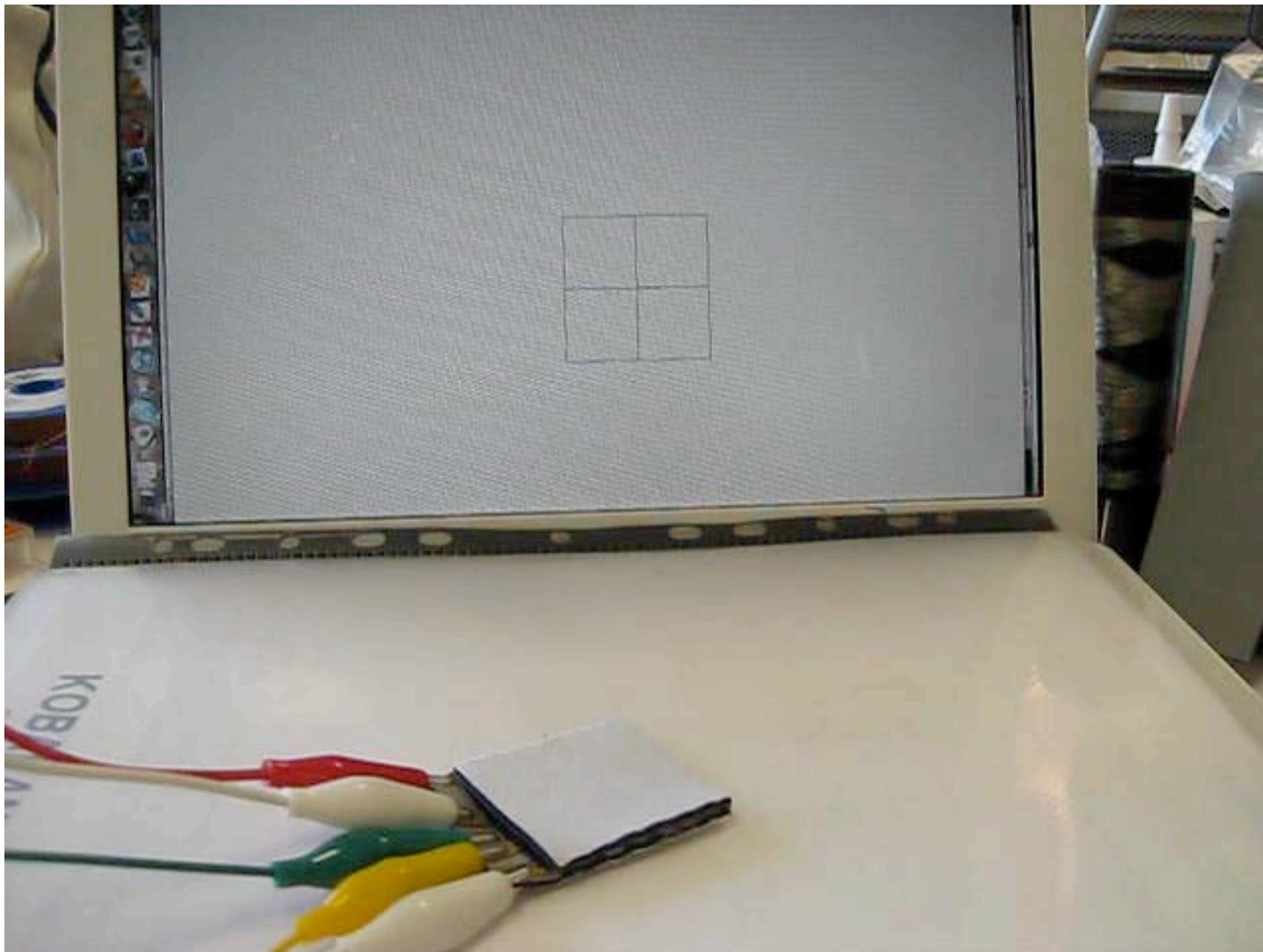
MATERIALS

- Neoprene
- Conductive thread
- Stretch conductive fabric
- Fusible interfacing
- Velostat



Pressure Sensor Matrix

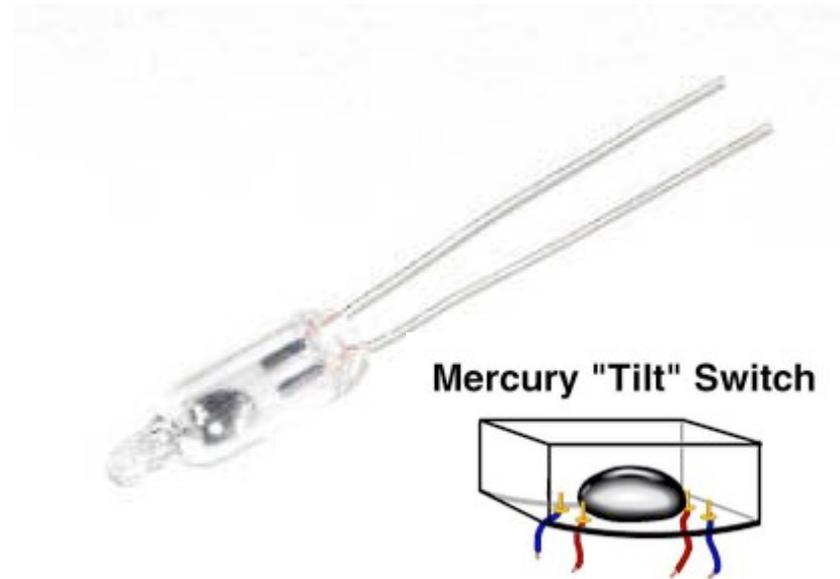




Fabric Tilt Sensor

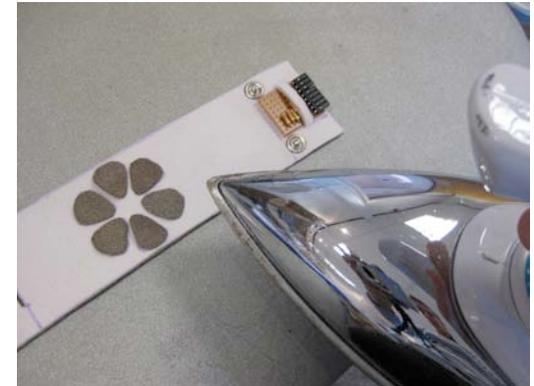


Fabric Tilt Sensor vs. Tilt Switch



Mercury tilt switch photo and diagram (right) © source unknown. All rights reserved.
This content is excluded from our Creative Commons license.
For more information, see <http://ocw.mit.edu/fairuse>.

Fabric Tilt Sensor

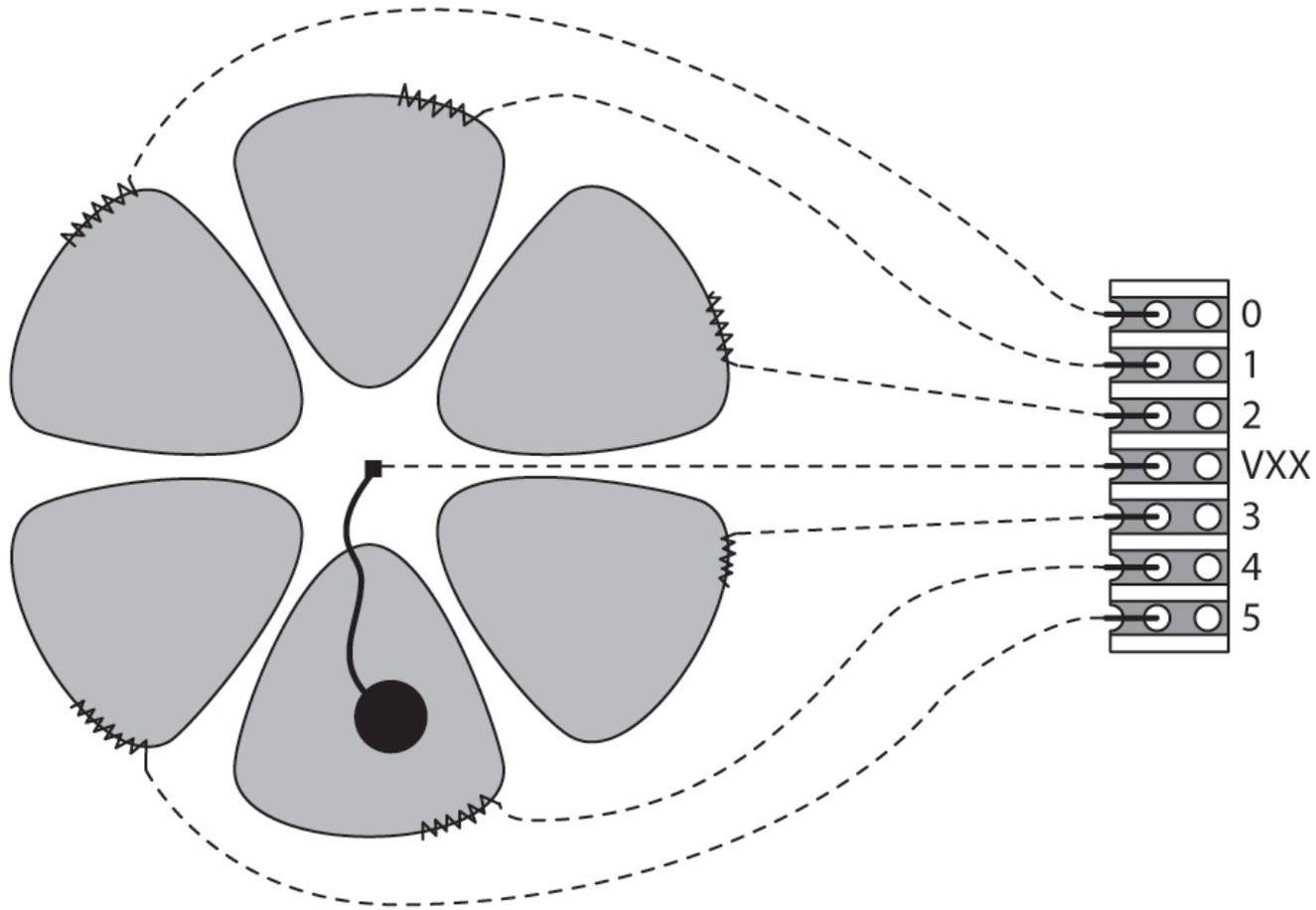


MATERIALS

- Neoprene
- Stretch conductive fabric
- Conductive thread
- Metal bead
- Stretchy fabric glue



Fabric Tilt Sensor



- conductive fabric
- metal bead
- knot

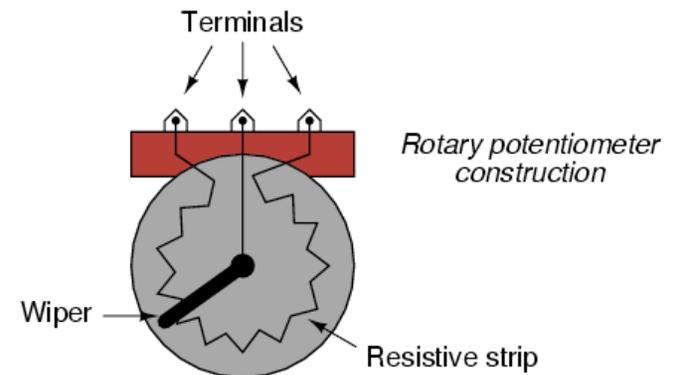
- conductive thread
- double cond. thread
- - - isolated cond. thread



Fabric Potentiometer



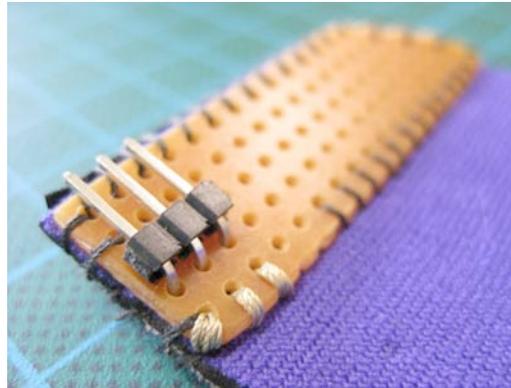
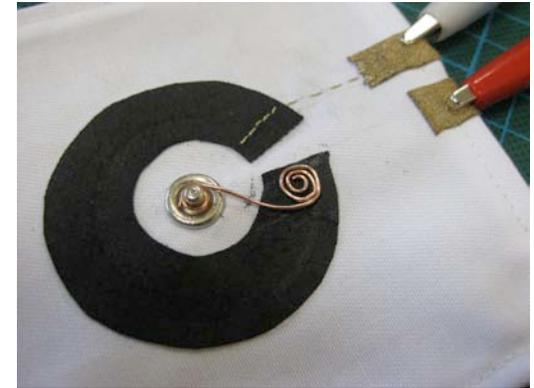
Fabric Potentiometer vs. Pot



Top right photo from [Wikipedia](https://en.wikipedia.org/wiki/Potentiometer) © Wikipedia User: Iainf. License CC BY-SA. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <http://ocw.mit.edu/fairuse>.

Lower right diagram courtesy of Tony R. Kuphaldt / All About Circuits.

Fabric Potentiometer

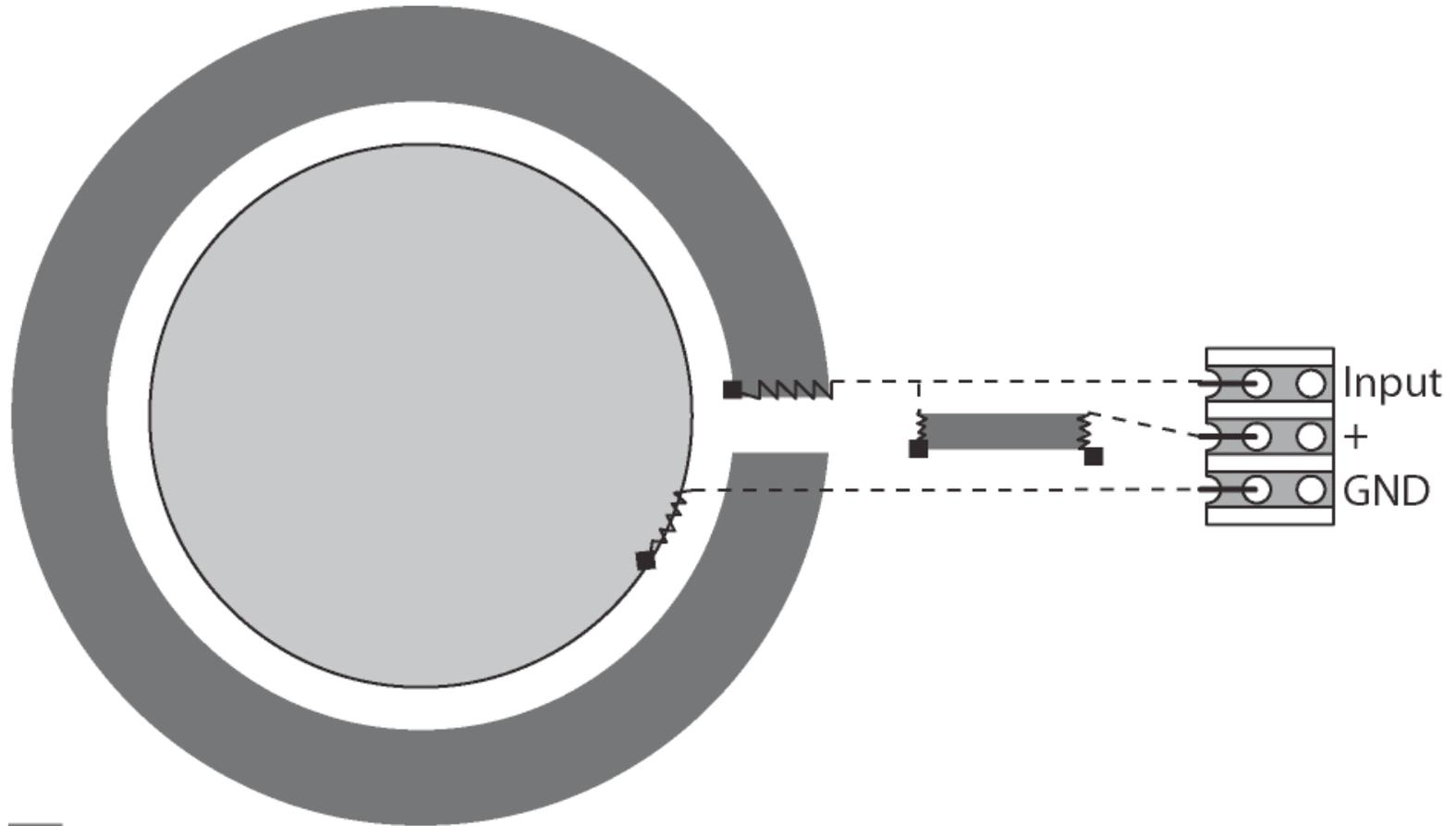


MATERIALS

- Neoprene
- Conductive thread
- Stretch conductive fabric
- Resistive fabric
- Fusible interfacing



Fabric Potentiometer



- resistive fabric
- conductive fabric
- knot

- conductive thread
- double cond. thread
- - - isolated cond. thread



Crochet Potentiometer



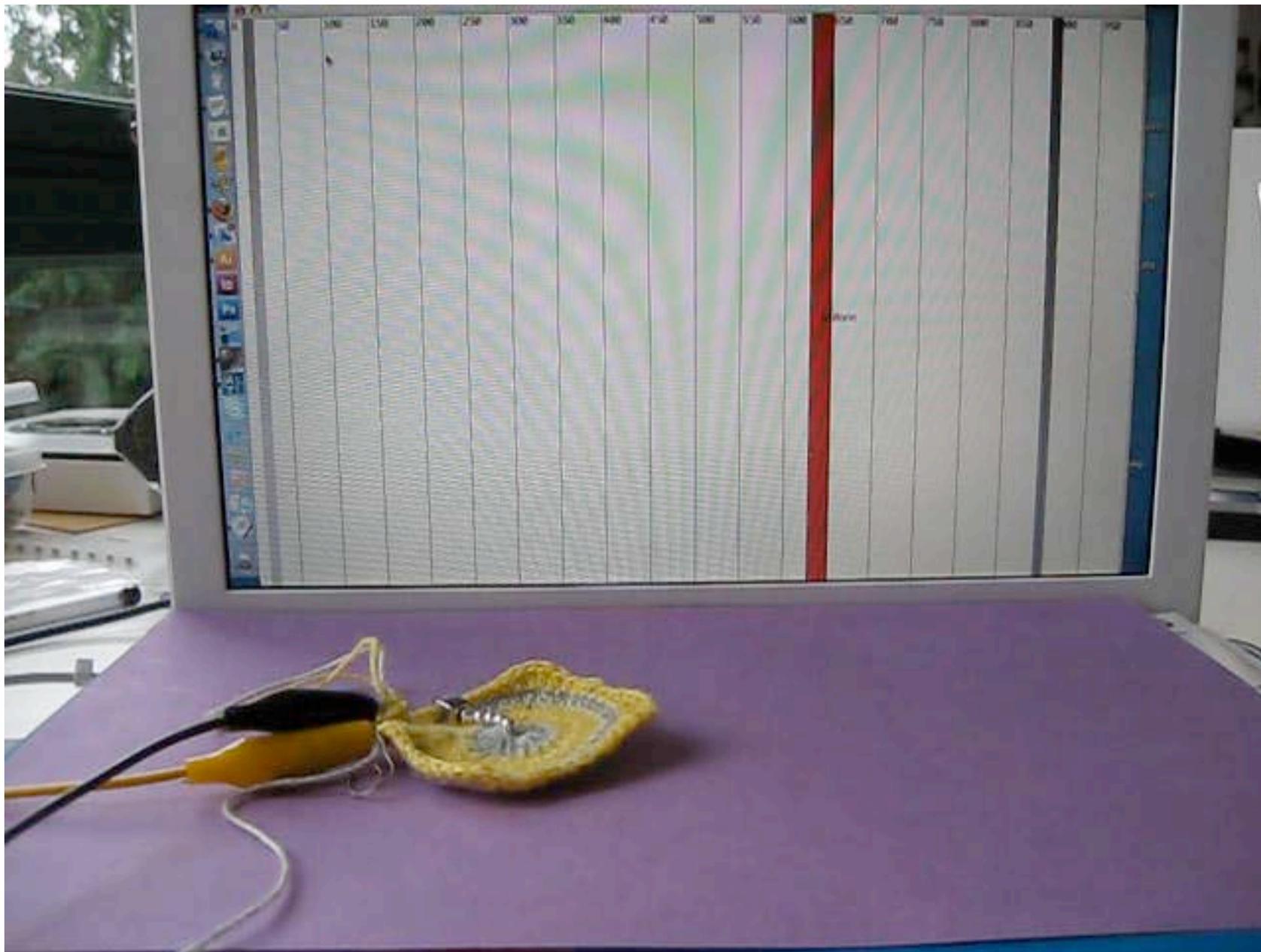
Crochet Potentiometer



MATERIALS

- Resistive yarn
- Regular yarn
- Conductive thread
- Metal bead

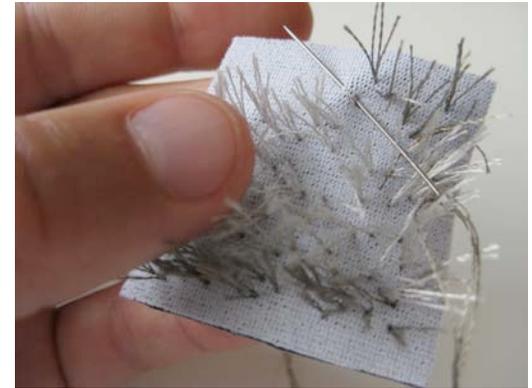




Stroke Sensor



Stroke Sensor

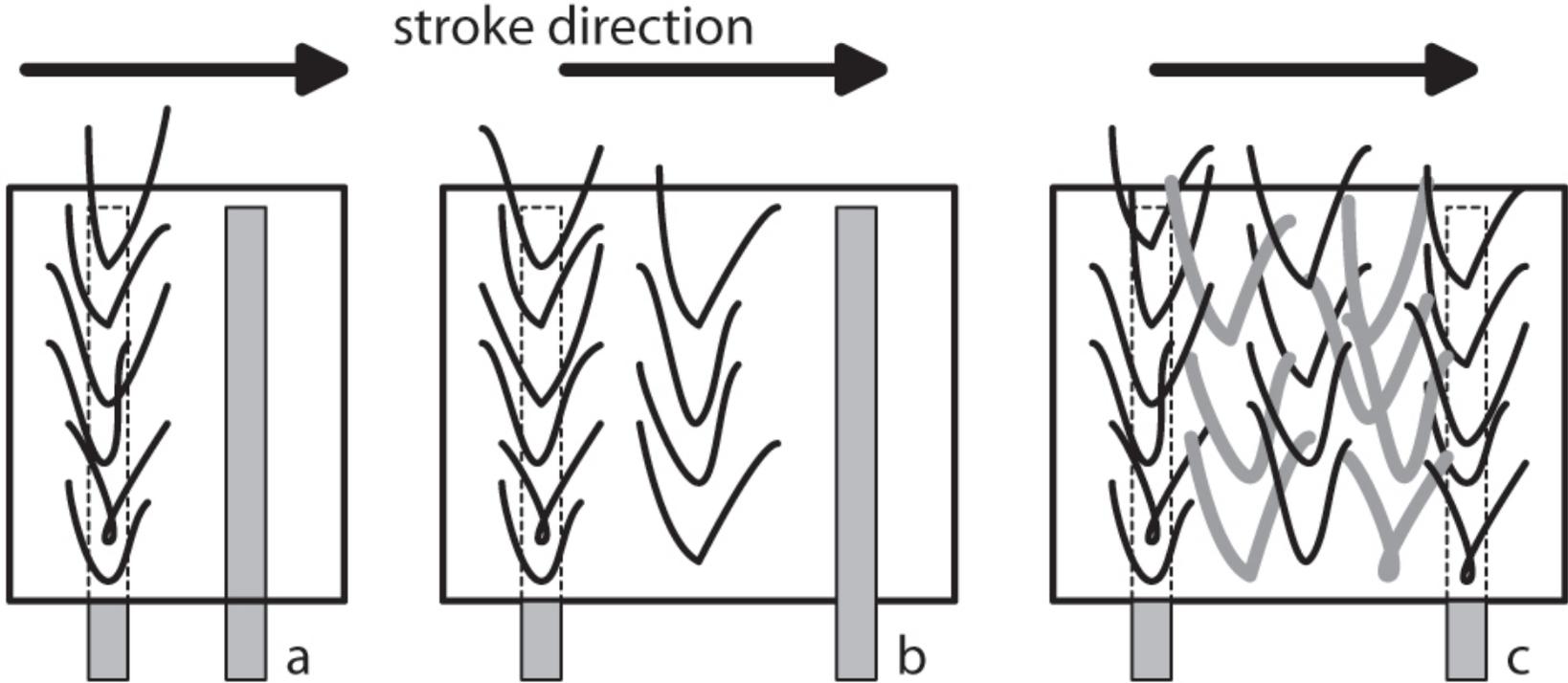


MATERIALS

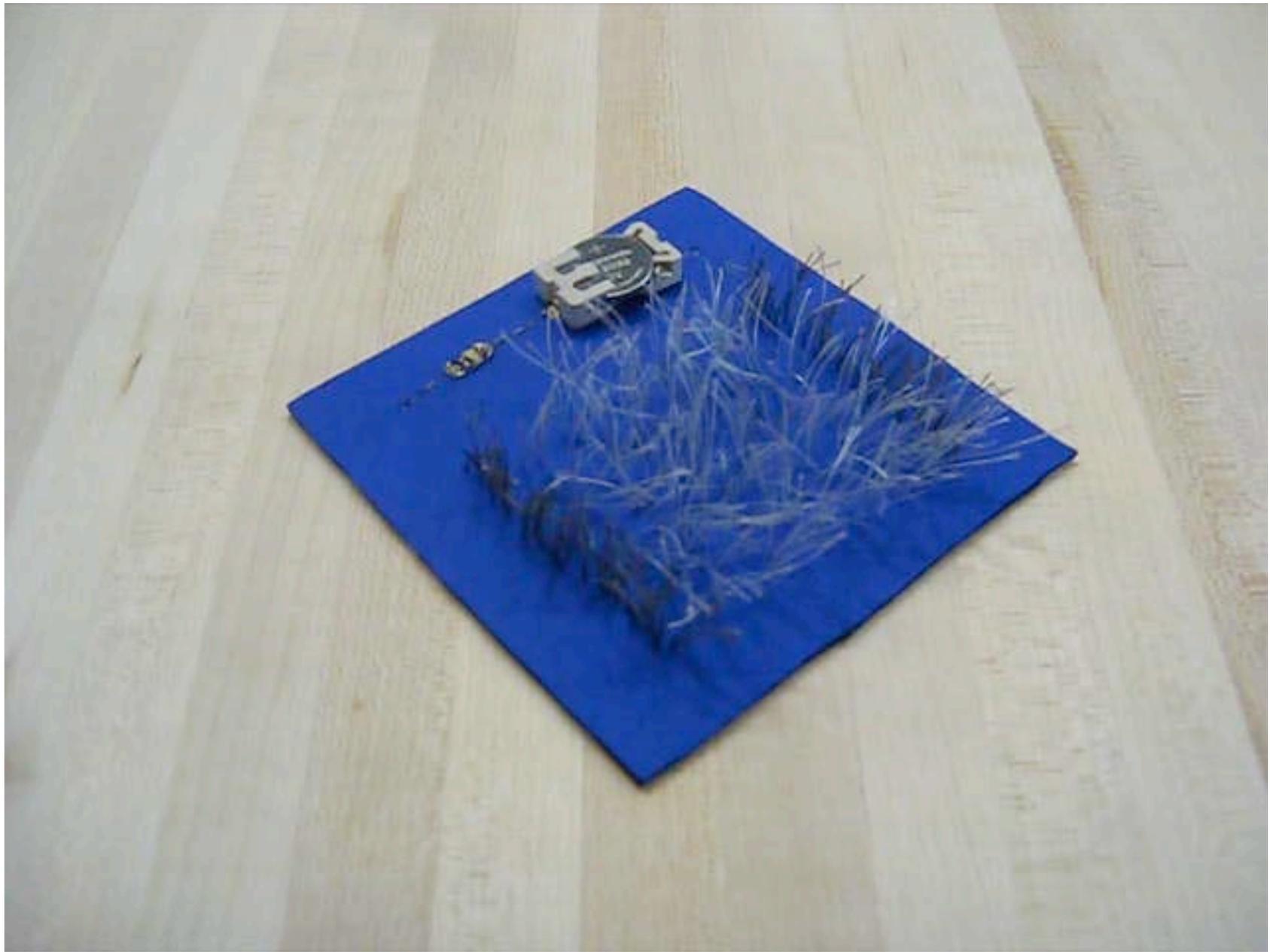
- Neoprene
- Conductive thread
- Resistive thread
- Conductive fabric
- Fusible interfacing



Stroke Sensor



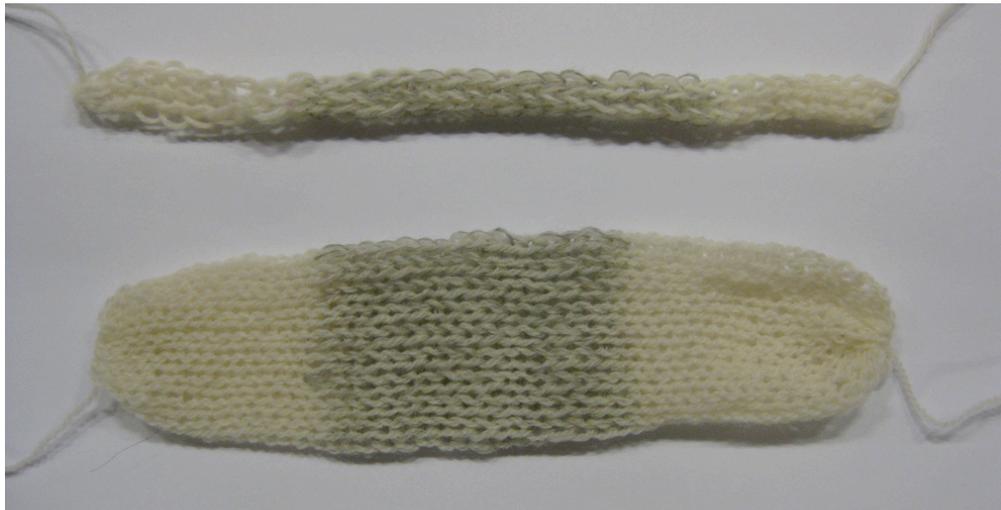
- neoprene
- conductive fabric
- conductive thread
- non-conductive or resistive thread



Knit Stretch Sensors

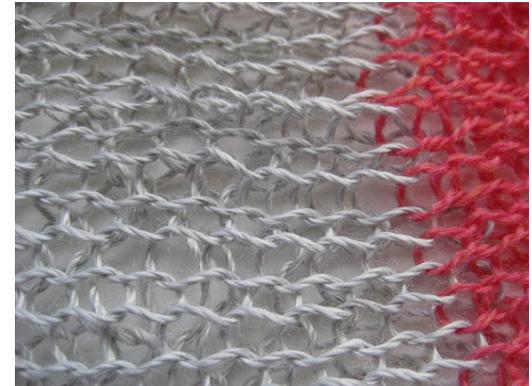
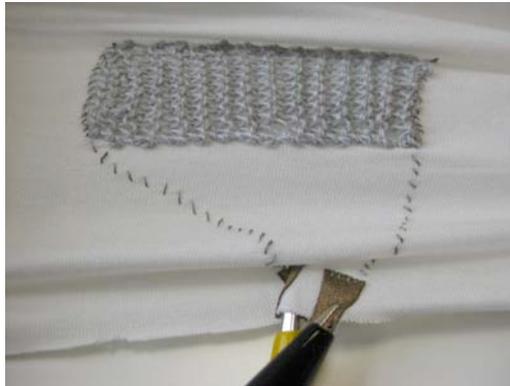


Knit Stretch Sensor vs. Commercial Stretch Sensor



Commercial stretch sensor photo © Electronix Express.
All rights reserved. This content is excluded from our
Creative Commons license. For more information,
see <http://ocw.mit.edu/fairuse>.

Knit Stretch Sensor

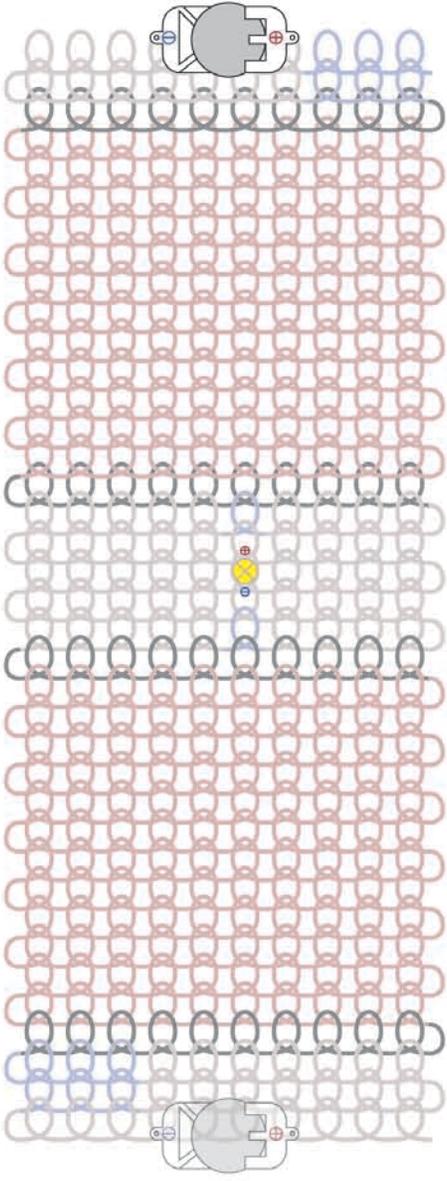
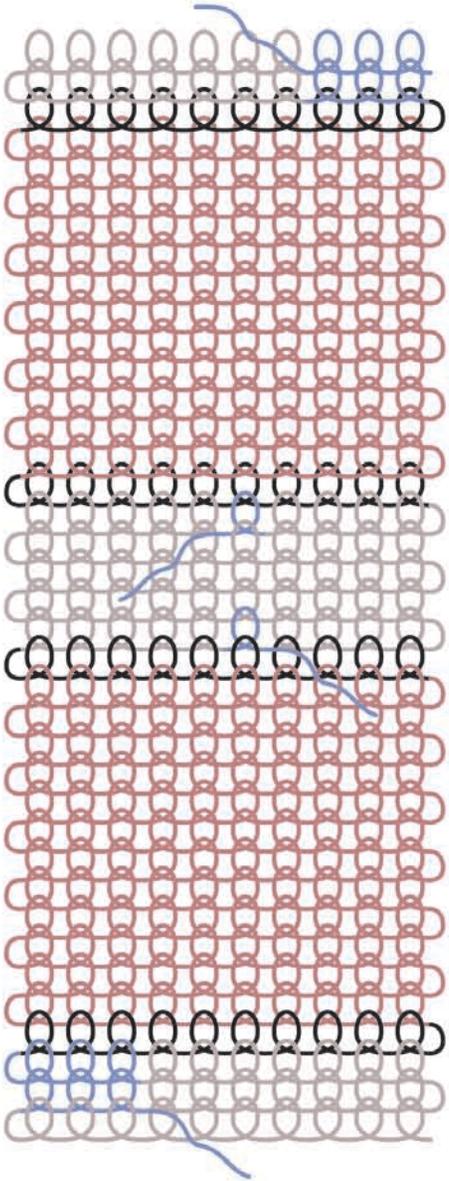


MATERIALS

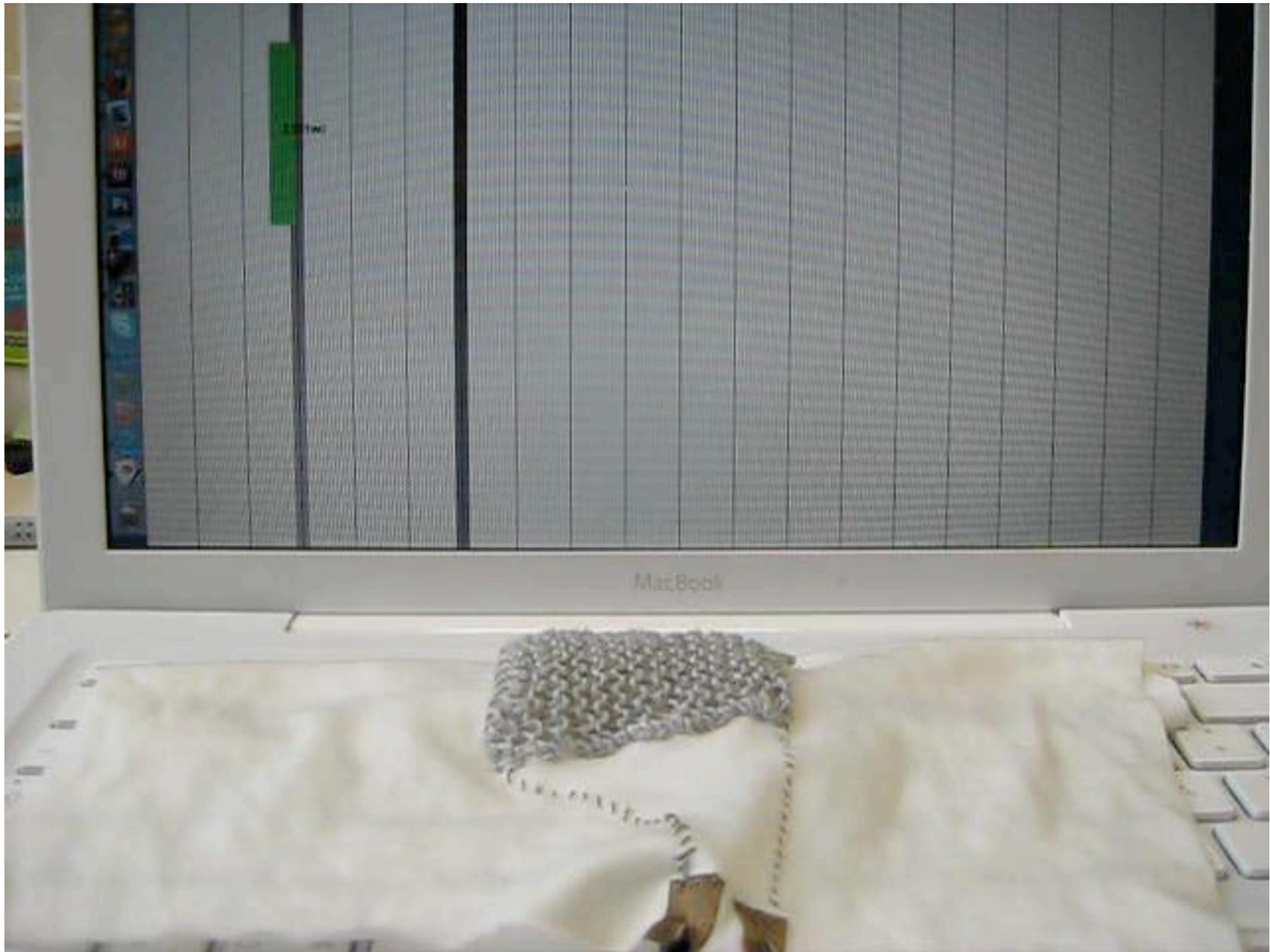
- Resistive yarn
- Regular yarn



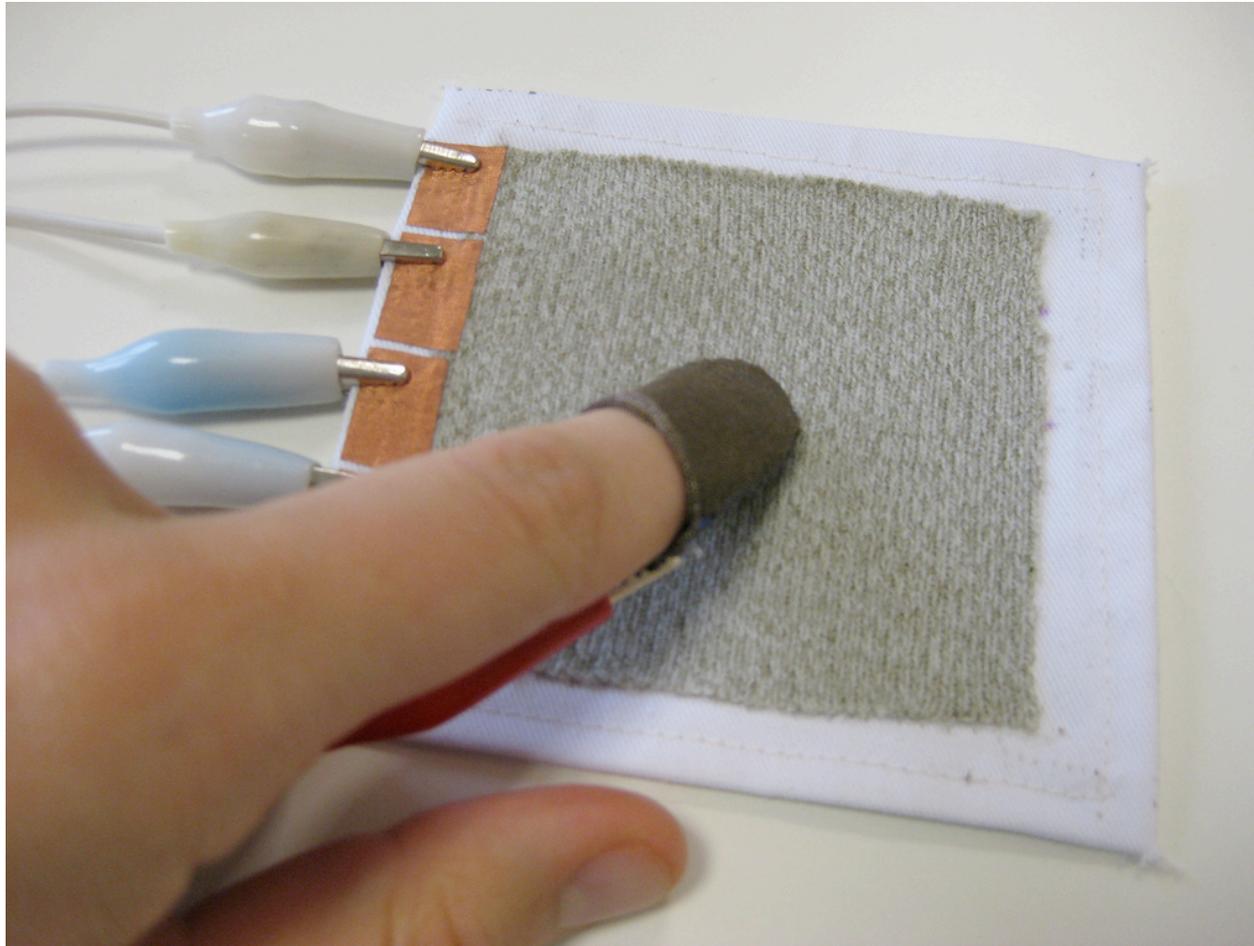
Knit Stretch Sensing Bracelet



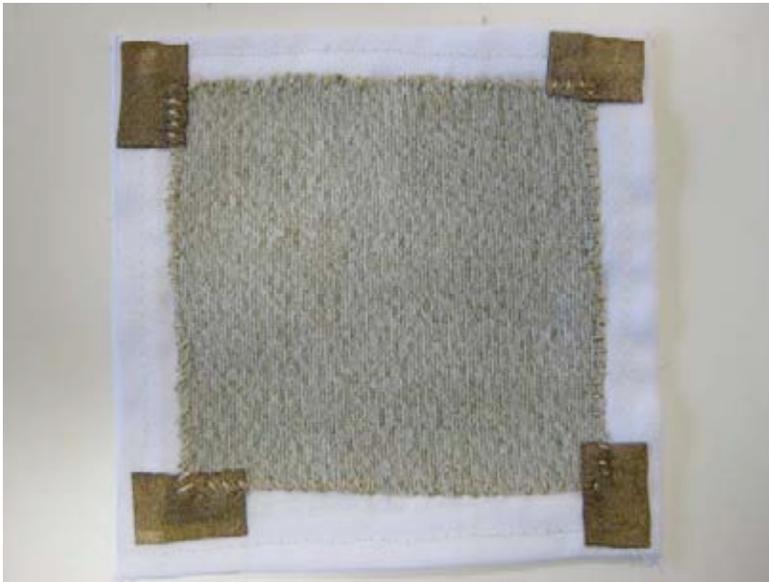
- regular yarn
- resistive yarn
- conductive thread
- regular yarn + resistive yarn
- regular yarn + conductive thread
- regular yarn + resistive yarn + conductive thread
- LED light
- Battery holder



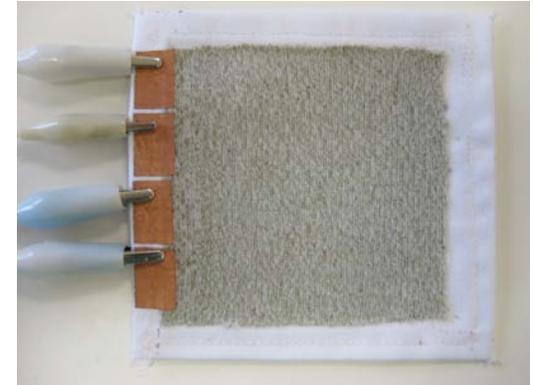
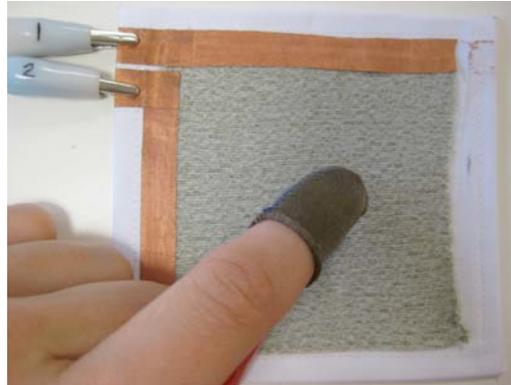
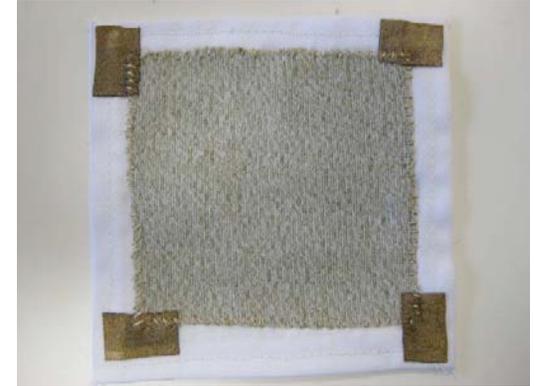
Knit Touchpad



Knit Touchpad vs. Laptop Touchpad

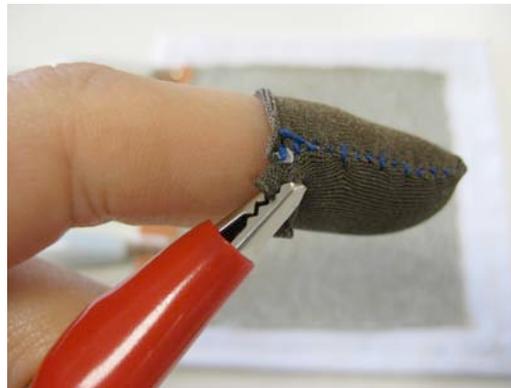


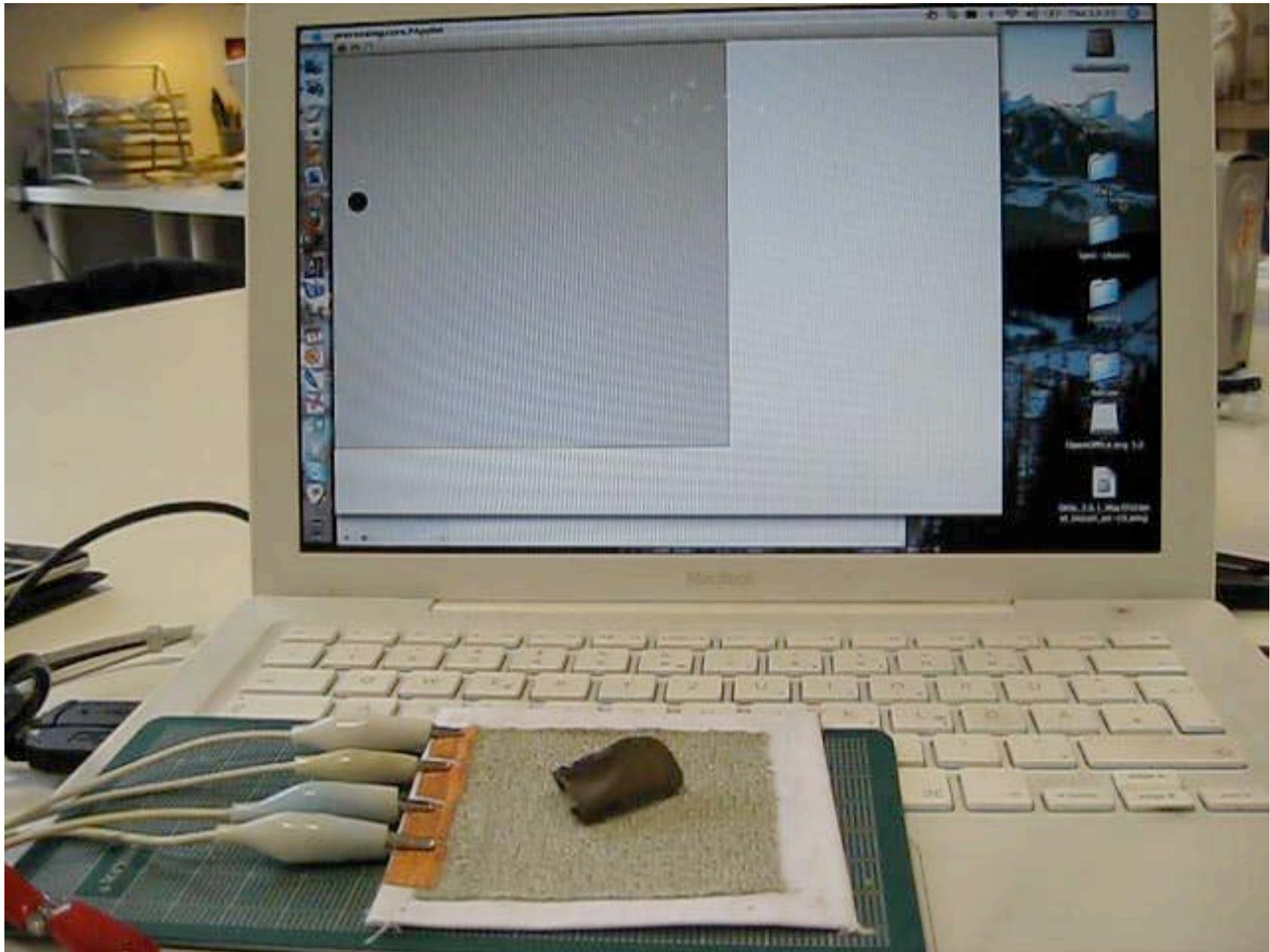
Knit Touchpad



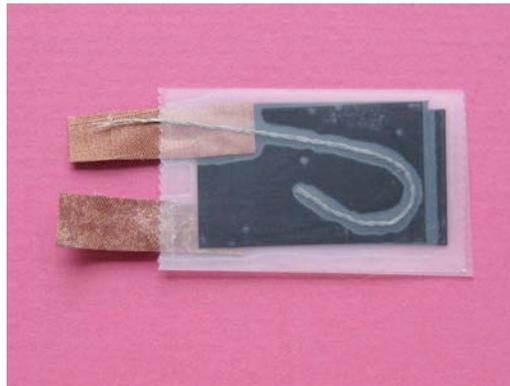
MATERIALS

- Antistatic knit glove
- Conductive fabric





More tools, more techniques, more sensors...



www.instructables.com/member/Plusea

instructables Home Explore Answers Community Submit

Jan 08 May 08 Sep 08 Jan 09 May 09

All Art Craft Food Games Green Home Kids Life Music Offbeat Outdoors Pets Ride S

member : Plusea [subscribe](#)

Instructables [rss](#) [img](#)

sort by: [recent](#) | [views](#) | [name](#) | [rating](#) 1-12 of 32 [next >](#)

Sensitive Fingertips

Stickytape Sensors

Neoprene Bend Sensor IMPROVED

Limpet Push-Button

Time Sensing Bracelet

Tilt Sensing Bracelet

Pressure Sensor Matrix

Solar Necklace T-Shirt

Plusea

Location
Brooklyn, NY

Web Site
<http://www.plusea.at>

Member Since: Jun 8, 2007

MEMBER STATS

Instructables: 32
Subscribers: 115

Courtesy of Instructables. Used with permission.

HOW TO GET WHAT YOU WANT

- EXAMPLE PROJECTS
- WORKSHOPS
- ACTUATORS
- CIRCUITS
- COMMUNICATION
- CONNECTIONS
- POWER
- SENSORS
- TRACES
- CONDUCTIVE MATERIALS
- NON-CONDUCTIVE MATERIALS
- TECHNIQUES
- TOOLS

- >> SENSORS
- BEAD TILT SENSOR
- CONSTRUCTED STRETCH SENSORS
- CROCHET PRESSURE SENSOR
- SENSOR
- CROCHET TILT POTENTIOMETER
- FABRIC BEND SENSOR
- FABRIC BUTTON
- FABRIC POTENTIOMETER
- FABRIC PRESSURE SENSOR
- FABRIC STRETCH SENSORS
- KNIT CONTACT SWITCH
- KNIT TOUCHPAD
- KNITTED STRETCH SENSORS
- PAINTED STRETCH SENSOR
- PRESSURE SENSOR MATRIX
- SIMPLE FABRIC PRESSURE SENSORS
- STICKYTAPE SENSORS

SENSORS

Sensors

CROCHET PRESSURE SENSOR



Here is the crochet pressure sensor. The main principle is same as regular pressure sensor. Instead of conductive fabric or thread, I used conductive yarn from Schoeller, Nm 50/2 60/40 Pes/Inox @ Euros 65.00/kg (25,000 metres/kg). Since this yarn is very thin, it is mixed with normal yarn and crochet, which is what you can see [...]

Sensors

CROCHET TILT POTENTIOMETER



Combination of tilt sensing and potentiometer using regular wool and conductive wool from Schoeller.

Sewable LED Light



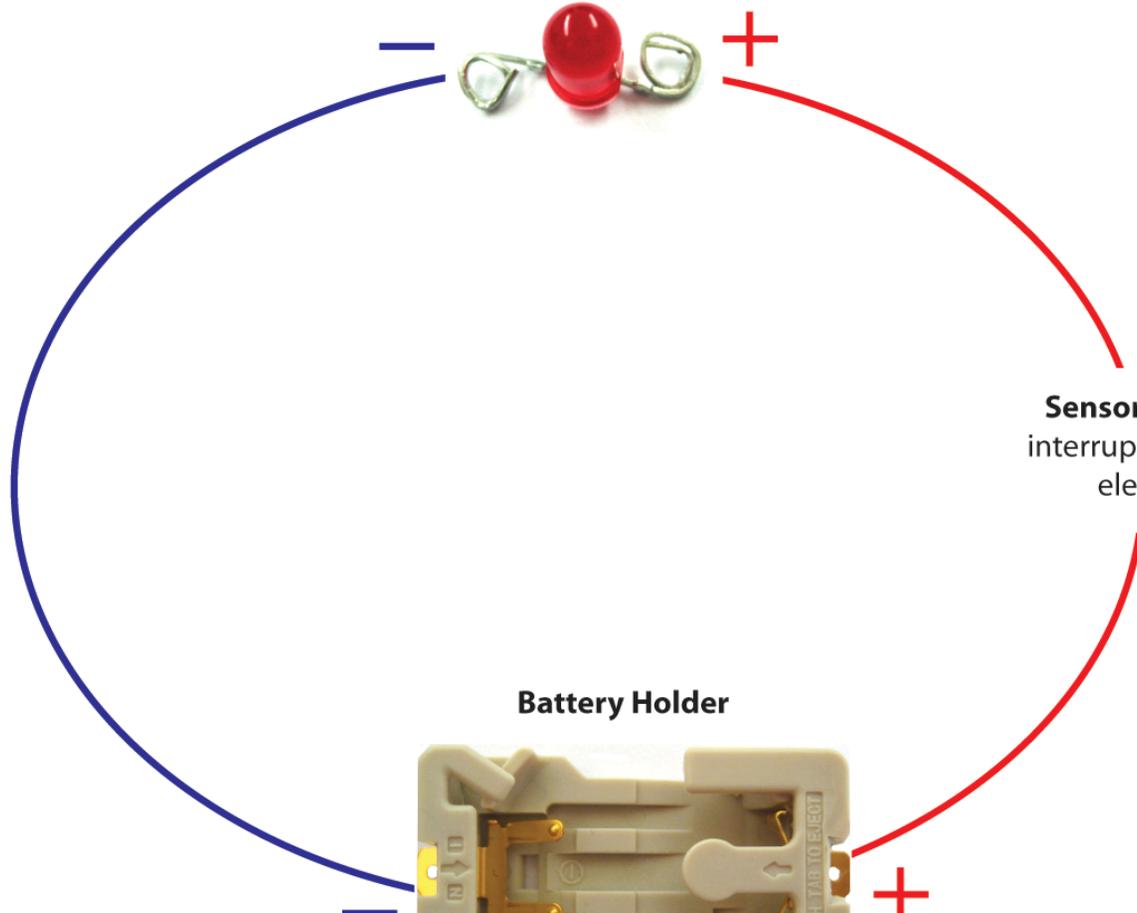
Sensor or Switch
interrupts the flow of
electricity

Battery Holder



Negative
Ground

Positive
Power



MIT OpenCourseWare
<http://ocw.mit.edu>

MAS.962 Special Topics: New Textiles
Spring 2010

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.