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
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
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

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Fabric Button

MATERIALS

• Neoprene
• Stretch conductive fabric
• Fusible interfacing
• Foam
Fabric Button

SIDE A
- conductive fabric
- neoprene
- metal snap

IN BETWEEN
- perforated foam
- only perforate in the area you want to be sensitive

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

**MATERIALS**
- Neoprene
- Conductive thread
- Stretch conductive fabric
- Fusible interfacing
- Velostat
Conductive Thread Pressure Sensor

SIDE A

IN BETWEEN

SIDE B

knot

exposed conductive thread

isolated conductive thread
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

SIDE A

exposed conductive thread

neoprene

SIDE B

A(1)
A(2)
A(3)
A(4)

isolated conductive thread
knot

conductive fabric

VXX
Fabric Tilt Sensor
Fabric Tilt Sensor vs. Tilt Switch

Mercury "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

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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
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

stroke direction

a
neoprene

b
conductive fabric

c
conductive thread
non-conductive or resistive thread
Knit Stretch Sensors
Knit Stretch Sensor vs. Commercial Stretch Sensor
Knit Stretch Sensor

MATERIALS

- Resistive yarn
- Regular yarn
Knit Stretch Sensing Bracelet
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

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**How to Get What You Want**

**Sensors**

**CROCHET PRESSURE SENSOR**

Here is the crochet pressure sensor. The main principle is the 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 [...]

**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