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Tangible Media

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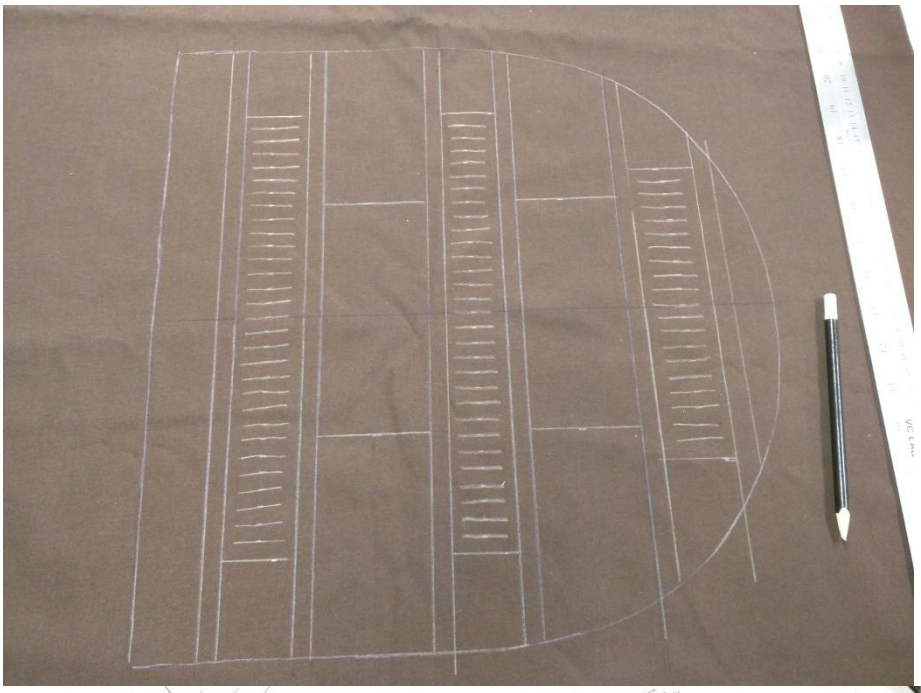
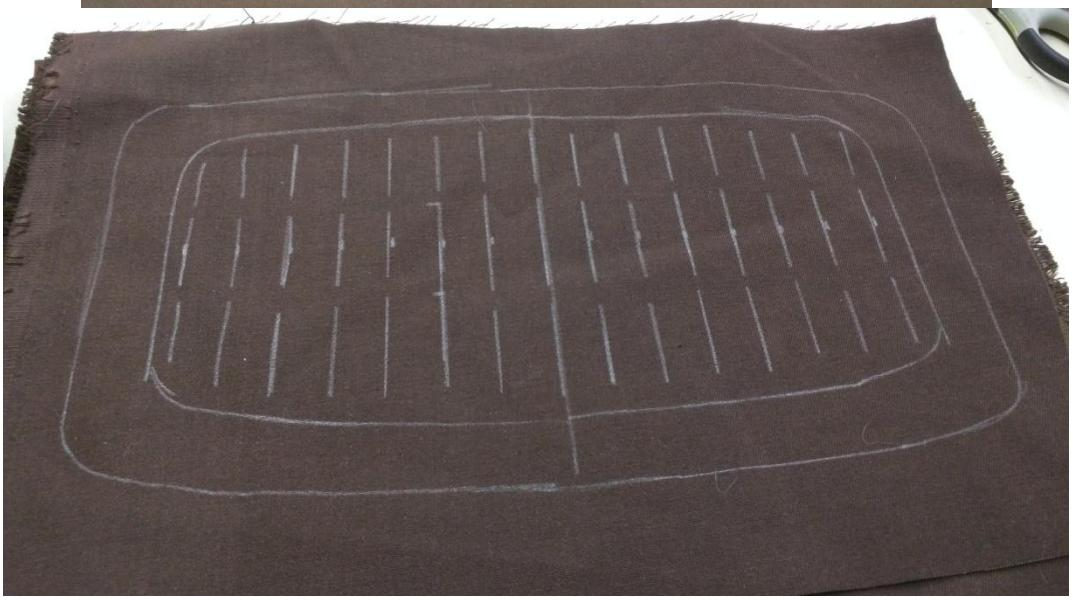
Affable Chair Documentation

Description: Affable chair is an ergonomic chair that monitors user's sitting pattern and sitting duration, and notify the user when his or her bad sitting posture and when to get up for a break. The chair is equipped with pressure sensors made by using a pressure-sensitive conductive sheet to detect the user and the user's sitting pattern. The chair also equipped with two heat pads, vibration motors, and a buzzer for a user feedback.

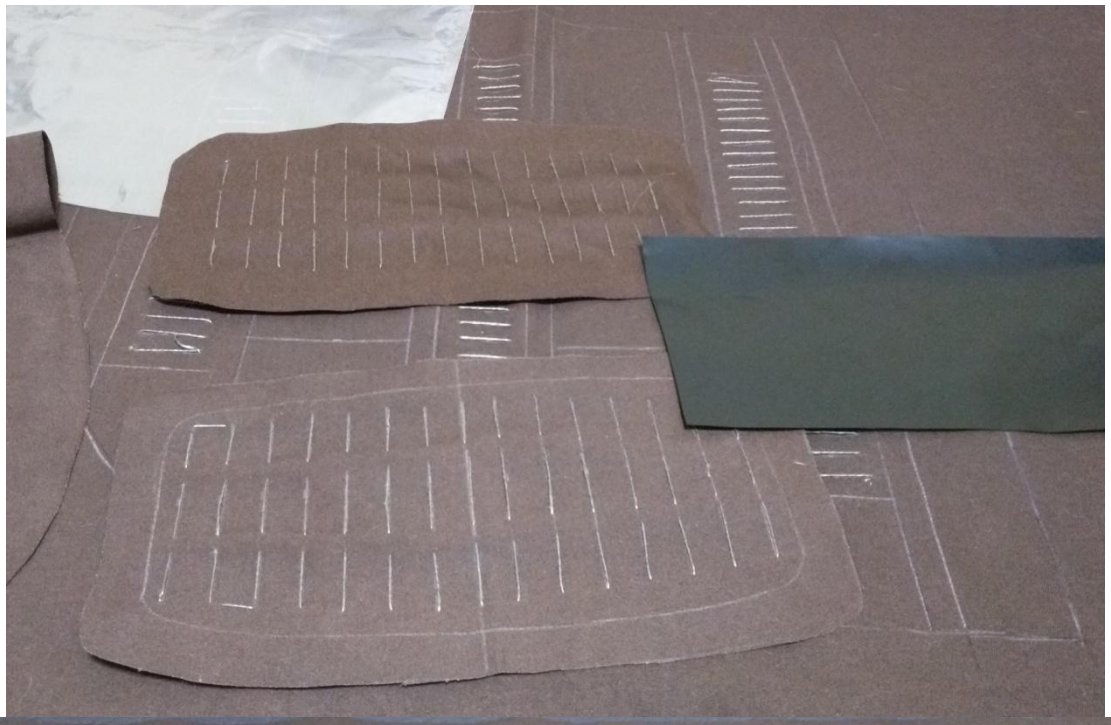
Construction Process:

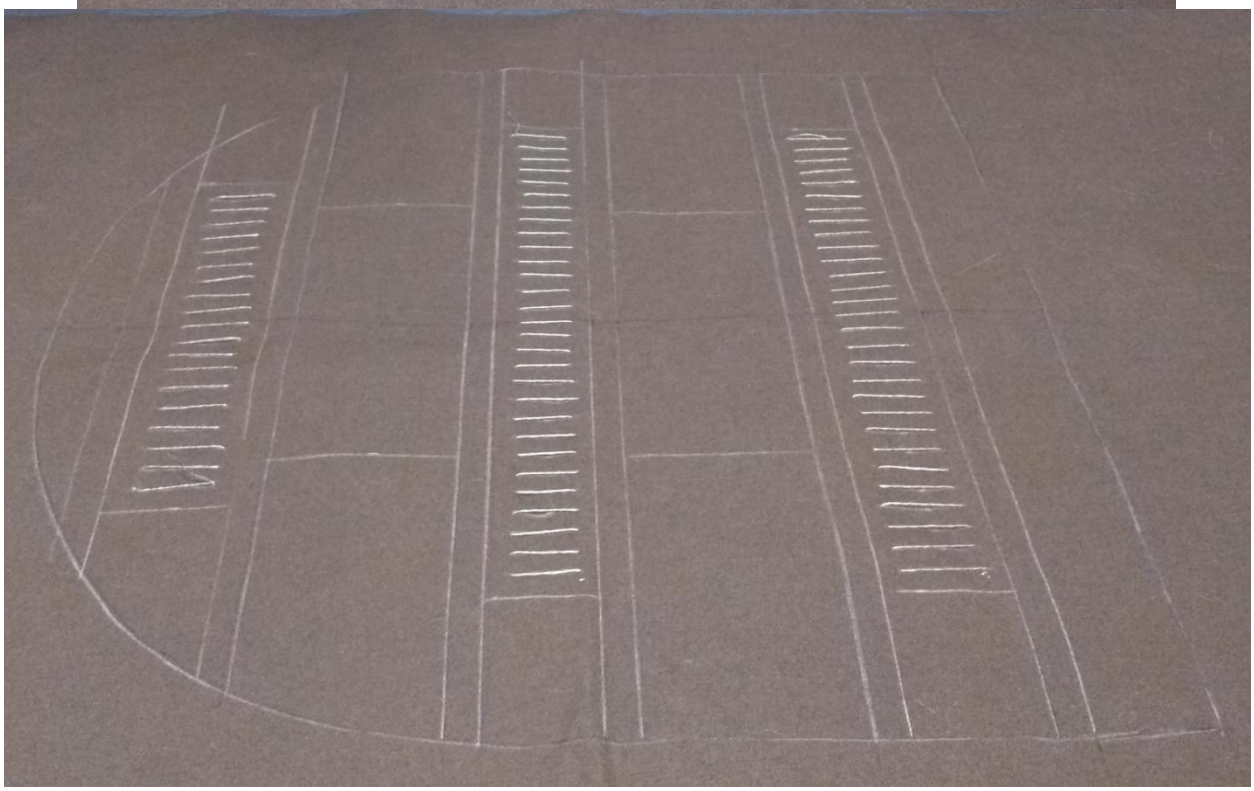
Step 1: Creating the pattern for the conductive thread on the fabric. Tracing the lines where the conductive thread will be sawn and where the velostats and heat pads will be placed.



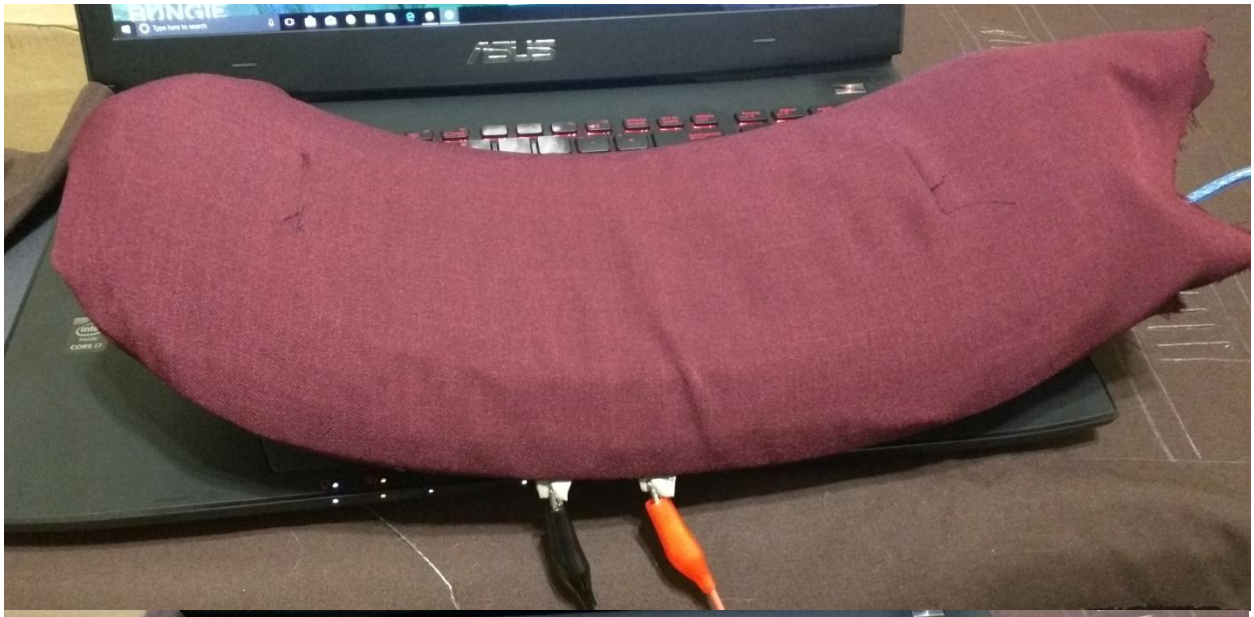


Step 2: Sawing the conductive thread and the conductive fabric on the cloth fabric. The sawn conductive thread will act as the conductor on each side of the velostat. And the conductive fabric is used as an attachment for the wire that will be connected to the arduino.





Step 3: Creating a cover for the backrest seat. Using another type of fabric, I traced the approximate shape and made a pouch that will be covering the pressure sensor. Also in this case, I sawed the conductive fabric attachment for the wire outside so I could test the sensor before completely closing the backrest seat cover.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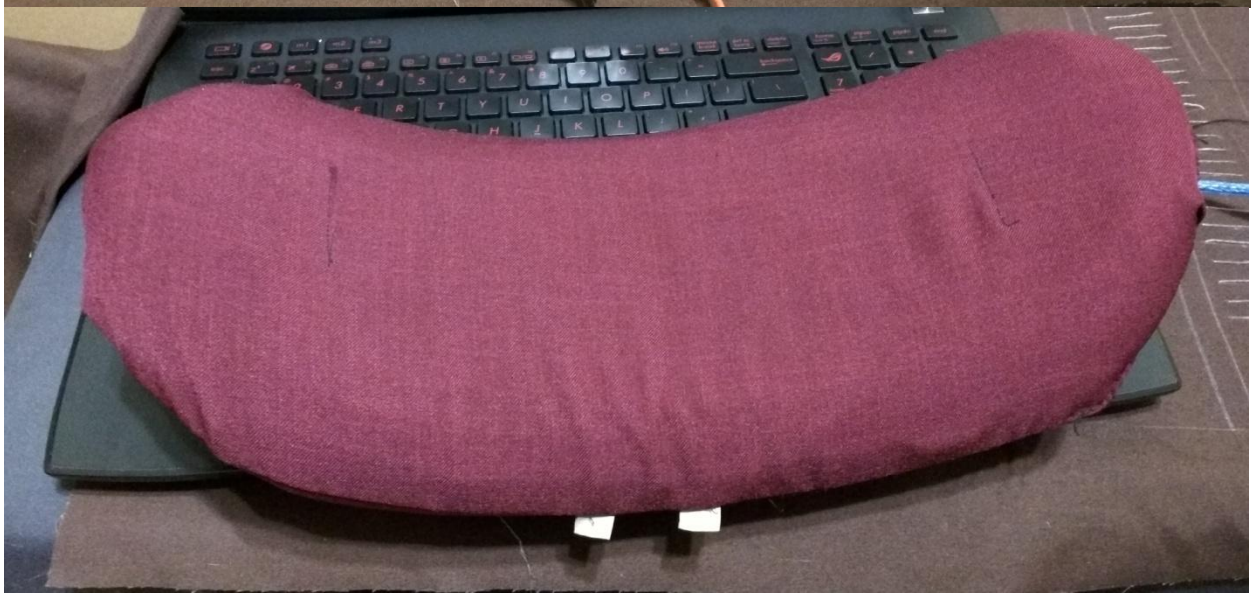
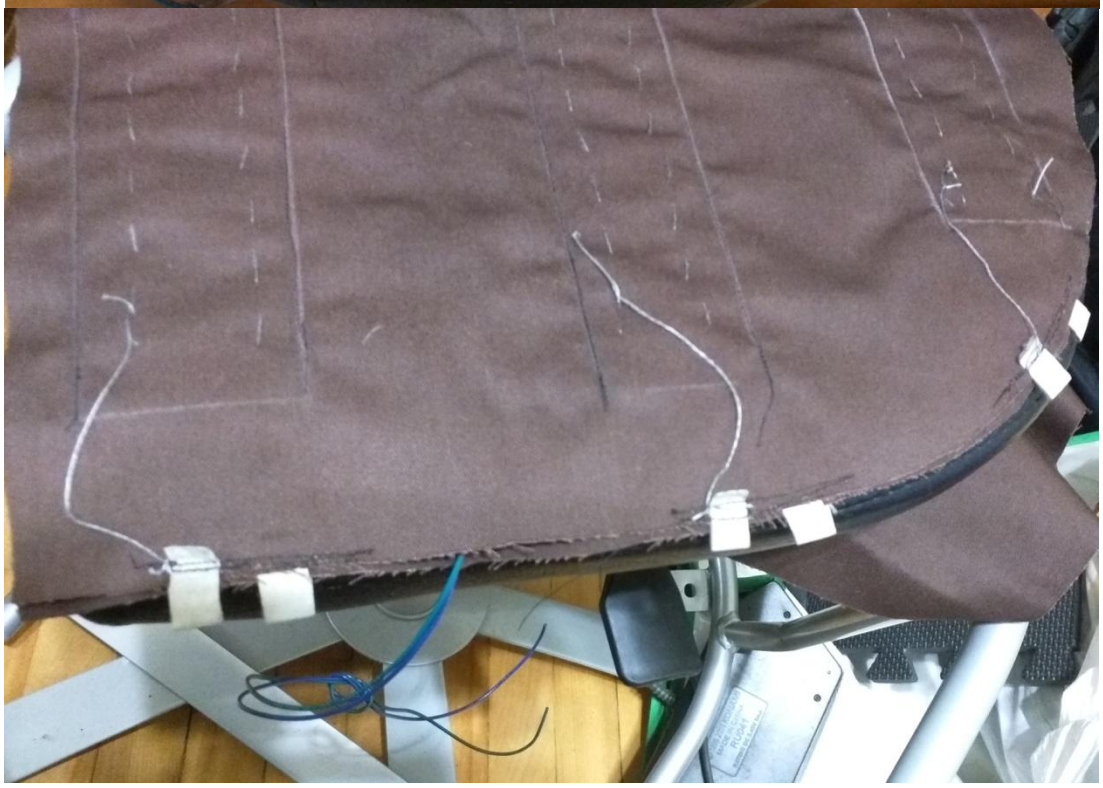
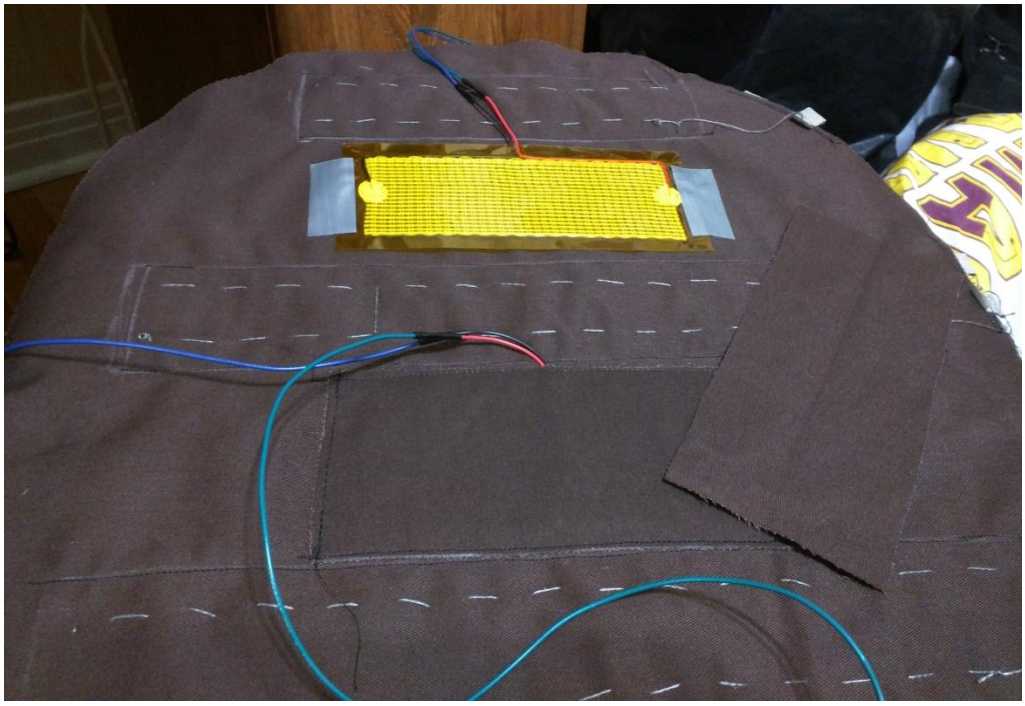


Step 4: After completing the backrest seat, I sawed the three velostats on the designated fabric to make the pressure sensors for the seat. And I also made the attachment for the wires using the conductive fabric.

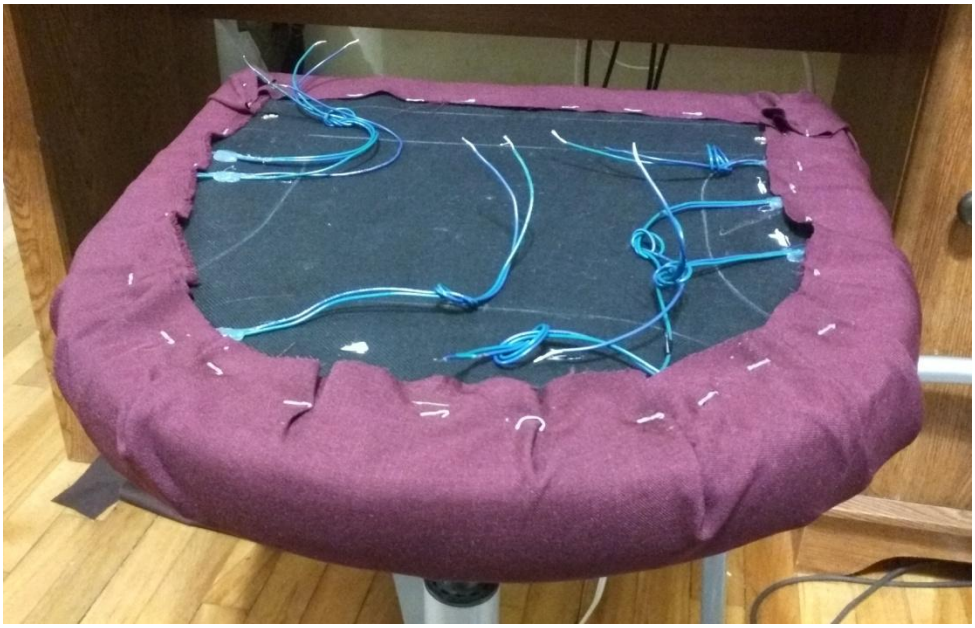


Step 5: Then I sawed the heat pads with a piece of cloth fabric and glued the vibration motors on the designated fabric.



Step 6: I attached all the wires for the three sensors and wrapped electric tapes. Then I placed the fabricated sensors along with the heat pads and the vibration motors on the chair. To secure the wires from sliding or moving, I glued them beneath the seat.

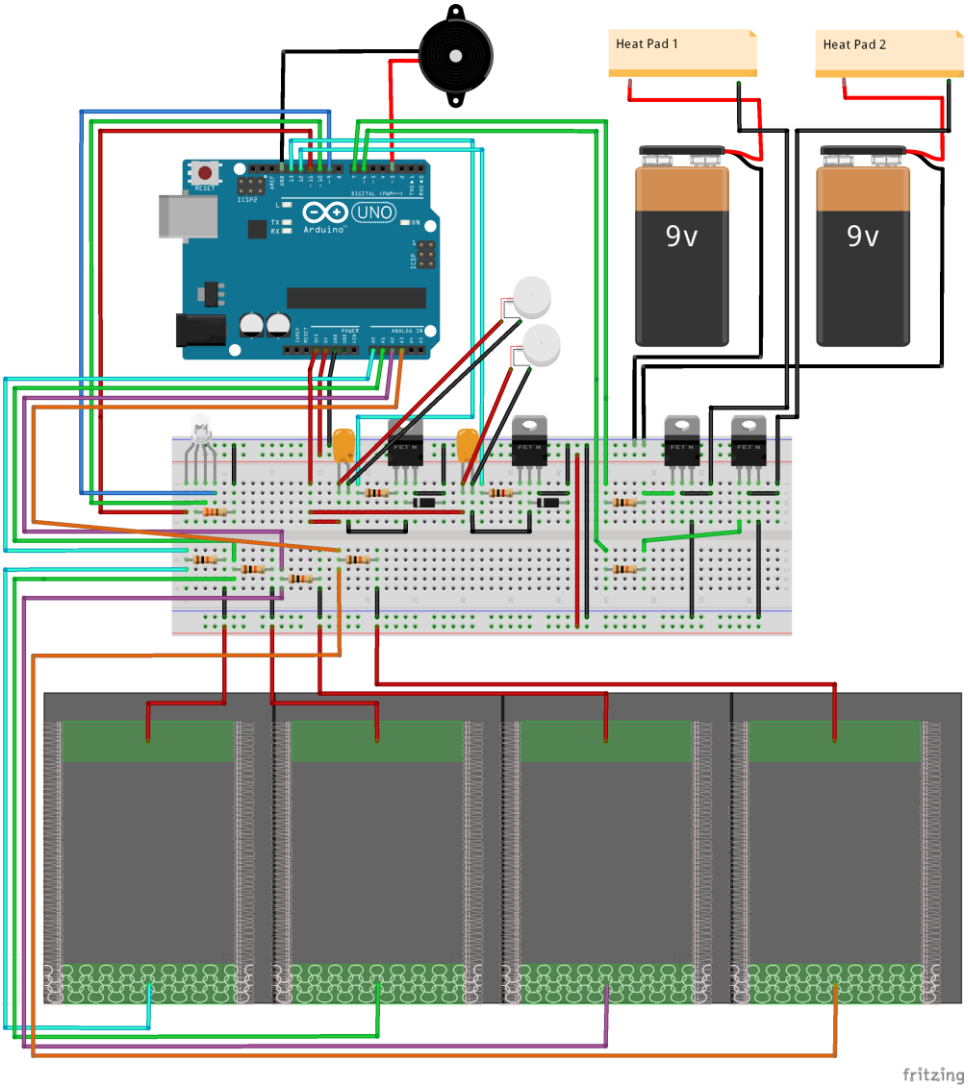
Step 7: Then I used the same cloth fabric to cover the fabricated sensors and the seat and stapled the cloth fabric.



Step 8: I reassembled the chair and screwed the arduino and the breadboard under the seat. Then I assembled the circuit.

Circuit

The buzzer is connected to pin 3 and there is nothing complicated about the set up except it use PWN for outputting different frequency. The RGB LED is a common cathode which uses a 330 ohm resistor, but in my circuit I used 300 ohm resistor due to I didn't have 330 ohm. The LED is connected to pin 11, 10, and 9. The pressure sensors use a pull-down resistor method with 10k ohm resistor and they are connected to A0, A1, A2, and A3 analog pins. The heat pads are powered separately and individually by a 9 volt power supply. I also used n-channel MOSFET transistors to control the voltage flow or to turn it on/off. The heat pads are connected to pin 6 and 7. Lastly, the vibration motors also use n-channel MOSFET transistors to control it. In addition, I placed a 0.1 uf capacitor and diode to protect the microcontroller. The vibration motors draw power in the arduino's 3.3v instead of external mean and they are connected to pin 12 and 13.



Components used in the chair:

- Arduino Uno
- 9 volt power supply for Arduino
- Bread board
- Two heat pads
- Four velostats (Pressure-sensitive Conductive Sheet)
- Two vibration motors
- Buzzer
- RGB LED
- Four N-channel MOSFETs
- Two 0.1 uf ceramic capacitors
- Two 1N4001 Diodes
- Six 10k ohm resistors
- Two 1k ohm resistors
- One 300 ohm resistor
- Two external 9v power supplies for the heat pads
- Tons of wires
- Conductive fabric
- Conductive thread
- Cloth frabric
- Old chair

References to circuit and DIY:

Velostat instruction and application notes: https://cdn-shop.adafruit.com/datasheets/HandcraftingSensors.pdf

Vibration motor schematic: http://cdn.instructables.com/F9L/KDFG/GU7FXUMH/F9LKDFGGU7FXUMH.MEDIUM.jpg

Vibration motor arduino project: http://learningaboutelectronics.com/Articles/Vibration-motor-circuit.php