

THEME I

INTELLIGENT TEXTILES - PIEZORESISTIVE PRESSURE SENSOR

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OBJECTIVE(S)

- The project aim is to build a basic and multipurpose pressure sensor which holds **Piezoresitivity** principle as base.
- What is Pressure Sensor ?
- Unlike the locally available textile sensors, the goal here is to develop a textile sensor with all relevant features(as below) combined.
 - Softness
 - High Stretchability
 - Precise Sensitivity in the sensing defined areas
- Such a pressure sensor would be able to sense and detect the amount of external force/strain applied on textiles which could be in the form of pressure, stretch, twist etc

SENSOR CONCEPT AND SETUP

Sensor Making and layers

The sensor would be built to consist of 3 layers.

- Upper and lower layers are the conductive fabric.
- The resistive layer would be embedded between the conductive layers.
- Copper tapes could be surfaced on conductive layers for high conductivity.
- A multimeter would then be used to measure the amount of pressure imposed on the sensor and LED for output.
- The entire sensor setup would then be integrated to the 15*15cm wooden frame.

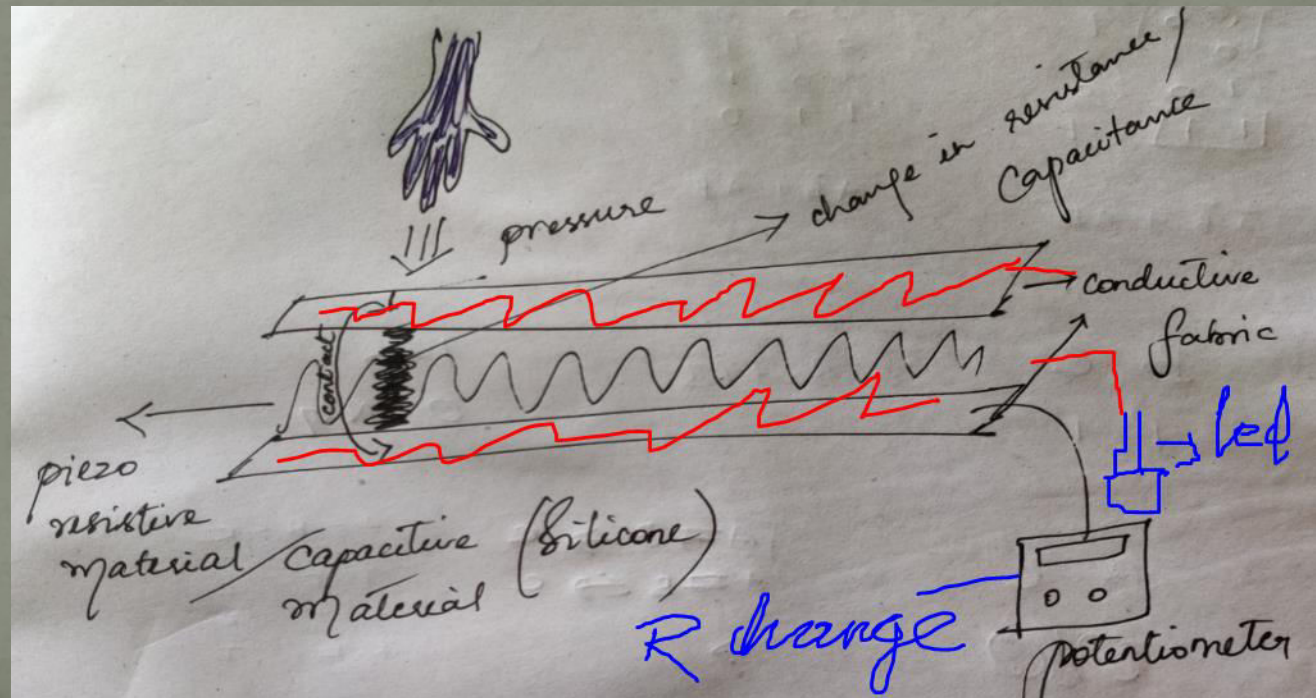
Working Principle of Pressure Sensor

Basic principle is that the change in resistance of the conductive material implies about the amount of external force/strain. The change in the position of electrons between the energy bands, which are triggered by external energy (twist, pressure, stretch etc) are responsible for conduction. The more the strain, more is the change in structure of electrons which is change in resistance, contributing to the conductivity.

PROTOTYPE AND FUNCTION

Prototype 1 :

- Change in resistance(due to pressure applied) = LED Output



TECHNICAL IMPLEMENTATION CHALLENGES

- Introductory lecture quotes

*“Sensor must have some level of complexity,
can but must not contain a micro controller”.*

Therefore I have decided to build the pressure sensor without Arduino controller, but produce output using a LED, which is a challenge for the below reason.

- In software like tinker cad, when there is a change in resistance (potentiometer), output in LED is well and precisely noticeable. But when it comes to hardware, it is a challenge to make the led glow when there is slight change in resistance.
- Sometimes the brightness of LED might not be noticeable.
- Developing our project-sensor in the given wooden frame

INTERACTION DESIGN CHALLENGES

- Twist is also a form of pressure, but since we have to integrate our projects in the 15*15 wooden frame, we should restrict ourselves from twist input.
- Level of pressure and corresponding sensitivity.

CURRENT STATUS

- Purchased LEDs
- Upper and lower conductive layers with resistive layer in between is formed.
- Testing the first prototype with LEDs.

Project Plan

GANTT CHART								
Task Number	Task Name	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7 & Week 8
		June 18- June 24	June 24- July 1	July 2- July 8	July 9- July 15	July 16- July 22	July 23- July 29	July 30 - August 12
1	Gathering remaining required materials							
2	Finding substitutes for non acquired materials							
3	Half sewing of soft & conductive fabrics to develop basic sensor							
4	Making the sensor region highly sensitive							
5	Developing to fully sewed stretchable sensor from soft sensor							
6	Pilot run with the e textile sensor							
7	Finalization and tests							

OPEN QUESTIONS

- In order to optimize the sensor and produce a better output, I have planned to make the sensor area more sensitive.
- If you have any ideas on it, please suggest.

THANK YOU!