TEXTILE + DESIGN LAB

Case Study Number: 03/2016

Project Title: Investigating Textile Sensor Characteristics for a Force Mat

Researcher/People Involved: Sarah De Guzman (B Mechanical Engineering student)

Project Period: February - October 2016

Project Description:

This was a final year project, by a student completing her Bachelor of Mechanical Engineering degree. The project focus was investigating the incorporation of mechanical engineering aspects to unconventional materials. The project investigates the potential of different conductive textile sensors for the application of force mats.

The final product used silver conductive yarn in a paired matrix array that was combined with a dielectric material to create a capacitive sensor. The force mat is integrated with a circuit that measures an electrical signal; this change corresponds to the force that a person exerts on it. This force measuring device will help quantify force and other biomechanical parameters in a simplistic way without the need for expensive force plates.

Background:

The student researcher was looking into applications that could incorporate textiles, in particular knitted structures. Sarah questioned how knitted textiles would behave, and approached the Textile and Design Lab (TDL) to begin the process. Staff at the TDL showed Sarah similar works from previous projects and Senior Technician, Gordon Fraser, began a sampling process, to test the basic principles of electrical sensing for these materials.

Process:

Initially, Sarah was looking at both felting and knitting techniques for the textile component. Major considerations were evaluating the differences and the advantages with the results and electrical readings that the various samples provided.

The materials selected were conductive fibres used for felting and other electrostatic discharge systems, and various conductive yarns. After testing both felted and knitted conductive samples for impedance, it was found that the most effective materials were conductive knitted patches made with silver conductive yarn as the main sensing material.

The researcher and several fellow students attended an e-Textiles workshop run by the TDL, which was advantageous in gaining an understanding of the relationship between textile surfaces and integrated sensors.

Project Outcomes:

The project is still at the prototype stage, and working with textiles has raised new technical considerations for the project that were not initially anticipated. Sarah commented that she was pleased that when sampling a new design, the technician foresaw technical construction issues and made the necessary alterations to offer the required attributes for each prototype.

Images:

Figure 1: Knitted conductive panels made from silver coated yarn