Piezoelectric Based Pressure Sensing Matrix Array

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Conventionally there are two mechanisms for measuring pressure at multiple points on a grid; Resistive/Capacitive and the Resistance/Capacitance of each single point on a grid is measured one after the other at a high frame rate. These systems cost over $2000 and the complementary data acquisition units require a lot of space and power, therefore preventing pressure mapping from being used in size critical applications such as Touchscreens and Sports Equipment. To combat these issues, I developed a Piezoelectric based system which can measure pressure at multiple points simultaneously using Piezoelectric Transducers arranged in a ‘Matrix Circuit’. An Algorithm I have developed then deduces the magnitude and location of where the force was applied in the matrix circuit. The corresponding voltages are then outputted to a graphical interface, where the voltage values have been mapped to RGB colour values. The use of Piezoelectric materials to sense pressure means that the sensing area does not require power because a Piezoelectric material generates a voltage proportional to the force applied to the material. Compared to the conventional systems the power consumption has been reduced dramatically, and the prototype I have created costs less than $40, which is an order of magnitude cheaper than the current systems. The system can also be made transparent for use in touchscreens by replacing the Piezoelectric transducers with ‘Polyvinylidene Fluoride’, which is a transparent fluoropolymer. The goal of my project was to create a new pressure mapping system which would make pressure mapping a commercially viable tool, and the prototype I have created of a 5x5 Matrix successfully demonstrates this new mechanism for pressure mapping.

Awards Won: