

Quantum Tunnelling Composite Materials to Aid Next Generation Tactile Robotic Skin Development

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Peratech Limited has been commissioned by the MIT Media Lab to develop a new type of electronic 'skin' that enables robotic devices to detect not only that they have been touched but also where and how hard the touch was.

The key to the [sensing technology](#) is Peratech's patented 'QTC' materials. QTC's, or Quantum Tunnelling Composites, are a unique new material type which provides a measured response to force and/or touch by changing its [electrical resistance](#) - much as a dimmer light switch controls a light bulb. This enables a simple [electronic circuit](#) within the robot to determine touch. Being easily formed into unique shapes - including being 'draped' over an object much like a garment might, QTC's provide a metaphor for how human skin works to detect touch.

Uniquely, QTC's provide a 'proportional' response - in other words detecting 'how hard' they have been touched. Further, using Peratech's patented xy scanning technology, the robot is able to detect where on a matrix of sensors applied to areas such as the forearms, shoulders and torso, it has been touched.

As robotic devices continue to make inroads to our daily life, their ability to understand the presence and interaction with humans and other objects within a space becomes critically important. This research project is hoped to produce results which could soon be applied to a range of robotics projects that MIT works upon.

Peratech's QTC technology has an established track record for use in robotics, having previously been adopted by NASA for their Robonaut device and by Shadow Robot in the UK, producers of what is widely regarded as the World's most advanced [robotic hand](#), which have utilised QTC to sense 'touch'. However, this project with MIT is a World first in enabling a human to interact - through touch across the body of a robot - much as they would with another human.

QTC's are electro-active [polymeric materials](#) made from metallic or non-metallic filler particles combined in an elastomeric binder. These enable the action of 'touch' to be translated into an electrical reaction, enabling a vast array of devices to incorporate very thin and highly robust 'sensing' of touch and pressure. QTC's unique properties enable it to be made into force sensitive switches of any shape or size. QTC switches and switch matrices can be screen printed allowing for development and integration of switches that are as thin as 75 microns.

QTC is also low power and interfaces can be designed with no start resistance so that without pressure, the switch draws no power and passes no current. Importantly, when pressure is applied, the resistance drops in proportion to the amount of pressure which allows sophisticated human

machine interface designs that react to variations in pressure. QTC technology has no moving parts and requires no air gap between contacts. This makes it extremely reliable and suitable for integration into the thinnest electronic designs and with industry leading operational life.

More information: www.peratech.com/qtcmaterial.php

Source: Peratech Limited

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