DISTRIBUTED SENSOR NETWORKS

Optical lace gives robots a light touch

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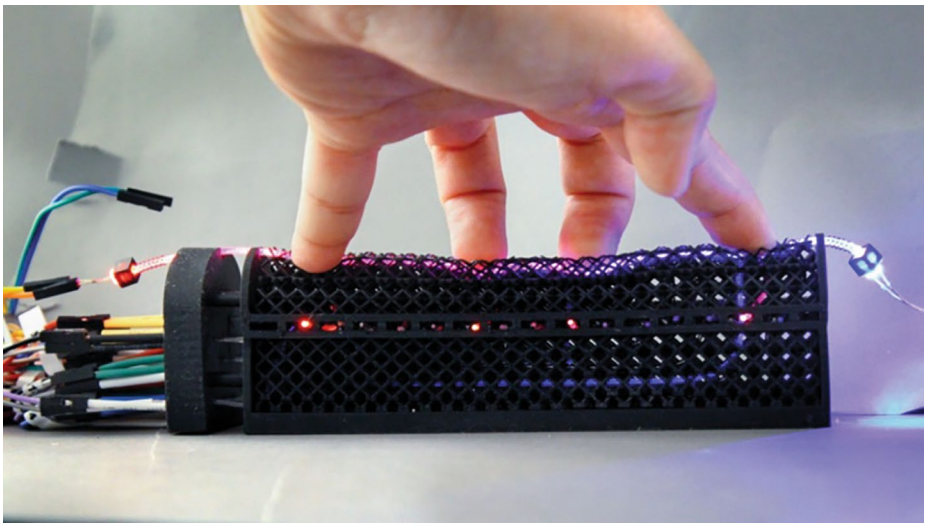

Credit: Cornell University

Most autonomous robots rely on vision for navigation, but there may be situations where sensing based on vision alone is unsuitable. Humans and animals leverage a range of sensory modalities such as light, sound, temperature, taste, pressure and smell to navigate unfamiliar terrain. Taken together, these sensing modes form a 'nervous system' capable of responding to external stimuli (exteroception) and, importantly, an awareness of its body position and self-movement (proprioception). Inspired by biological nervous systems, Robert Shepherd and colleagues have now developed a three-dimensional mechanosensor network that can sense localized, volumetric deformations within a 3D-printed polyurethane lattice.

The researchers — who are based at Cornell University, Istituto Italiano di Tecnologia Genova and IRCCS Ospedale Policlinico San Martino — integrated stretchable optical fibres into a 3D-printed structure to create a soft platform they term 'optical lace'. There are two types of optical fibre used in the optical lace: an input lightguide and an output lightguide. The platform is able to determine the location and extent (by the change in optical power of the fibre) of deformation by measuring the coupling interaction between the input and output lightguides. It can determine the location of deformations with sub-millimetre positional accuracy and detect applied forces with sub-newton resolution.

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