robotics Swiss National Centre of Competence in Research

NEWS BULLETIN

Issue 26

A Composite Thread that Varies in Rigidity

VIDEO

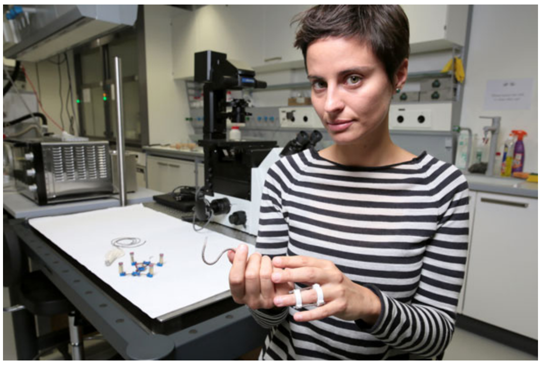
Soft "hardware" components are becoming more and more popular solutions within the field of robotics. In fact, softness, compliance and foldability bring significant advantages to devices, by allowing conformability and safe interactions with users, objects and unstructured environments. However, for some applications the softness of components adversely reduces the range of forces that those devices can apply or sustain. An optimal solution would be having components able to vary their softness according to the needed task. A group from Floreano Lab, EPFL and NCCR Robotics has published their novel variable stiffness fibre with self-healing capability.

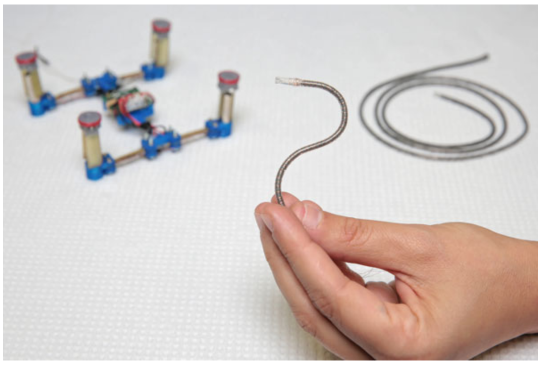
The fibre has a metal core, consisting of low melting point alloys (LMPA), which is contained within a pre-stretched silicone tube. At room temperatures the LMPA is a solid, thus the fibre is stiff and behaves like a thin metal wire. But when an electrical current is passed through a copper wire coiled around the tube, the LMPA inner core is warmed above 62 ^{o}C and melts, thus the fibre becomes up to 700 times softer and 400 times more deformable.

A second advantage of this fibre is that if the metallic core breaks, it just needs heating and voila! The fibre is fixed! And to top it off, the changing of states occurs in tens of seconds (depending on the current injected and the dimension of the LMPA core).

The fibre has a myriad of real-world applications in the fields of mobile robots, wearable devices and soft systems. Currently the team is using the fibre to create multi-purpose foldable drones. In fact, the fibre can be morphed into different shapes that are preserved after cooling, ie the four arms of the drone can take different functional morphologies, i.e. deployed in a quadrotor-like configuration for aerial locomotion or bent towards the ground in a four-wheeled configuration for terrestrial locomotion.

Future applications that the team is investigating include in endoscopes and other medical applications, where instruments need to be soft and pliable as they are exploring delicate body cavities, but then need to be able to penetrate resistive biological tissues (e.g. for a biopsy) once they have reached their desired location.





SWISS ROBOTICS INDUSTRY DAY 2016

The second Swiss Robotics Industry Day organised by NCCR Robotics on 2nd November 2016 at the Swiss Tech Convention Center, Lausanne, will showcase cutting edge robotics research and SMEs from the 20 professorships in NCCR Robotics and the Swiss Robotics ecosystem. The Day is a vital opportunity for industry in fields that use robotics to network with potential partners, talents and collaborators as well as offering privileged access to new and emerging technologies. Find out more at swissroboticsindustry.ch

Reference

Tonazzini, A., Mintchev, S., Schubert, B., Mazzolai, B., Shintake, J. and Floreano, D. (2016), Variable Stiffness Fiber with Self-Healing Capability. Adv. Mater.. doi:10.1002/adma.201602580

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NCCR Robotics

The Swiss National Center of Competence in Robotics (NCCR Robotics) is a federally funded programme bringing together robotics laboratories from EPFL, ETH Zurich, University of Zurich and IDSIA to work on wearable, rescue and educational robots.

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27 October 2016