UNIVERSITÉ DE GENÈVE

PRESS RELEASE

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The elephant's trunk will inspire a revolutionary robot

An international team, including UNIGE, will analyse the African elephant's trunk, and its exceptional agility and versatility, to create a robot guided by touch.

Elephants interact with their environment with their trunk, an organ of exceptional agility and versatility which allows them to grasp objects with force or delicacy, to breathe, eat, drink and communicate with their congeners. An international team of researchers will draw inspiration from this organ which combines the sense of touch, an unexpected delicacy and a remarkable strength, to develop a new type of robot thanks to the PROBOSCIS project funded by the European Commission, coordinated by the IIT-Istituto Italiano di Tecnologia in Pontedera (Pisa, Italy) and in which the University of Geneva (UNIGE), Switzerland, participates. The Swiss team will generate the biological data required to develop a new generation of manipulative robots capable of operating in unstable environments, adapting quickly to unexpected situations and performing a multitude of concrete tasks. The project could revolutionise automation in the manufacturing and food industry, as well as in robotic assistance systems for the elderly or disabled.

The UNIGE researchers in the PROBOSCIS project will analyse in details the African elephant's trunk using innovative microscopy techniques for very large objects and at very high resolution, before reconstructing its structure and movements using 3D visualization tools. "We will provide the biological data, both from an anatomical point of view and in terms of the dynamic of movements", says Michel Milinkovitch, professor in the Department of Genetics and Evolution of the Faculty of Sciences at UNIGE. "Our contribution lies at the interface of biology, physics and computer science and responds perfectly to the multidisciplinary philosophy of the project."

To complete these data, the elephants will also be observed in the field and the movements of their trunks studied using innovative cinematographic methods. The data generated by Professor Milinkovitch's team will then be used and adapted by the engineers and materials specialists within the consortium in a philosophy of 'biomimicry' or 'bio-inspiration' (imitation of the living). This approach will integrate for example one of the peculiarities of the African elephant's trunk which ends in two extremities – or "fingers" – that the animal uses to manipulate small objects with great precision.

The project consortium thus intends to define a new concept of robotic manipulation that will allow robots to reach, detect, grasp, manipulate and release a whole range of payloads and objects of various shapes and sizes, while operating indifferently in dry or humid environments.

The robot's body will be made up of actuator jacks, assembled according to a bio-inspired architecture, and an advanced tactile detection system capable of supplying the necessary information to the algo-

High resolution pictures

rithms that will control it. The intelligence of the system will therefore be based on this tactile detection. In fact, unlike many vision-based robots for control and interaction with their environment, the PROBOSCIS robot will be mainly guided by touch. The artificial trunk will be covered with an artificial skin whose mechanical structure will be inspired by the wrinkled skin of an elephant, also studied by the UNIGE team, sensitive but resistant to hostile environments, such as high temperatures or dust. The ending of the trunk will be very dense in sensors to allow optimal interaction with small and fragile objects.

The PROBOSCIS project was funded by a grant of 3.5 million euros from the European Commission as part of the Horizon 2020 FET-Future Emerging Technologies program. Coordinated by the IIT-Istituto Italiano di Tecnologia in Pontedera (Pisa), it also brings together UNIGE, the Hebrew University of Jerusalem, the Scuola Superiore Sant'Anna in Pisa and Photocentric Ltd in Cambridge.

contact

Michel Milinkovitch
Full Professor in the Department of Genetics and Evolution
Faculty of Sciences
+41 22 379 33 38
Michel.Milinkovitch@unige.ch

UNIVERSITÉ DE GENÈVE
Communication Department
24 rue du Général-Dufour
CH-1211 Geneva 4

Tel. +41 22 379 77 17

media@unige.ch
www.unige.ch