“Users will have to feel safe so that they are not afraid to walk or of growing tired too quickly.”

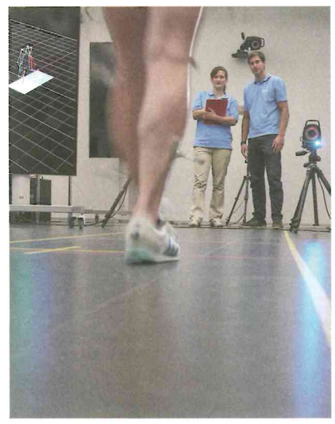
Dr. Konrad Stadler

Dr. Konrad Stadler, Institute for Mechatronic Systems

Prof. Dr. Markus Wirz, Institute for Physiotherapy

INTELLIGENT LEGGINGS FOR SAFE MOVEMENT IN DAILY LIFE

In the XoSoft project, which is part of the Horizon2020 research programme, nine research teams from seven countries are developing a soft and flexible exoskeleton in the form of leggings for elderly people or patients with neurological disorders causing to restricted movement due to muscular weakness or sensory processing disorders. The device comprises three modules on the ankles, knees and hips. It permits safe movement and helps prevent secondary diseases caused by immobility. Prof. Dr. Wirz (Institute of Physiotherapy) and Dr. Stadler (Institute of Mechatronic Systems) at Zurich University of Applied Sciences (ZHAW) explain how it works.



Please tell us more about this practical research project.
PROF. DR. MARKUS WIRZ: The focus of the new technology is on future users. There are three test phases: the first two prototypes will be trialled in the laboratory on patients with restricted walking ability. The findings will be used for developing the third prototype, which will be tested under real living conditions in the clinic in Erlangen.

Safety is to be provided by hardening the material. How will this work?
DR. KONRAD STADLER: The leggings can be hardened using an electro-rheological solution in tubes, which alters the viscosity. The signal is passed on via the sensors to the system that controls the viscosity, and this can prevent the user from losing balance or falling.

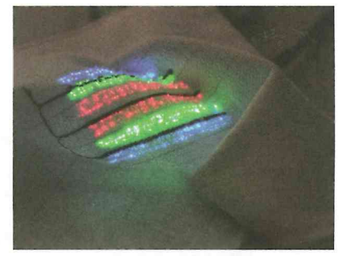
Which tests are currently in progress? Do you have any initial findings?
MARKUS WIRZ: We first have to determine whether the sensors really collect the data required by the system for regulating the leggings and for the monitoring process. The components for the ankles and knees have already been partially tested on textiles in the Movement Laboratory at the ZHAW Institute of Physiotherapy.
KONRAD STADLER: The sensor technology is already working well, but controlling the change in viscosity is still a challenge for users.

What has already been tested in terms of textiles?
MARKUS WIRZ: We are focusing on questions such as how easy it will be to put on and take off the leggings, the best place to install the sensors so that they cannot be bent, and how we can install the wiring.

Which requirements will the leggings have to meet for everyday use?
MARKUS WIRZ: Reliability, intuitive usability, easy to put on and take off. Design is an important factor too: the product will have to be worn beneath the user’s clothing.
KONRAD STADLER: Users will have to feel safe so that they are not afraid to walk or of growing tired too quickly.

Will the sensors be textile-based or integrated into the textile?
MARKUS WIRZ: The need to easily exchange defective sensors points to an integrated solution: wires could be damaged when the leggings are put on or taken off.
KONRAD STADLER: We have also discussed the option of making the thread conductive, but this is something for a future project.

XoSoft project, www.xosoft.eu



SOFT SENSORS FOR SMART TEXTILES

The Swiss Federal Laboratories for Materials Science and Technology (Empa) has succeeded in using a melting process to produce optical fibres for sensors that are suitable for textiles. These fibres are extremely pliable, which means they can be knitted and do not break when knotted. The sensors can be manufactured industrially, are washable and can also be disinfected. They are therefore ideal for use in hospitals.
The newly developed optical textile sensor was tested for measuring heart rate. For this purpose it can be placed on bare skin anywhere on the body. The heart rate can then be measured by transmitting light through the material and measuring the light intensity that is fed back to the detector and changes with the pulse. Together with Swiss research and industry partners, Empa aims to further develop this textile sensor so that it can also monitor a patient's oxygen saturation or metabolism.

Swiss Federal Laboratories for Materials Science and Technology, Empa, www.empa.ch