

At long last—stroke patients can be monitored at home, using a sensor suit

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INTERACTION system. Credit: University of Twente

From now on it will be possible to accurately monitor and analyse how stroke patients move during everyday life. This involves the use of a new suit fitted with 41 sensors, plus the infrastructure needed to transmit, store and process all of the data collected. This technology and

information will make it possible to improve the rehabilitation process and cut healthcare costs. Bart Klaassen developed the system together with an international team of engineers and healthcare professionals. He will defend his thesis (which is based on this research) on 30 November, at the University of Twente.

As many as 33 million people throughout the world suffered strokes in 2010. With our aging population, it seems logical to expect a further increase in these numbers in the upcoming years. Stroke survivors often have to cope with physical limitations. They generally take part in rehabilitation programmes, which are intended to help patients function as effectively as possible in their everyday lives. In practice, however, rehabilitation mainly takes place in rehabilitation clinics. Not enough is known about how, after completing such programmes, patients cope with their limitations in a daily life setting. Yet it is known that a better understanding of how these people function in [everyday life](#) could lead to more effective rehabilitation, at a lower cost. In the context of a European FP7 research project, Bart Klaassen (a PhD student at the University of Twente) and a large team of researchers developed a system for accurately measuring and modelling these patients' movement quality, and for transmitting the relevant information to the therapist. This project is a world first. Never before have researchers used systems like this to analyse these patients' every movement in a daily life setting. "There has long been a great need for systems like this, but the technology simply was not ready", says Klaassen. "That is now changing rapidly, thanks to rapid developments in the fields of battery technology, wearables, smart e-textiles and [big data analysis](#)."

41 sensors

Together with a large consortium of engineers and healthcare professionals, Bart Klaassen developed the INTERACTION System. This consists of a suit that study subjects had to wear under their

clothing for three months, as well as the entire technical infrastructure needed to transmit, store and process the data collected. The suit contains no less than 41 [sensors](#), including sensors on a large number of body segments, sensors that measure muscle strength, stretch sensors on the back and the hands, and force sensors in the soles of the shoes. In addition, the suit is equipped with a portable transmitter that can transmit all of the information gathered through the internet to data processing servers at the University of Twente.



INTERACTION system. Credit: University of Twente

In the course of his PhD research, Klaassen showed that the system

works well in practice. "We have been able to demonstrate that all the information is transmitted successfully, that this process is very efficient, and much more besides. We have succeeded in modelling all of the relevant movements, and in cleaning up the data that is relevant for the therapist by filtering out the rest. Our project has delivered new techniques and methods that can be used to monitor patients at home for extended periods of time, and to identify any differences with structured clinical measurements. We are currently engaged in further research to obtain final verification that these methods are indeed an ideal way of supervising rehabilitation."

When developing this system, Bart Klaassen and the team adopted a user-centred design approach. This enabled them to continually incorporate feedback from the [patients](#) involved into the development of the system. Other relevant parties – such as insurance companies and [healthcare professionals](#) – were also involved in the design and research work at an early stage.

Provided by University of Twente

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