Intelligent shoe performs pressure imaging

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The prototype of the intelligent shoe

(PhysOrg.com) -- Martin Schepers of the University of Twente, The Netherlands, has developed a new intelligent shoe. It has four sensors that measure pressure and movement during walking, giving doctors a fast and accurate image of the walking pattern and enabling them to plan the right method of treatment.

Schepers is being awarded his doctorate today at the Faculty of Electrical Engineering, Mathematics and Computer Science.

In order to ascertain the correct treatment for patients who have trouble walking - for example as the result of a stroke - a doctor must first know exactly how a person walks. Currently, this is done by using a special tile that contains sensors for measuring the walking pattern: the pressure plate. This plate is embedded discreetly within a space, out of obvious sight. The patient is given indications of where he should begin to walk, but he is not told where the plate is located, to avoid influencing the

walking pattern. This method is time-consuming for both doctor and patient. Martin Schepers of the University of Twente therefore developed an intelligent shoe: the pressure shoe.

The shoe consists of a sandal with pressure sensors and movement sensors underneath. The pressure sensors measure the strength exerted while walking. The movement sensors measure the movement of the foot (acceleration and cornering speed). The patient now merely has to put on the shoe and walk. Whereas the procedure could previously be extremely lengthy, doctor and patient are now finished in half an hour, with all the required measurements obtained. The research shows that the shoe performs as well as the pressure plate.

Schepers also worked on the measurement of movement. The movement sensors are located on the shoe, but also, for example, adhered to the body to follow the movement. A disadvantage of these movement sensors is that they cannot estimate distances. There was no indication of where the sensors were located on the body in relation to each other. For this, a new measuring system was developed which works with the aid of magnetism. This portable system has now been optimized by Schepers. The source is at a central point on the body: 'the reel' which is used to estimate the position and orientation of the sensors in relation to the source.

Xsens Technologies B.V., for which Martin Schepers now works, is currently investigating the possibilities of developing the pressure shoe into a commercial product. Xsens, a spin-off company of the UT, was founded in 2000 and presently employs fifty people. For the last three years, the company has been among the Deloitte Fast 50, a list of the fastest-growing technology companies in the Netherlands. Xsens also holds various patents and has offered several PhD students from the UT a challenging career, developing products further for introduction to the market.