Title:

Textile sensor glove for health monitoring – Application in home assessment of Rheumatoid Arthritis

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Background:

Wearable sensors and smart garments can be used for continual monitoring of a person's physiology or physical activities. These garments may be used to assess chronic conditions in the home setting and for rehabilitation by providing feedback and motivation to users and to identify effectiveness and adherence to therapists. This work focusses on the use of a sensor glove for home assessment of rheumatoid arthritis in assessing joint stiffness through range and velocity of movement.

Material & Methods:

A sensor glove has been developed using fabric stretch sensors integrated into an oedema glove. The stretch sensors are made of a knit fabric coated with conducting polymer, giving them piezoresistive properties. This means that when the fabric is stretched the resistance changes, which can be measured using straightforward circuitry and captured using a microprocessor platform. An arduino fio with integrated Xbee radio is used to collect and wirelessly transfer the data to a laptop.

Results:

Wooden blocks cut at various angles are used to calibrate the glove. To do this the user rests their hand on the block which maintains the joint position at a particular angle. A neural network is then used to calculate the joint position during dynamic movements. An animated hand on the computer gives immediate visual feedback to the user. The next stage will be to compare the glove performance to a motion capture system such as Vicon.

Conclusions:

The advantage of the glove is in the fit and comfort for the wearer, the sensors and the glove itself are made from a lycra spandex material. Conventional bend sensors and fibre optics are more rigid and while suitable for computer gaming and motion capture applications are not ideal for use in people with impaired dexterity and mobility. This work presents a low-cost solution for home assessment of conditions such as rheumatoid arthritis and a means user feedback to assist and motivate users with prescribed therapeutic exercises.