Editorial

Catherine S. Holloway

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There are a billion people living with disabilities globally. With an ageing population and the advances in medical care and assistive technologies this number will continue to rise. Assistive technologies such as wheelchairs and orthotics are becoming smarter, frequently embedded with electronics that help to sense, and then help adapt to the user and the environment. This is possible due to the fall in price and miniaturisation of electronics, the increase in battery power, the advances in additive and digital manufacturing as well as a rise in people ‘hacking’ or simply making their own assistive technologies. This is a very dynamic and exciting time for assistive technologies and for tracking rehabilitation practices. However, it also produces challenges.

Sensing technology now allows us to understand how an assistive technology is being used. This can help clinicians better inform their practice and provide more appropriate assistive technologies for people. However, it can also answer the simple question: is the assistive technology being used? This is important as a third of assistive technologies are abandoned.

Sensor technology is improving rapidly. Kinematic sensors are now commonly used for measuring activity and increasingly this occurs ‘in the wild’, away from a rehabilitation or clinical setting. Dermal sensors are also coming of age. Aiding the sensor development is the advancement in processing power allowing for more data processing at the site of data capture as well as harnessing cloud computing to detect patterns within and between patient groups. However, at the heart of all of the technological advances is the embedding of user-centred design. Understanding how people interact with their technology, when and how it works well, and if it fails is essential for success of products.

All of these advances mean that people who use assistive technologies are now able to get immediate, as well as reflective, feedback. The next step will be for people to be able to give feedback to the clinician and system easily in real-time. This will then allow for data to be linked to direct measures of quality of life of people. A second challenge is to make assistive technologies accessible to more people. This theme, along with the opportunities is explored by myself and Dr. Dawes in ‘Disrupting the world of Disability: The Next Generation of Assistive Technologies and Rehabilitation Practices’. This piece explores both the challenges and

opportunities for engineers to utilise advances in manufacturing and sensor technology as well as the rise of the maker movement to change the face of disability. The papers in this Special Issue explore the use of sensing technologies in clinical settings as well as during every day use. A common theme in the collection is the measurement of forces and movement.

Oyeka *et al.* describe a new system of inkjet printed body-worn radio frequency identification tags, which are integrated into medical sticking plasters for wireless, long-term monitoring in hospital environments.

Monitoring falls using a new fuzzy logic-based algorithm is presented by Iakovakis *et al.*; the authors explore the role of a feedback mechanism in aiding activities of daily living.

Feedback is essential to aiding rehabilitation and this theme can be seen in Symonds *et al.*, which focuses on the development of a force-sensing hand-rim for wheelchair users.

Carlson *et al.* explore the physiological interaction forces during lower limb exoskeleton use.

Velero *et al.* describe the development and use of a novel interfacial pressure and shear sensor for fingertip contact applications.

The development of a new system to enable functional electrical stimulation for gait training in hemiplegic patients is presented by Watanabe *et al.*

Lin *et al.* present a system that integrates a flexible sensor and virtual alarm unit for blood leakage detection during dialysis therapy.

Finally, Thorpe *et al.* focus on the development of a pervasive assistive technology for people with dementia, importantly, developed using a user-centred approach.

These papers, as a collection, range from clinical practice papers to engineering design. I hope you enjoy reading them, as they showcase the engineering advances in assistive technologies and signpost the emerging opportunities open to us to help change the lives of people living with disabilities.

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