ABSTRACT
Cardiff and Vale University Health Board’s Rehabilitation Engineering Unit (REU) perform clinical assessments on clients with neurocognitive, musculoskelet- al and/or other conditions that result in limited movement, complex body shape and poor posture. Some data collected at a clinical assessment is subjective and is susceptible to inter-observer errors. Using Cardiff and Vale’s latest Cardiff Body Match (CBM) shape sensor it is possible to capture the shape of a client’s body. The shape data captured using the CBM shape sensor can be analysed and anthropometric measurements can be extracted from the measurements. The position of the ischial tuberocities where a seated position can be used to determine the position of the pelvis. Locating the ischial tuberocities in CBM measurements will allow a clinical engineer to objectively record the orientation of the pelvis.

Purpose and Significance
The purpose of this research is to develop an algorithm that is able to approximate the position of the ITs; bony prominences that transfer the weight of the upper body to the sitting surface when in a seated position. The simulation can be repeated with different starting points and/or different sized spheres to achieve a more accurate approximation of the position of the ischial tuberocities, and uses the assumption that the ITs are usually located at the areas of most displacement/placement [1][2].

METHOD

The positions of the ischial tuberocities in a seated position can be used to calculate the orientation of the pelvis. The algorithm was developed in C++ and using rigid body physics calculates the path of a rolling sphere. The simulation places spheres at uniform and random intervals on a 3d surface which has been constructed using CBM measurement data. The resting points of the spheres are recorded and through cluster analysis the two most significant clusters are identified. The positions of the centroids of the two most significant clusters are used as the estimated positions of the ischial tuberocities.

The outputs from the algorithm can be used to monitor the progression of client’s musculoskeletal conditions over time and inform clinical engineers as to the position of the client’s conditions can be monitored over time to assess whether the care being received by the client is effective or requires review.

The positions of the ischial tuberocities can be used to calculate the orientation of the pelvis and estimate the position of the ischial tuberocities using physics based algorithms.

This technique produces an output that are the coordinates of the ITs which can be used for rehabilitation engineering purposes, providing a clinical engineer with an accurate way to monitor a client’s pelvic obliquity and rotation over time. This technique will allow a clinical engineer to objective-ly record the orientation of the pelvis.

CONCLUSION

This technique facilitates the recording of a client’s pelvic orientation of their ‘habitual’ posture when seated in the CBM shape sensor. This will enable cli-nical engineers to monitor the degree of pelvic obliquity and rotation over time. The technique also removes the subjective component from monitoring a client’s pelvic orientation that is associated with clinicians monitoring a client on a daily basis.

This technique produces an output that are the coordinates of the ITs which can be used to calculate the pelvic’s orientation but also can be used as an input into other systems such as the system described in [3].

REFERENCES