

Next Generation Wireless Accelerometer Data Collection Platform

David Darrow; Bryan Ladd MD; Nicholas Peterson; Andrew W. Grande MD

Department of Neurosurgery, University of Minnesota

Introduction

Wearable wireless accelerometer based technology is a viable tool for the quantification of movement, which has found utility with correlates to RASS scores, detection of seizures, and characterization of extremity motion, just to name a few. The platforms to collect the accelerometer data are largely designed for clinical applications under the supervision of a trained technician. This has presented as a barrier to the collection of data from patients outside the clinical environment, which has placed limitations on the current technology. In order to further broaden the utility of this technology, a user-friendly platform was developed.

Methods

Mock user volunteers were given a brief description of the purpose of the software. A demonstration was not provided. The volunteers were asked to execute the stated purpose using only the prompts offered by the software as guidance. The time to complete the task was recorded. Barriers to completion were identified and solutions implemented as part of the software design cycle. Design iterations were tested by volunteers that participated in prior iterations as well as volunteers not involved in previous iterations.

Figure 1

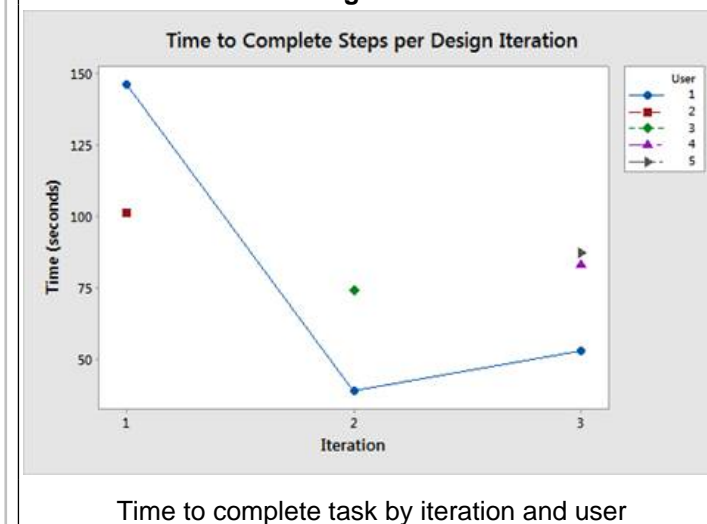


Screenshots from the application

Results

The first iteration of the software was found to contain confusing and frustrating steps, however, these barriers were not insurmountable and all users were able to start the data collection process. Design iterations addressed these barriers resulting in a sufficiently streamlined application. There was a notable benefit associated with increasing user experience, indicating a benefit to early user training.

Figure 2



Conclusions

Through the use of engineering design cycles, we have developed a user friendly, Android-based application that can be used to expand the utility of wearable wireless accelerometers to non-clinical environments. As field experience with the software accumulates, additional improvements can be pushed to users via the Google Play Store, adding to the versatility of the developed platform.

Learning Objectives

By the conclusion of reviewing this poster, participants should be able to: 1) Describe the possible utility of accelerometer based technology, 2) Understand the current limitations of today's technology, 3) Have gained insight into work being conducted to overcome the stated limitations.

Figure 3



Android tablet communication with sensor via bluetooth and web-based services via wifi

References

- Ayasrah, Shahnaz Mohammad, et al. "Pain assessment and management in critically ill intubated patients in Jordan: a prospective study." *International journal of health sciences* 8.3 (2014): 287.
- Curley, Martha AQ, et al. "State behavioral scale (SBS) a sedation assessment instrument for infants and young children supported on mechanical ventilation." *Pediatric critical care medicine: a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies* 7.2 (2006): 107.
- Gélinas, Céline, et al. "Pain assessment and management in critically ill intubated patients: a retrospective study." *American Journal of Critical Care* 13.2 (2004): 126-136.
- Young, Jeanne, et al. "Use of a Behavioural Pain Scale to assess pain in ventilated, unconscious and/or sedated patients." *Intensive and Critical Care Nursing* 22.1 (2006): 32-39.