

Sample thesis proposal

A finite element model of the mechanism leading to carpal tunnel syndrome in habitual video game users

Your name

Your e-mail address

Objective

Develop and validate a virtual model of the entire system, including both the mechanical (input device) and biomechanical (human hand and wrist) components, capable of representing the behavior and subsequent damage to the user.

Justification for research

While Carpal Tunnel Syndrome (CTS) has been endemic in the administrative professions for some time, the incidence in video game users has doubled in the last four years. A previous (1992) study has been performed by researchers at IBM in Armonk, New York for CTS damage resulting from typing in business settings, but this was limited by its small sample size and did not take into account the mechanics of materials aspects of the muscle tissue, ligaments, and bone structure. As the movements required by video game input devices differ significantly from those used in keyboarding, that study's relevance to video game users may be limited.

Approach and methodology

The model is developed and validated through the following steps.

1. A 3D model of a typical, healthy hand is created. The detailed structure and composition of the hand must be ascertained both for the average hand, and for a reasonable representation of the variation seen in the general population. Using this 3-D Model and on 2002 strength of tissue research by Dr. Y X. Z III at the University of Washington's Harborview hospital, a finite element model of the hand is created using a proprietary algorithm.
2. A finite element model of the mechanical input device is developed.
3. Field research on usage patterns for the input device is undertaken using as large a sample as possible. High speed digital cameras are used to capture movements which are often too quick to be seen in real time.
4. The finite element models and the usage patterns are used to rapidly model many years of game playing, and the resulting damage is tabulated.
5. The predicted results are validated using extensive x-rays of veteran video game enthusiasts, including those with and without complaints of CTS.

Work schedule

The work schedule is as follows:

- AQ04 and WQ05: Develop the FEA model for the hand and wrist and compare Dr. Z's results with previous work.
- SPQ05: Collect and analyze usage data and develop FEA model of controller.
- AQ05: Finish integrating usage data with the FEA models and perform multiple simulation runs.
- WI06: Analyze and validate results.

Estimated cost

Microsoft Corporation, makers of the XBOX game system, have provided a grant to perform five quarters of research, including RA support. No additional costs are expected.

Committee member names and e-mail addresses

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Prof. John Doe, email@uw.edu

Dr. Jane Doe, email@uw.edu

Committee Chair's signature: _____

Date signed by Committee Chair: _____

Please submit Thesis Proposal to the ME Graduate adviser at: megrad@uw.edu or ME 143C