

The Department of Mechanical Engineering presents:

The Master's Defense of Chun-Han Chu

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in Bourns Hall A265**

Design and Evaluation of a Multimedia Scaffolding System for

Teaching Statics

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Thomas Stahovich, Chairperson

Newton's Tablet is an intelligent tutoring system for teaching Statics developed at the Smart Tools Lab at UC Riverside. Newton's Tablet uses a *reactive teaching* approach; that is, it provides feedback when the student makes an error. The program helps students decompose a statics problem into problem-solving steps and provides assistance to students when they make mistakes completing a step. The system also has a database of conceptual help that users can reference.

This research project has two parts. The first is to evaluate the effectiveness of Newton's Tablet. To do this, we conducted the experiment with students from ME 002, Introduction to Mechanical Engineering. About 80 students participated in this experiment. We used pre- and posttests to evaluate the effectiveness of the program. This study demonstrated that the system does produce learning gains.

The second part of this project is designing and creating a scaffolding system for use with Newton's Tablet. We extended Newton's Tablet by providing additional scaffolding to teach statics concepts to students via a set of tutorial videos designed to guide students through the problem-solving process. The scaffolding presents concepts by explaining a worked example. Students then apply what they learn from the videos to solve new problems. The videos transform Newton's Tablet into an *active* teaching system.

We conducted a study to evaluate the usefulness of Newton's tablet combined with the new scaffolding system. In this study, the experimental group used Newton's Tablet with the instructional videos, while the control group was provided with traditional paper-based instructional materials containing the same content as the videos. We compare the learning gains of both groups using pre- and posttests. Students using the tutoring system with the videos had significantly larger learning gains than the students who used the paper-based materials.