Executive Summary:

Our client Dr. Michael Zinn of the UW-Madison Dept of Mechanical Engineering is in need of forceps that can measure and display applied forces and be used for research and pediatric surgeries, particularly on neurological, bowel, and arterial tissue. The forceps must display real-time feedback and be universally compatible with all forceps designs. They must not hinder the surgeon's ability to perform, weigh less than 250 grams, be biocompatible, and withstand contact with bodily fluids.

The device would be utilized by medical schools, tissue labs, and hospitals to improve the accuracy of new surgeons and discover tissue thresholds. There is potential for commercial applications, since forceps are used universally in surgeries. According to the National Health Statistics Report, 19.9 million surgeries were done in the U.S. in 2006 (1). At a cost of $500 per system, this product has the possibility for millions of sales.

There are currently no competing devices on the market. The intellectual property consists of the novelty of the product as well as programming multiple user interfaces for the convenience of the user and using BME in-house developed microcontrollers to transmit data.

The purpose of this design is to improve the existing device by developing a user interface that will not distract the surgeons while communicating the force values. The goal is to create a user interface that is universally understandable, by using a numerical display of instantaneous force, and a stoplight paired with an auditory alert to indicate breached thresholds.

The resulting prototype device includes a set of forceps with adhered strain gauges and wires stemming from them. The wires are attached to a USB microcontroller using a four-point connector. The microcontroller is plugged into a laptop that utilizes Eclipse. The screen of the laptop becomes the described display.

Testing the device is extremely important to evaluate its efficacy. Testing will consist of calibration tests as well as surgeons doing multiple trials with the forceps to see if the use of the forceps system improves surgical precision.

The proposed device effectively meets the client's needs by sending real-time auditory and visual feedback that does not inhibit the surgeon. The device is within the budget, under the maximum weight, biocompatible, and withstands contact with bodily fluids. The device is compatible with any forceps and can easily be calibrated. Therefore, the proposed design meets the client's needs and could be used in numerous surgical applications.

References:

1. "Ambulatory Surgery in the United States, 2006." *Http://www.cdc.gov/nchs/data/nhsr/nhsr011.pdf*. National Health Statistics Report, 4 Sept. 2009. Web. 12 Apr. 2011.