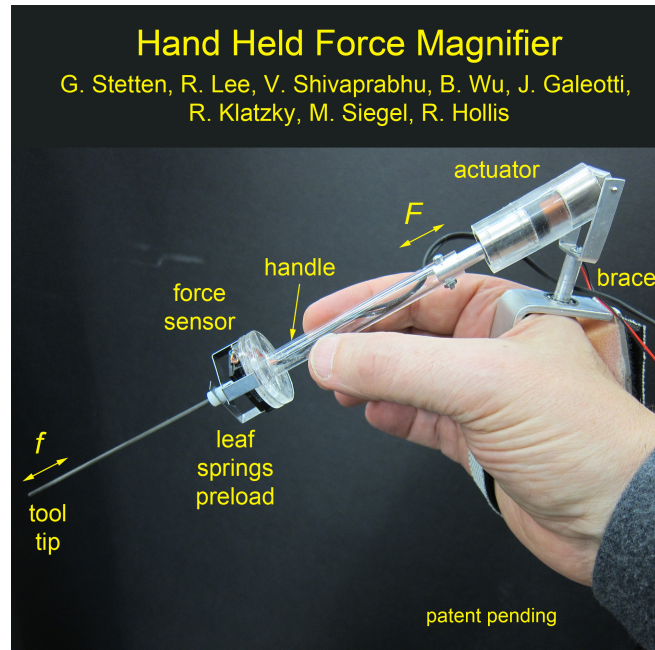


George Stetten, Randy Lee, Vikas Shivaprabhu, Bing Wu, John Galeotti, Roberta Klatzky, Mel Siegel, Ralph Hollis

**Second Generation Hand-Held Force Magnifier for Surgical Instruments**

**Abstract:** We present a novel and relatively simple method for magnifying forces perceived by an operator using a tool. A sensor measures a pushing or pulling force ( $f$ ) between the tip of a tool and its handle held by the operator's fingers. An actuator between the handle and a brace attached to the operator's hand creates a proportionally greater force ( $F$ ), providing an enhanced perception of forces between the tip of the tool and a target. We have designed and tested several prototypes that are completely hand-held and thus can be easily manipulated to a wide variety of locations and

orientations. Preliminary psychophysical evaluation demonstrates that the device improves the ability to detect and differentiate between small forces at the tip of the tool. Magnifying forces in this manner may provide an improved ability to perform delicate surgical procedures, while preserving the flexibility of a hand-held instrument.



**Contact Name:** George Stetten

**Contact Email:** stetten@pitt.edu

**Contact Phone:** 412-624-7762