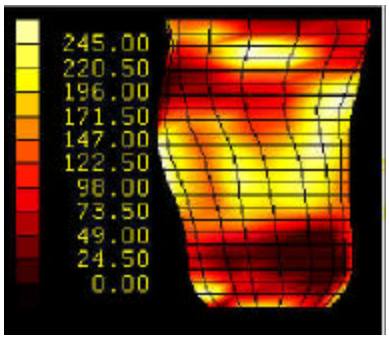
Prosthetics Engineering Laboratory

Department of Bioengineering



The Prosthetics Laboratory at the University of Washington is dedicated to the measurement, analysis, and prediction of stresses that occur at the skin-socket interface of residual limbs of amputes. This research in conjunction with that of the Tissue Sciences and Biomaterials Laboratory will be used to develop new devices and/or treatment strategies to encourage skin load tolerance and enhance biomechanical performance. Additionally, this research is directed to encourage the creation of new prosthetic designs that may reduce the risks of skin breakdown for amputees.

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The prosthetic engineering effort is directed towards improving the design and performance of artificial limbs for lower-limb amputees. It is strongly affiliated with other prosthetics and engineering research groups at the University of Washington - the Departments of Rehabilitation Medicine, Mechanical Engineering, and Civil Engineering - as well as local industry. Much of our prosthetic engineering research effort is directed towards achieving a better understanding of load transfer (pressures and shear stresses) at the residual limb-prosthetic socket interface and factors that influence them. Other projects concentrate on developing techniques to overcome the detrimental effects of residual limb shape change on interface stress distributions and enhancing computer-aided prosthetic design methods. Current projects include evaluating of interface pressure and shear stress, measuring changes in residual limb shape over time, predicting interface pressures and shear stresses using Finite Element Modeling (FEM), parameterizing bone and residual limb shape, and quantifying residual limb adaptation to compliance changes in the prosthesis during bouncing gaits. All Prosthetic Engineering research is supported by the National Center for Medical Rehabilitation Research (NCMRR) (National Institute of Child and Human Development (NICHD) at the National Institutes of Health (NIH)).

Selected Publications

Sanders JE, Greve JM, Clinton C, and Hafner BJ: Changes in interface pressure and stump shape over time: Preliminary results from a trans-tibial amputee subject. *Prosthetics and Orthotics International* vol. 24(3), pp. 163-168, 2000

Zachariah SG and Sanders JE: Modeling of interface mechanics in the trans-tibial prosthesis. *Journal of Biomechanics* vol. 33(7), pp. 895-899, 2000

Sanders JE, Baker AB, Greve JM, Clinton C, and Zachariah SG: Effects of changes in cadence, prosthetic componentry, and time on interface pressures and shear stresses of three trans-tibial amputees. *Clinical Biomechanics* vol. 15(9), pp. 684-694 , 2000

Sanders JE, Bell DM, Okumura R, and Dralle AJ: Effects of alignment changes on stance phase pressures and shear stresses on trans-tibial amputees: Measurements from thirteen transducer sites. *IEEE Transactions on Rehabilitation Engineering*, vol. 6(1), pp. 21-31, 1998

Hafner BJ, Zachariah SG, and Sanders JE: Characterization of three-dimensional skeletal shapes using principal components: Application to the proximal tibia. *Medical and Biological Engineering and Computing*, vol. 38(1), pp. 9-16, 2000