Interactive simulation of needle insertion using a magnetic levitation haptic interface

Bing Wu[1], Hanns Tappeiner[2], Roberta Klatzky[1], George Stetten[2,3] & Ralph Hollis[2]
[1]Dept. of Psychology, Carnegie Mellon University
[2]Robotics Institute, Carnegie Mellon University
[3]Dept. of Bioengineering, University of Pittsburgh

This demonstration will present an interactive simulation of virtual needle insertion in soft tissue. In our implementation, deformable tissue is simulated by a modified incremental viscoelastic model developed by Brett et al. (1997) that allows real-time computation of the deformation and resistance forces produced. Static and dynamic friction during needle insertion is implemented using Hayward's stick-slip model (2000). The complete simulation has been developed around a six-DOF magnetic levitation haptic device. The demonstration will provide user realistic haptic feedback of virtual needle insertion at an updating rate of >1 kHz and visual feedback at 60 Hz.