The Simulation Group @ CIMIT

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CIMIT Simulation Group / Harvard Medical School

CIMIT

- CIMIT (Center for Integration of Medicine & Innovative Technology) is a non-profit consortium of world-leading academic and research institutions:
  - Massachusetts General Hospital
  - Brigham and Women’s Hospital
  - Massachusetts Institute of Technology
  - Draper Laboratory.
- CIMIT’s mission is to improve patient care by bringing together scientists, engineers, and clinicians to catalyze development of innovative technology, emphasizing minimally invasive diagnosis and therapy.

http://www.cimit.org

The Simulation Group

- The team: 7 people of mixed backgrounds
- Main focus: medical simulation
- Emphasis on:
  - soft tissue modeling
  - validation / metrics
  - systems integration
  - applications

http://www.medicalsim.org

Past & current projects

- ICTS: Interventional Cardiology Training System
- VIRGIL: Chest Trauma Training System
- CELTS: Computer Enhanced Laparoscopic Training System
- Interventional Neuroradiology Training System
- CAML: Generic Framework for Medical Simulation
- Real-time Soft Tissue Modeling
  - Linear Elastic Behavior using FEM (hepatic surgery)
  - Spring Mass Models (eye surgery)
  - New approaches for non-linear elasticity & more complex behavior
- Soft Tissue Properties Measurement Devices:
  - Tempest, Rosa
  - Truth Cube

ICTS Architecture

Real-time multi-processor system

Multi-axial haptics device

High-fidelity visual feedback
ICTS Today
- Sold by Mentice AB and named VIST®
- Eight systems installed at the Guidant European Cardiac and Vascular Institute in Brussels
- New center created in Tokyo in 2003
- About 4,000 physicians trained

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VIRGIL®
- Chest Trauma Training System
- Hybrid mannequin / computer based simulator
- Ready for battlefield training

Virgil Video Clip (news?)

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CELTS
- Training system for technical skills
- Incorporate new metrics for accurate skills assessment
- Integrates a task-independent standardized scoring system
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**Interventional Neuroradiology Training System**

- Design of a new tracking interface
- Development of accurate, real-time models of flexible devices
- Integrate soft tissue models of blood vessels

**Real-Time Deformation**

- Real-time volumetric deformation based on FEM and linear elasticity
- Real-time deformation of a catheter navigating through a vessel based on non-linear FEM and quadratic programming
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Eye Surgery Simulator

Soft-Tissue Modeling

- Four-year research program
- Collaboration with Harvard Biorobotics Lab
- First phase: measurement of mechanical properties of soft tissue in solid organs, in vivo
- Second phase: develop real-time deformable models of soft tissue and solid organs

TeMPeST device for measuring soft tissue properties in vivo

“Truth Cube”

- Validate real-time (and non real-time) soft tissue deformation algorithms
Contact Information

- **Web sites**
  - [www.medicalsim.org](http://www.medicalsim.org)
  - [www.truthcube.org](http://www.truthcube.org)

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- **Workshop on medical simulation**
  - **When:** June 17-18, 2004
  - **Where:** Boston

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