UNIUNEA EUROPEANĂ

GUVERNUL ROMANIEI

INSTRUMENTE STRUCTURALE
2007 - 2013

***Haptic-Med*: Interfete cu retur haptic in aplicatii medicale**

- Haptics and Laparoscopic Surgery-

Felix G. Hamza-Lup, Ph.D.
Crenguta Bogdan, Ph.D.

Universitatea Ovidius Constanta
Facultatea de Matematica si Informatica
Laboratorul de Cercetare CERVA

(Autoritatea Naţională pentru Cercetare Ştiinţifică - ANCS

CUPRINS

- Multimodal Systems
  - Visuo-Haptic
- Haptic Hardware
- Laparoscopic Surgery
- Haptic-based Training systems for Laparoscopic Surgery
- HapticMed: Prototype Proposals

(Interfete) Multimodal Interfaces

Multimodal Interface: multiple ways to communicate with the machine/systems using human senses: visual, tactile, auditory …

Human Computer Interaction:

- Visual/+Gesturi, Tactil, Auditiv/+Vorbire

Potential advantages of a multimodal system:

- enhances human/computer interaction;
- improves the information exchange rate between the system and the user.
- offers new views/perspectives of the system/situation dynamics

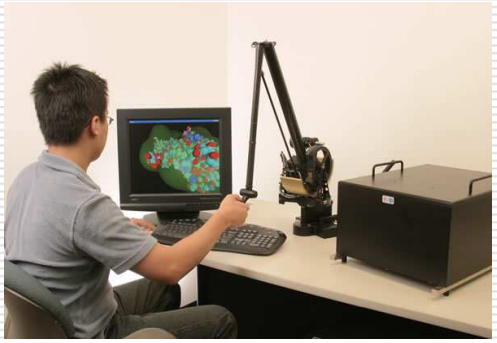
Visuo-Haptic Systems

VHS offers the following capabilities:

- 3D/2D visualization (immersive or augmented) of the virtual objects/data.
- Force feedback generation and tactile sensation for the virtual components. Tactile sensation can give the following information:
  - Surface properties
  - Object size and shape
  - Object rigidity/deformability
  - Object temperature (**NOT yet**)

Hardware Components – Haptics / Tactil (1)

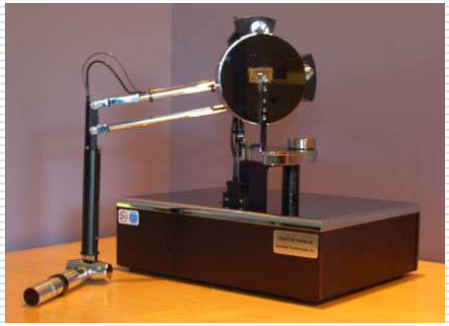
Falcon – Novint
http://home.novint.com/



Premium 3.0/6DOF
Haptic Device

Phantom Omni
6 grade libertate
450 dpi ~ 0.055 mm.

Phantom Desktop
Rez: 1100dpi~0.023 mm



PHANTOM Premium 1.5/6DOF

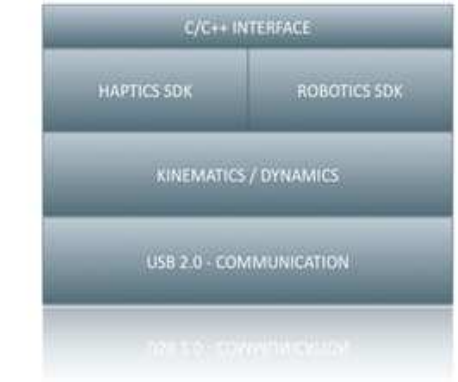
The PHANTOM Desktop haptic device with the Auto Suture® 5mm Endo Clinch® II device attached.

- SensAble http://www.sensable.com/

Hardware Components – Haptics / Tactil (2)

Omega 3

Omega 7



(!) CHAI3D Libraries

3 active translations
3 passive rotations
1 active grasping.

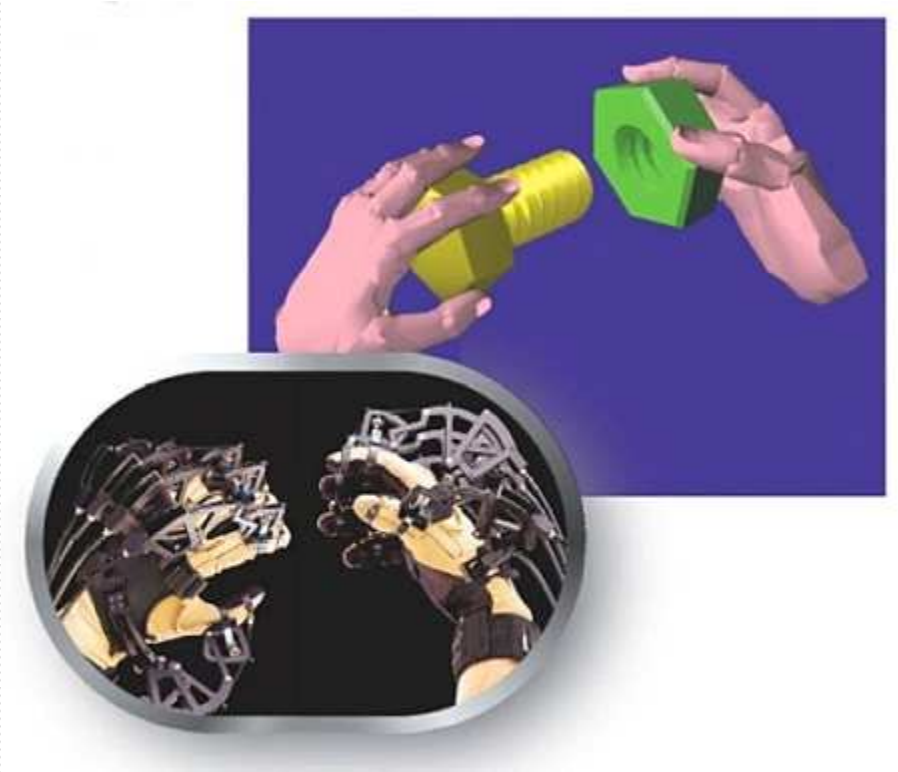
- Force Dimension

http://www.forcedimension.com/

Hardware Components – Haptics / Tactil (3)

Cyber Grasp

Cyber Force



Hardware Components – Haptics / Tactil (4)

Butterfly Haptic – magnetic levitation

Maglev 200™
Magnetic Levitation
Haptic Interface

- Butterfly Haptics
http://butterflyhaptics.com/

Hardware Components – 3D Visualization / **Vizualizare 3D**

Planar 3D

ReachIN

CRT – Shutter Glasses

LCD Based

SenseGraphics

Projector based

VHS – Example – Visual Volume Generation

Visuo-Haptic Systems for Laparoscopy

LapMentorII

1. Sistem produs de Simbionix: http://www.simbionix.co.il/index.html

2. Furnizeaza training laparoscopic format din aptitudini de baza, tutorial al task-urilor procedurale si simularea unei proceduri complete (e.g. colecistectomie – Lap Chole);

3. Permite simularea utilizarii instrumentarului chirurgical format din: foarfece, electrozi, disectoare, etc.

Visuo-Haptic Systems for Laparoscopy

LapVR Surgical Simulator (1)

1. Sistem produs de CAE Healthcare: http://www.cae.com/en/

2. Implementeaza aptitudini de baza, procedurale si chirurgicale;

3. Contine un modul de simulare a colecistectomiei laparoscopice;

Visuo-Haptic Systems for Laparoscopy

LapVR Surgical Simulator (2)

1. The LapVR Surgical Simulator

2. AccuTouch® endoscopy Surgical Simulator

3. CathLabVR System

Visuo-Haptic Systems for Laparoscopy

VSOne – VEST System One

- Sistem produs de Select IT Vest Systems AG:
  - http://www-kismet.iai.fzk.de/KISMET/VestSystem.html
- Contine 2 subsisteme:
  - VSOne CHO pentru simularea colecistectomiei laparoscopice
  - VSOne Gyn pentru simularea a doua tipuri de operatii ginecologice laparoscopice
- Implementeaza urmatoarele task-uri: manipularea camerei, navigarea si formarea dexteritatii
- Aptitudini implementate: manipulare si coordonare

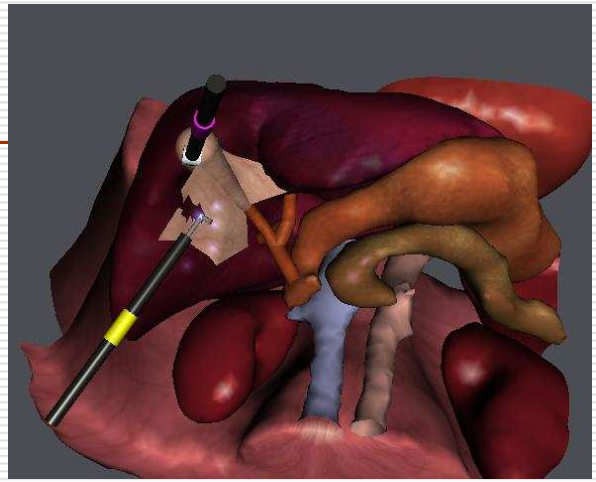
Visuo-Haptic Systems for Laparoscopy

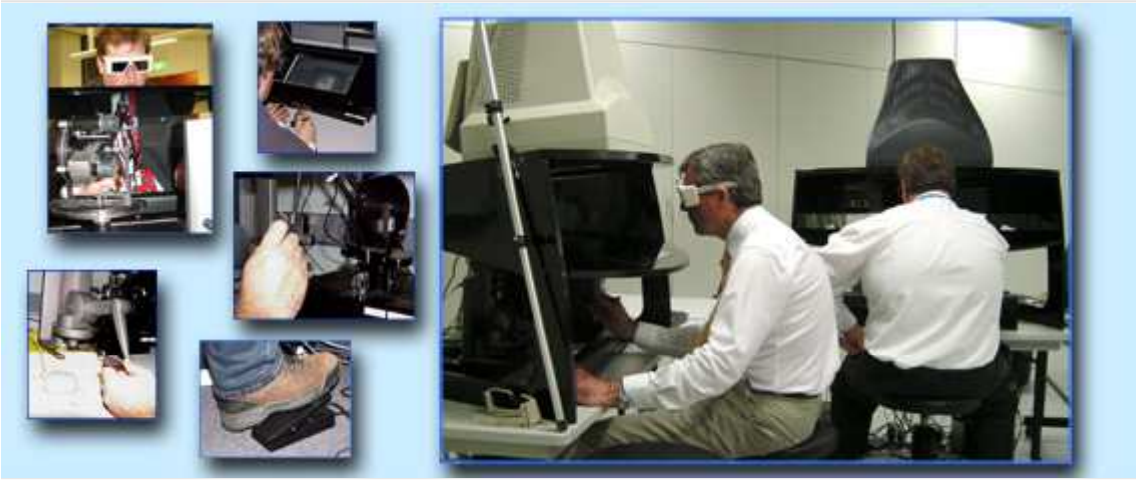
MIST™ Arthroscopy

- Sistem produs de Mentice: http://www.mentice.com/
- Simuleaza procedura de artroscopie a umarului
- Permite navigarea camerei, vizualizarea anatomiei umarului, simularea manipularii instrumentelor medicale si a stabilirii diagnosticului

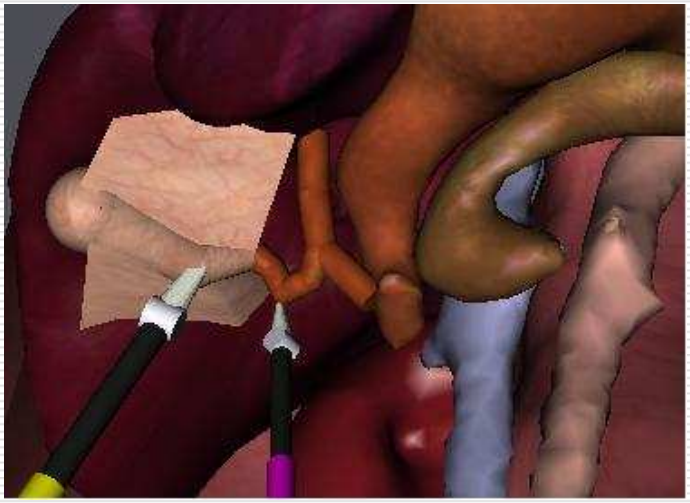
Visuo-Haptic Systems for Laparoscopy

Gallblader





CSIRO
http://www.ict.csiro.au/page.php?did=164



HapticMed Prototype(s) - Discussion

- Scopul proiectului
- Aplicabilitate
- Participanti

Prototipuri HapticMed

- Vor fi dezvoltate prototipurile a doua sisteme vizual-haptice de e-learning ce permit simularea operatiilor de colecistectomie laparoscopica si …?
- Prototipurile vor indeplini doua obiective majore:
  - furnizarea cunostintelor necesare invatarii de catre utilizatori a activitatilor procedurilor medicale simulate;
  - deprinderea aptitudinilor procedurale si chirurgicale necesare realizarii procedurilor medicale.
- Prototipurile vor fi evaluate de catre rezidenti dupa un plan bine stabilit.