



*The Future
of C.A.S.*



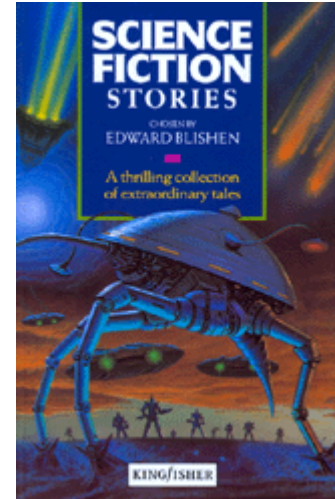
Introduction

“I think there is a world market for maybe five computers.”

Thomas Watson, chairman of IBM, 1943

Introduction

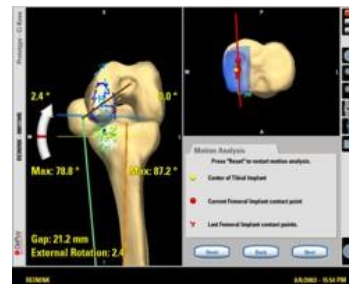
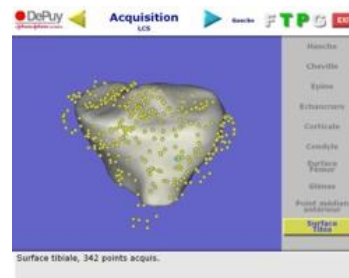
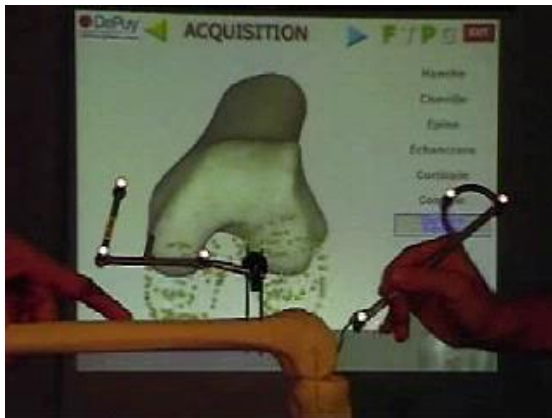
- Seeing in the future can lead to science-fiction
- Visions may turn into dreams
A fantastic but vain hope (dictionary definition)
- See the future with respect to the past
 - Learn from the past
 - Propose some Keywords
 - Do we need MORE or LESS ?



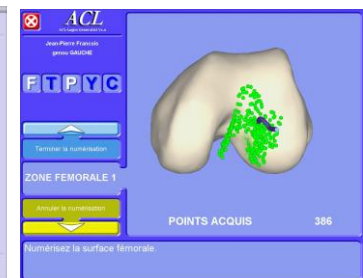
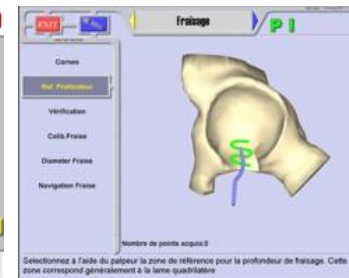
Introduction

- what append since 2004 ?
- **Bone morphing**
- 3D to 3D registration of deformable model is now a standard in acquisition of morphologic data

The bone morphing: 3D morphological data for total knee arthroplasty. E. STINDEL, J.L. BRIARD, P.MERLOZ, S. PLAWESKI, F.DUBRANA, C.LEFEVRE, J.TROCCAZ Computer Aided Surgery. 2002



BrainLab for Depuy in TKA



Orthosoft for Sulzer



Introduction

- what append since 2004 ?
- **3D intraop. X-RAY**
- Intra-operative 3D X ray imaging with C-ARM



Isocentric design



3D data sets in 2 min.

Introduction

- what append since 2004 ?

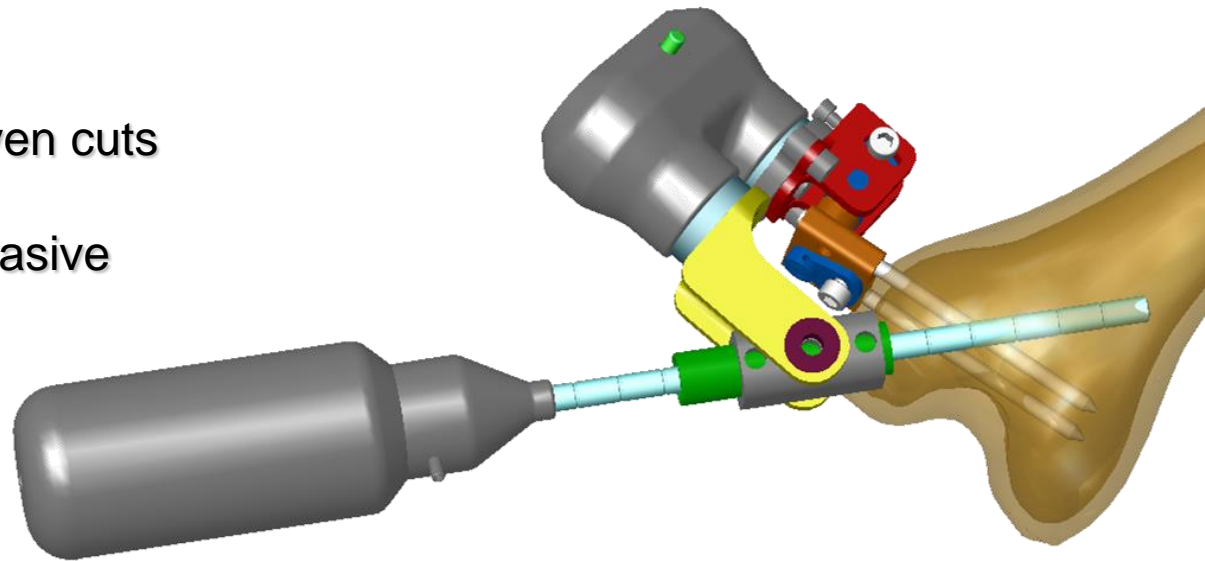
- Mini-invasive robots with milling tools



- Universal

- Software driven cuts

- Minimally invasive



Introduction

- what **DID NOT** append since 2004
- **Echo-Morphing**
- Non invasive version of the Bone Morphing Concept

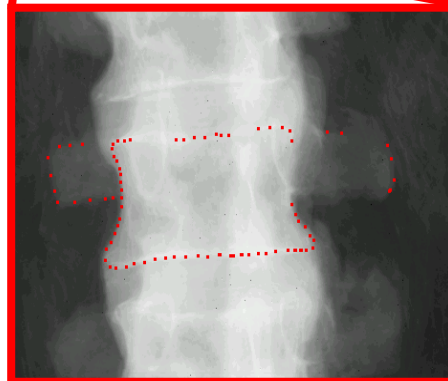
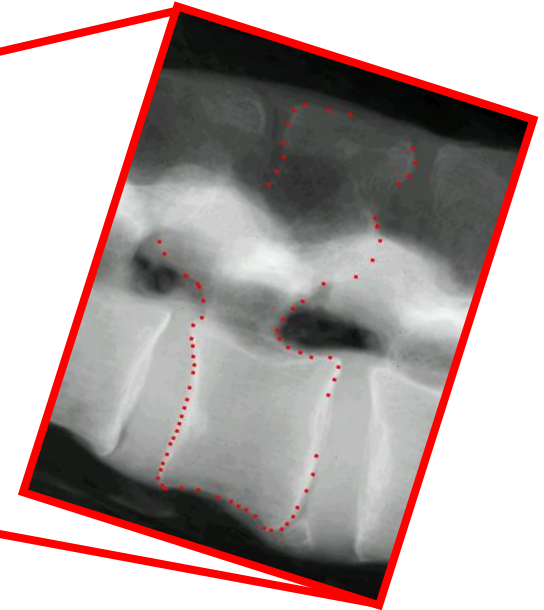
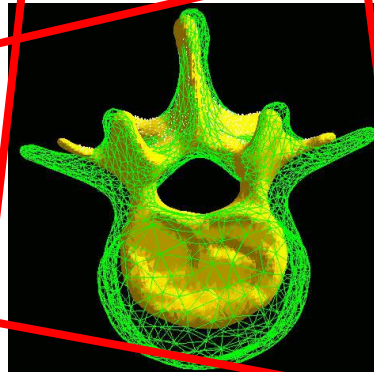


Introduction

- what **DID NOT** append since 2004

- X-Ray version of the Bone Morphing concept

- **Fluoro-Morphing**

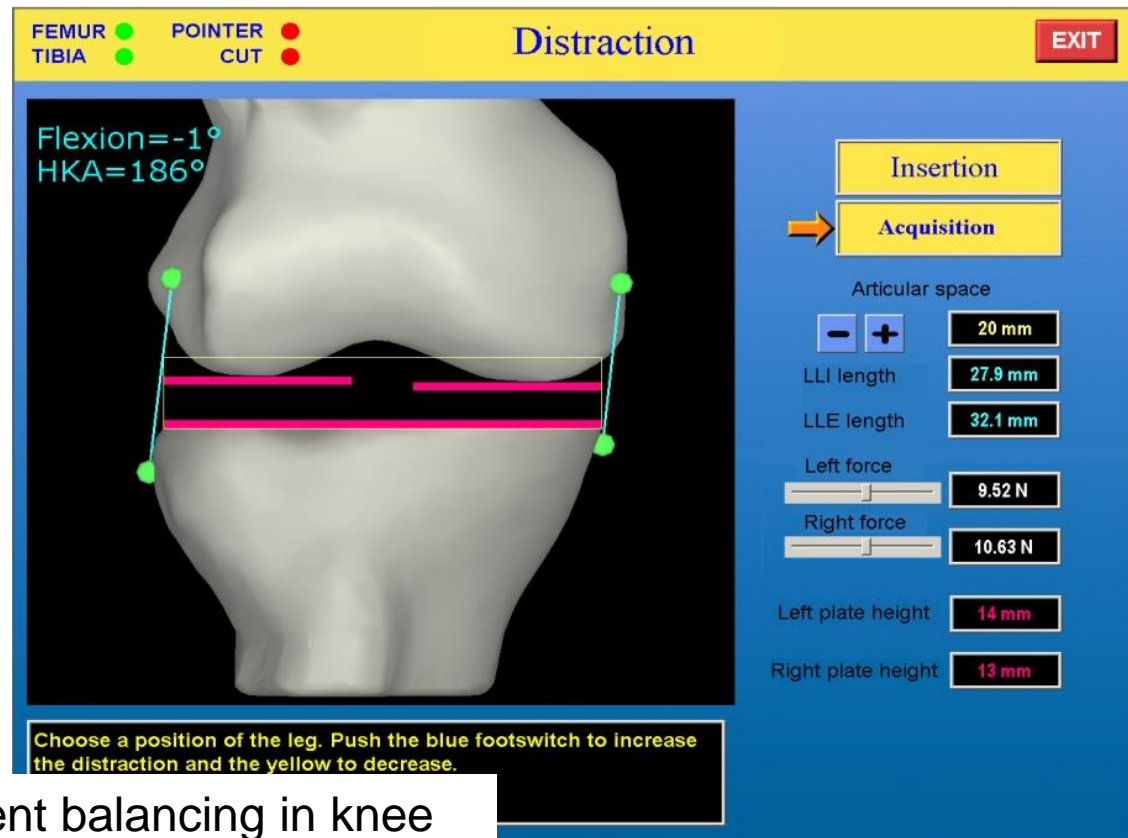
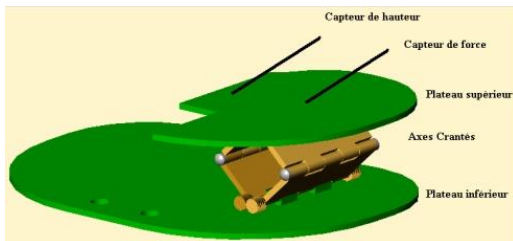


Introduction

- what **DID NOT** append since 2004

- **Functional data**

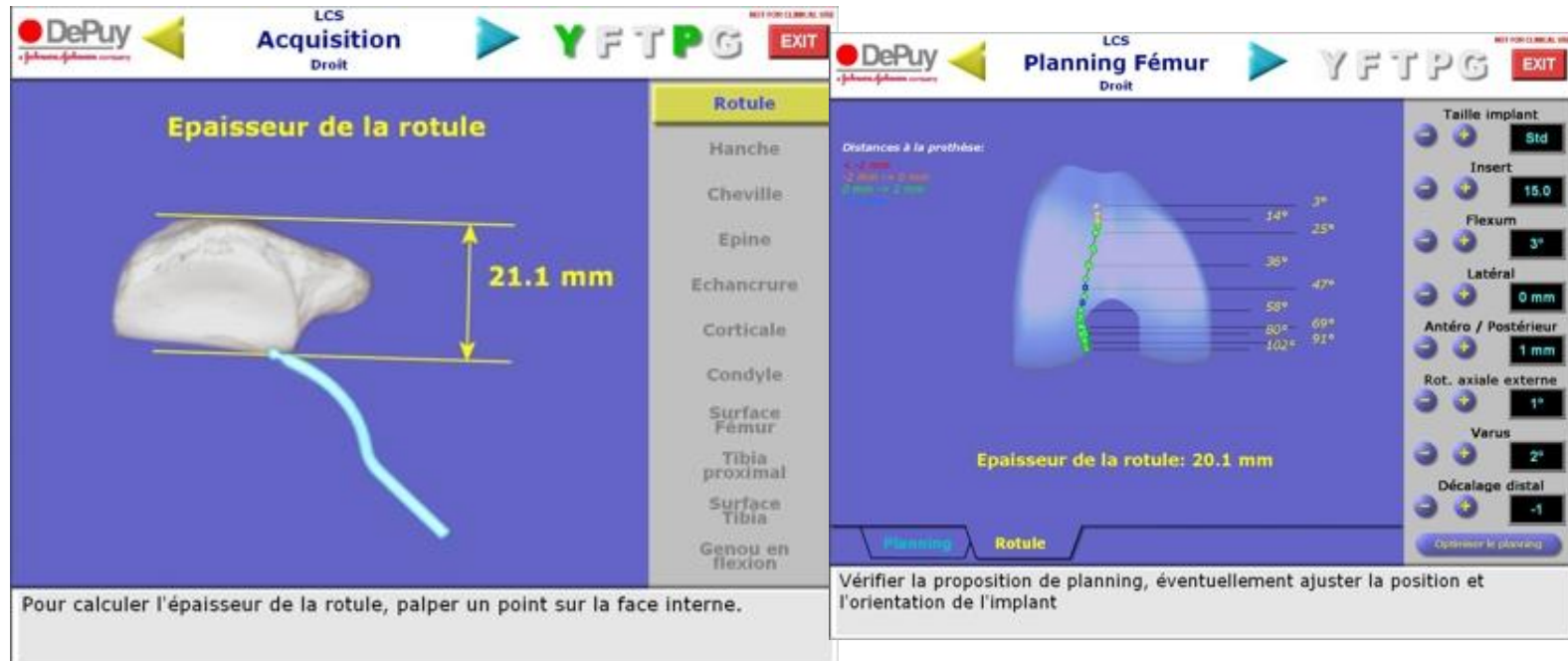
- Intra-operative robotized distracters



- Difficult issue of ligament balancing in knee

Introduction

- what **DID NOT** append since 2004
- **Functional data**
- Intra-operative tracking of the patella trajectory



•Morphologic analysis

•Kinematics analysis

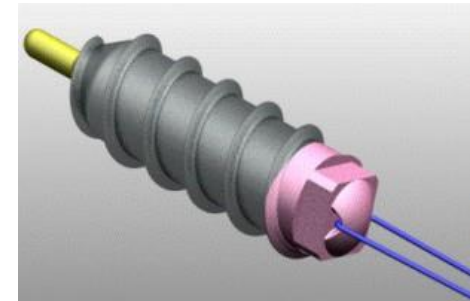
Introduction

- what **DID NOT** append since 2004

- **Tracking devices**

Wireless autonomous micro tracking technology

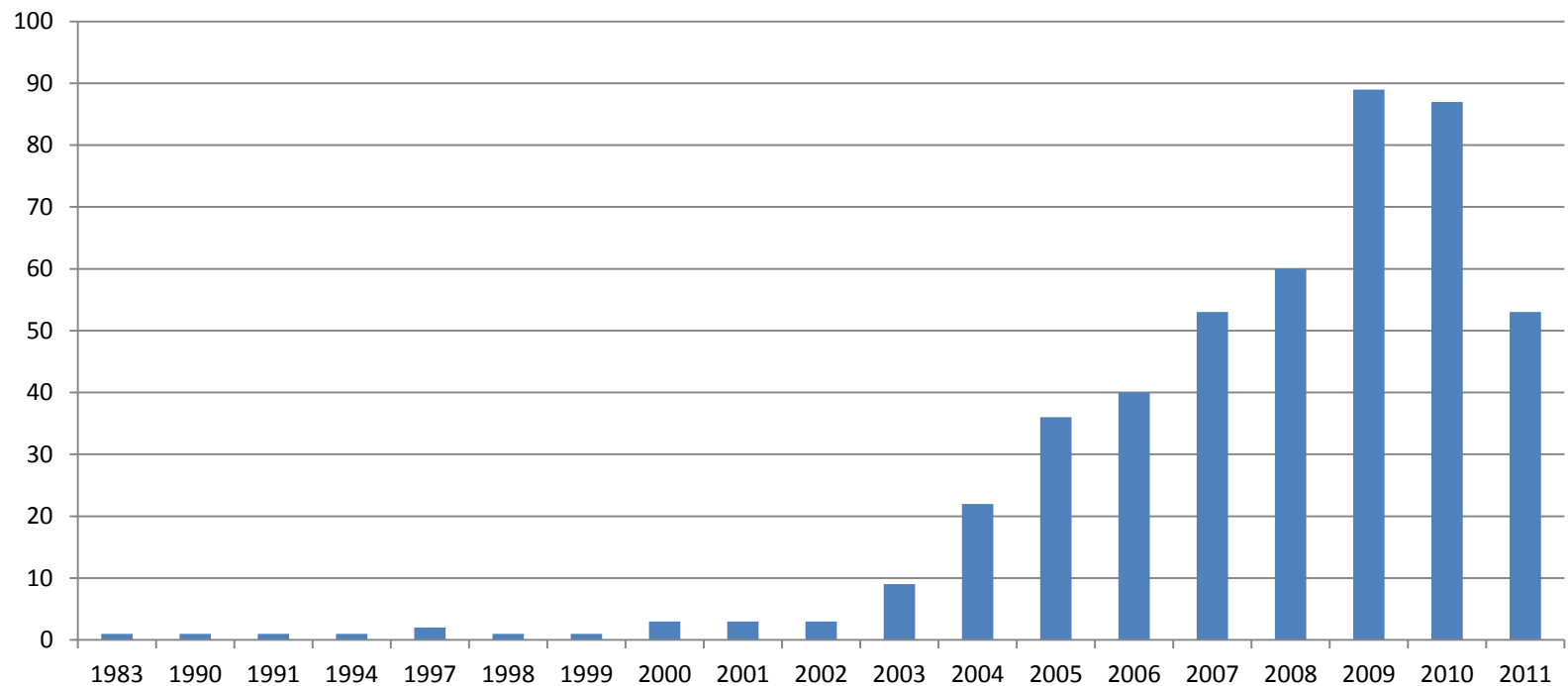
- Small
- No light of sight
- Robust to the magnetic environment
- Autonomous
- Deep anatomical tracking



The present

- Increasing interest

Number / Year



The present

- FUTURE ?

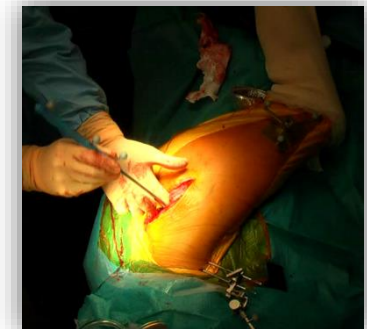
- Extinction:



- Replacement:

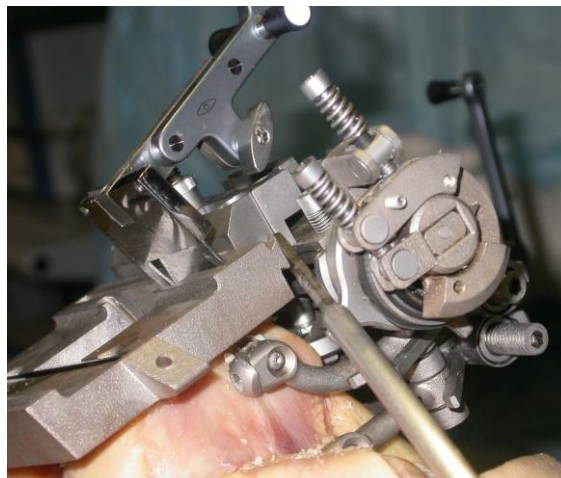
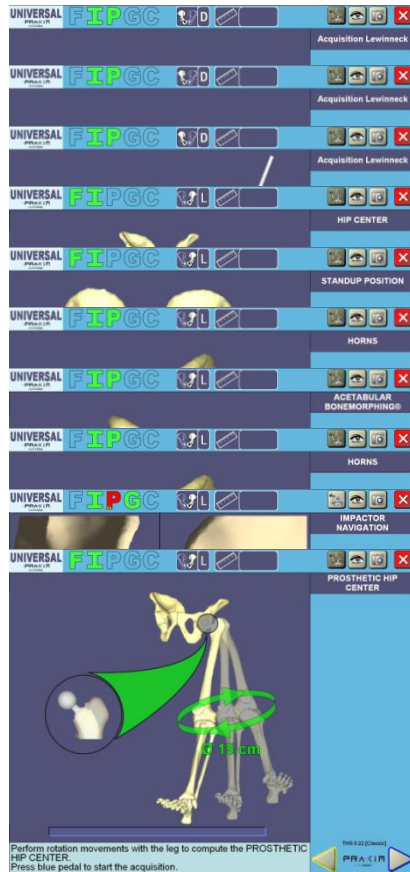


- Evolution: **Survival**



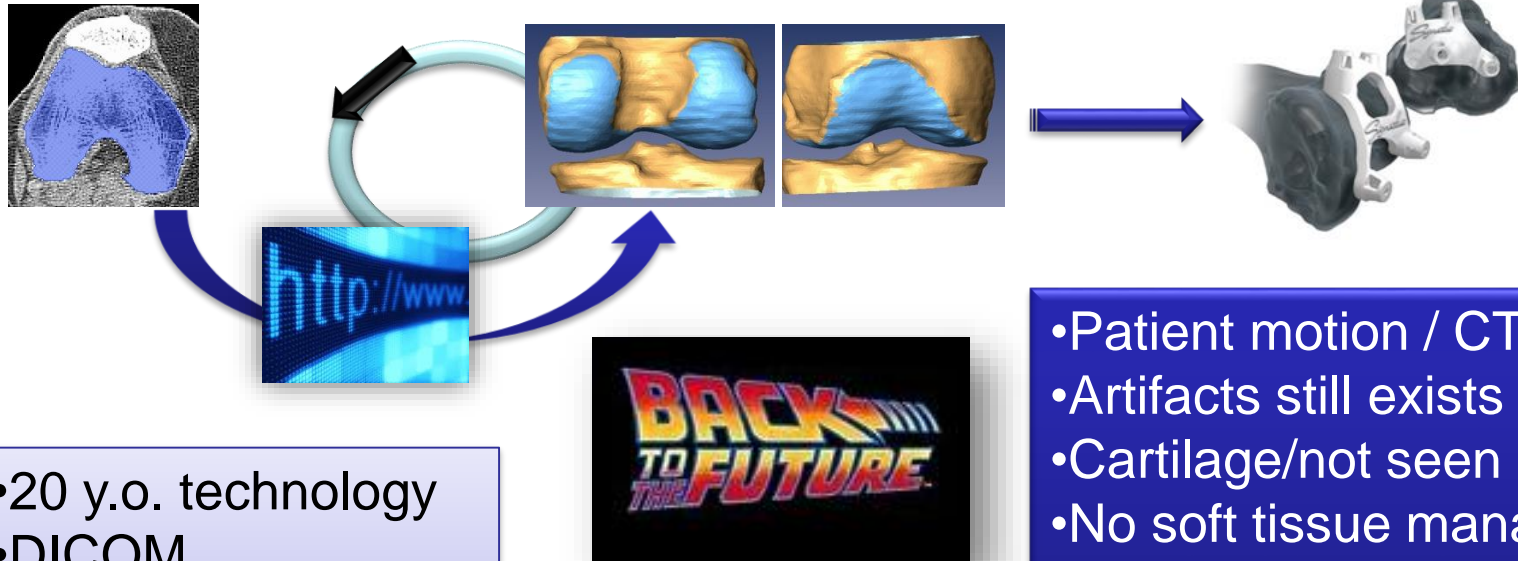
The present

- Extinction: what could be the reasons ?



The future

- Custom JIG: the navigation killer ?



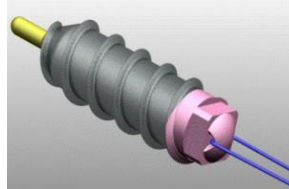
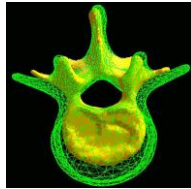
- 20 y.o. technology
- DICOM
- Artifacts
- Power of CPU
- Surgeon planning

- Company planning
- No IR localizer
- No DRB
- No intra-op acquisition
- Save time and money

- Patient motion / CT
- Artifacts still exists
- Cartilage/not seen
- No soft tissue manag.
- Osteophytes
- No intraop. fine tuning

The future

- Evolution could be:

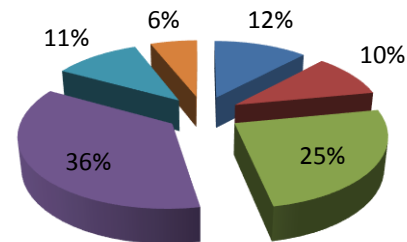


- A lot of technologies is on the way

- We will need MONEY

- We will need support of the industry

- CLIENTS adoption



The future

- Clients adoption: KEYWORDS

- Simplicity

- Accuracy

- Ease of use

- Efficiency

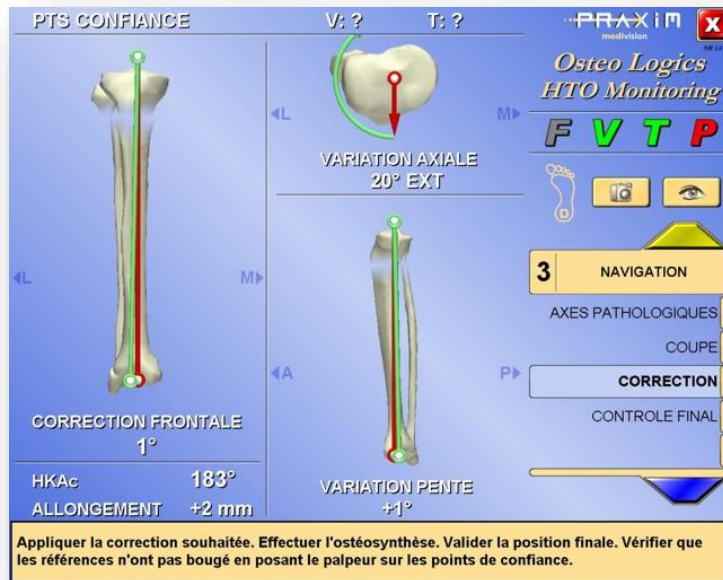
- Minimal number of steps

- Low number of features (Time / Features)

- Each acquisition is an excessive acquisition

The future

- The future is SIMPLIFICATION:
- Osteotomy: 3 steps
- TKR: Tibial cut only



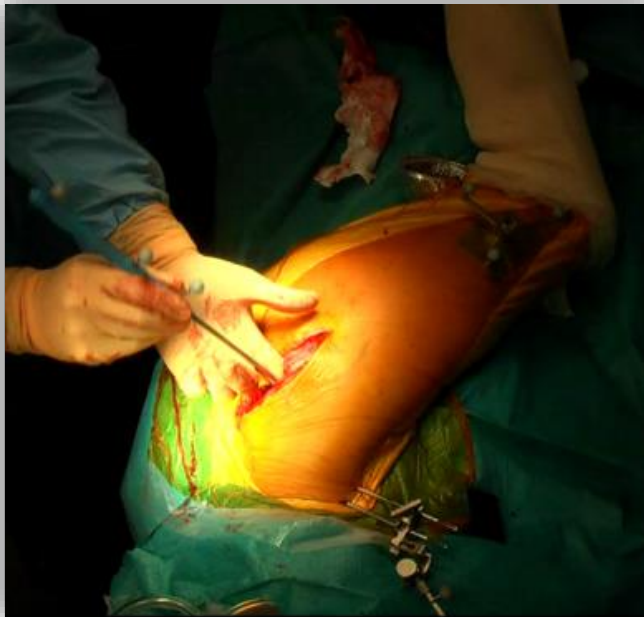
The future

- The future is SIMPLIFICATION:

- Leg length /offset

- Tracker on skin

- HIP express Brain Lab



- 2 out of 9

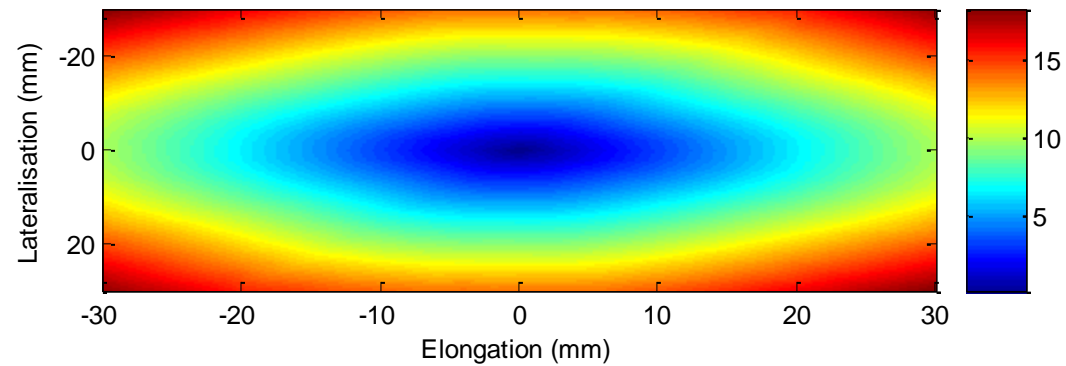


- 9 out of 9

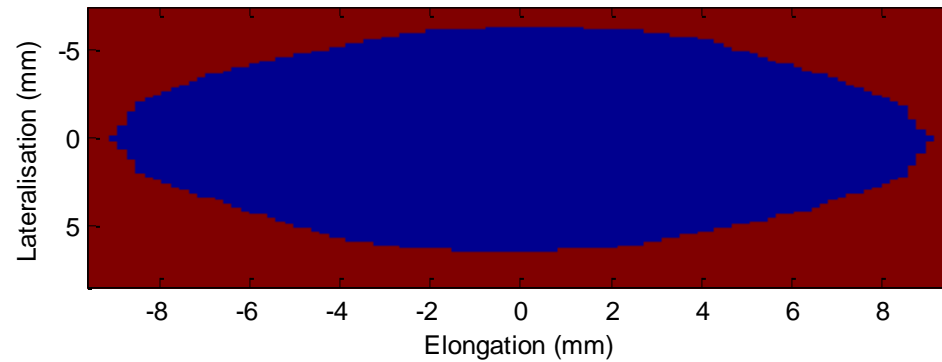
The future

- Is safety in jeopardy ?

Lateralisation : Intervalle de confiance a 95 pourcent (mm) pour configuration : $r_{30}f_{10}a_{10}$



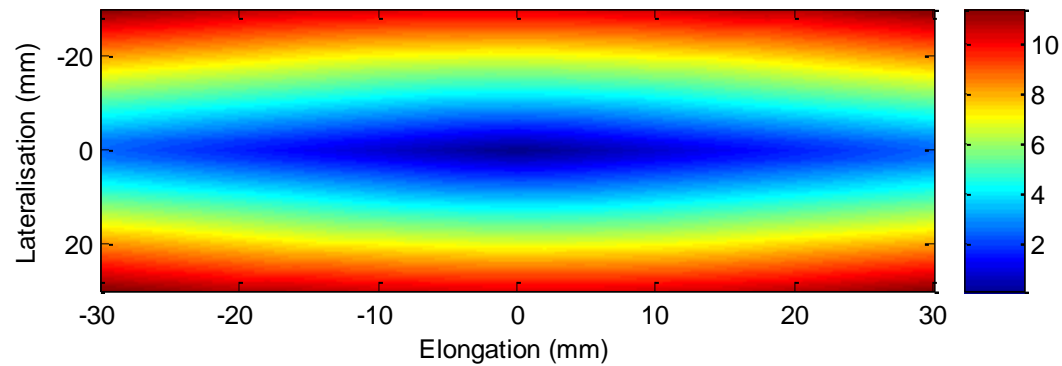
Limite 3 mm



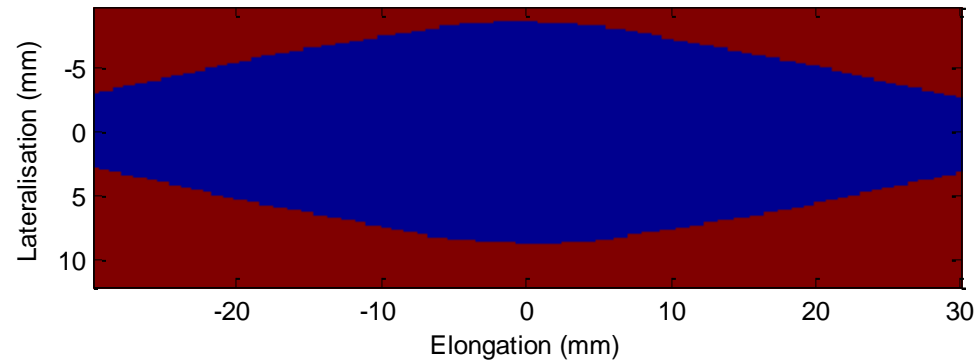
The future

- Is safety in jeopardy ?

Elongation : Intervalle de confiance a 95 pourcent (mm) pour configuration : $r_{30}f_{10}a_{10}$



Limite 3 mm



Conclusion

•ONLY

2

Keywords for the future

Solutions for larger adoption

=

Key for survival

=

Future of Navigation