

Medical Imaging Simulation and Robotics

Introduction

Céline Fouard

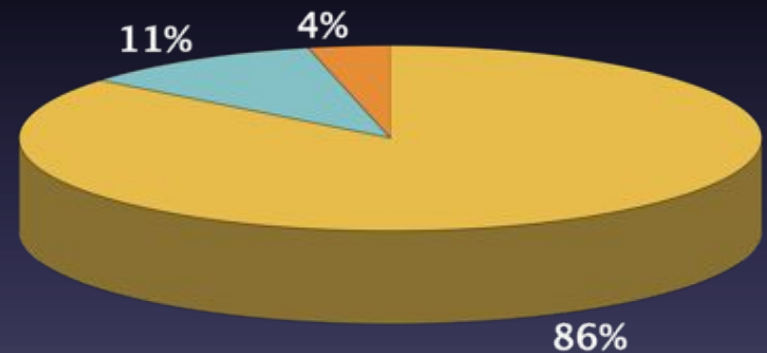
Jocelyne Troccaz

Emmanuel Promayon

CAMI Team TIMC-IMAG Laboratory

You follow this course from

- A. Master MoSIG
- B. Master Physique Médicale
- C. Master MITI



A



B



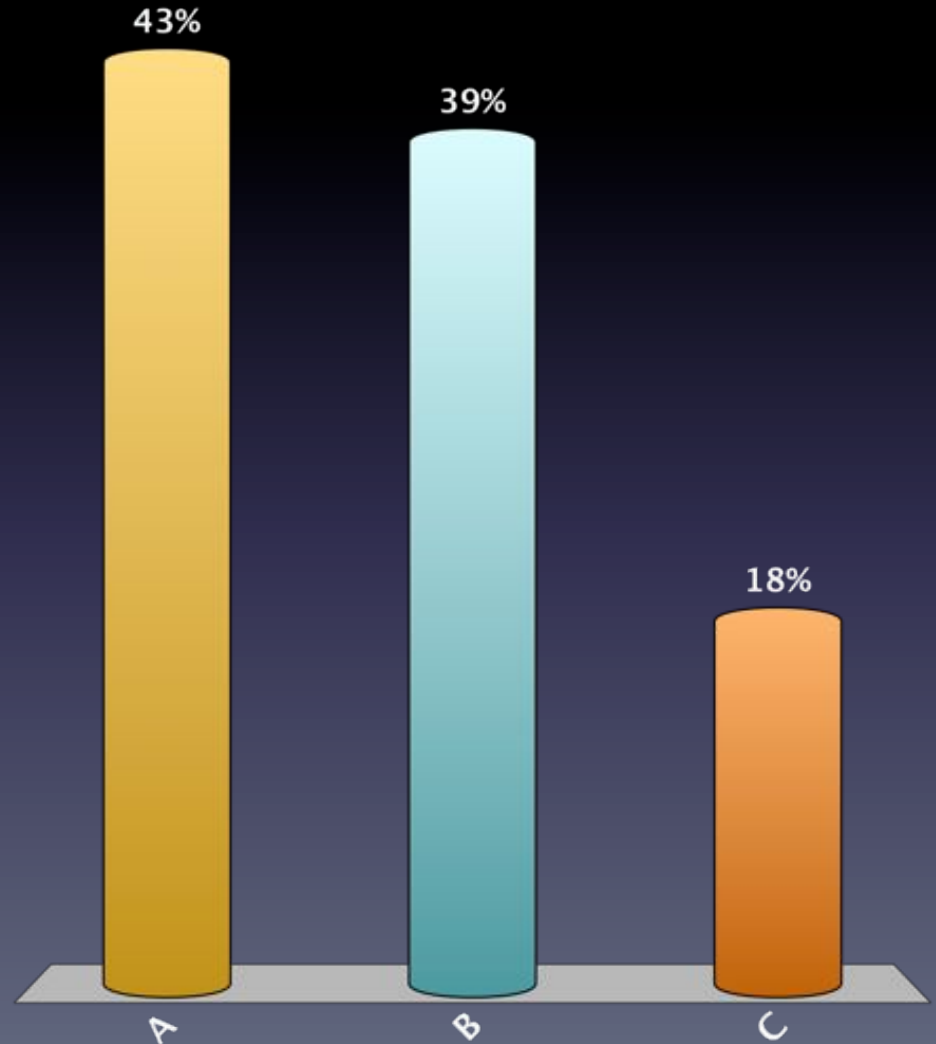
C

Your Professional Purpose is

A. Research

B. Industry

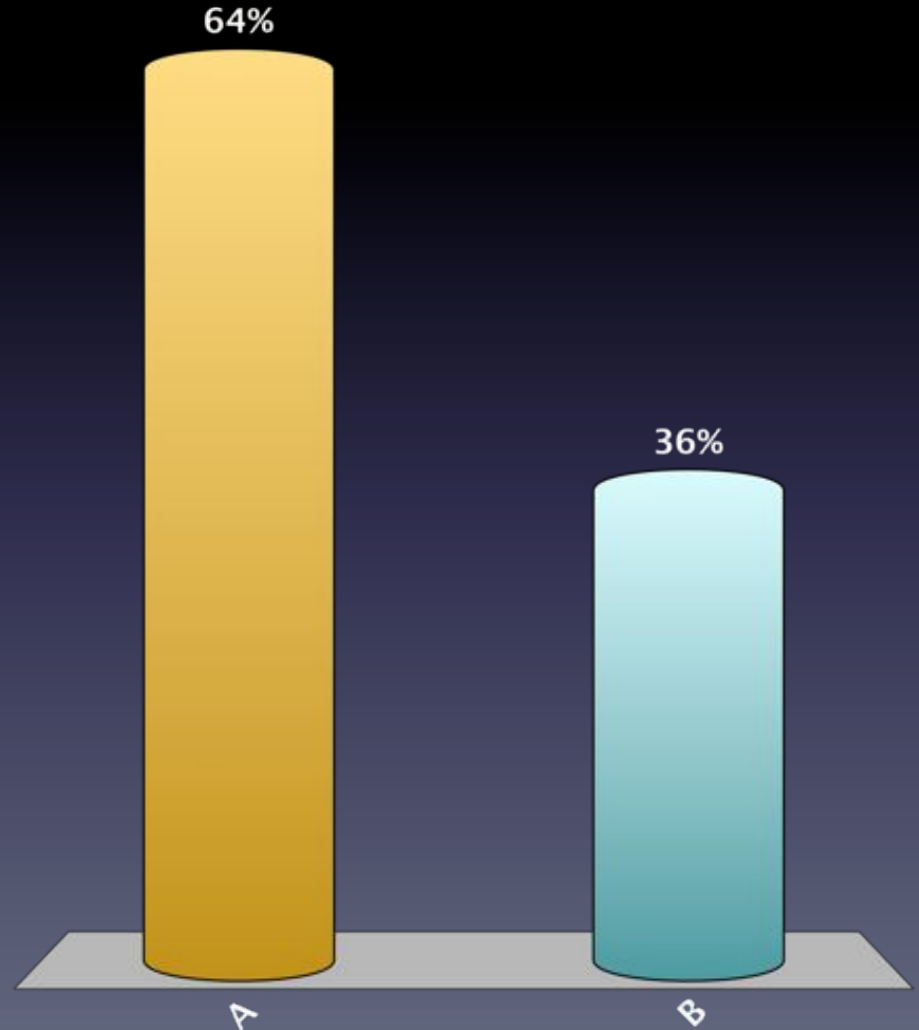
C. Medical Practice



You are interested in medical applications

A. True

B. False



Use Technology



Use Technology

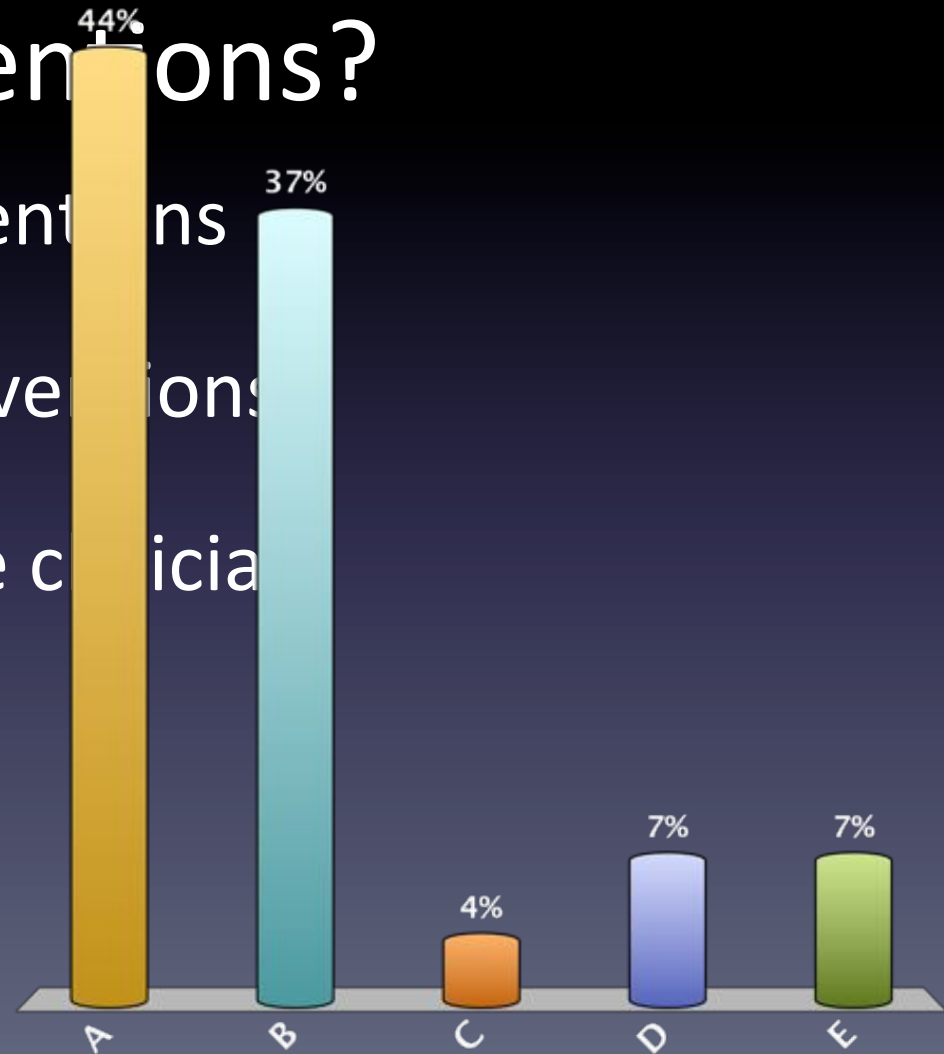


Clinical Needs

- More and more
 - Efficiency
 - Security (patient, clinician)
 - Comfort
- Less and less
 - Pain
 - Invasivity
 - Hospital time spent
 - money

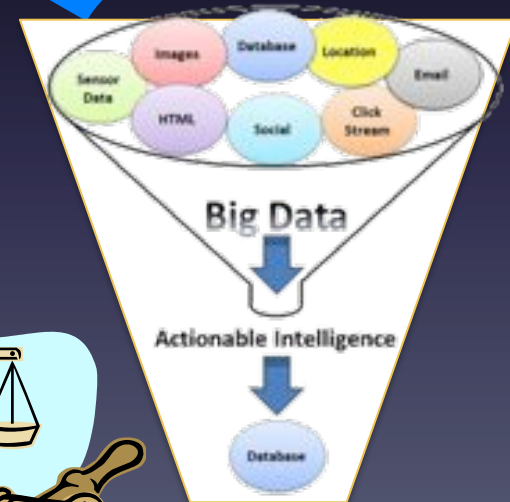
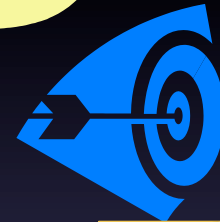
For you, What is the *Main* goal of Computer Assisted Medical Interventions?

- A. More precise interventions
- B. More accurate interventions
- C. More comfort for the clinician
- D. Less expensive care
- E. Other



Today's medicine challenges

- Less invasivity
 - Less direct perception
 - Smaller targets
- More and more information
 - 2D, 3D, 4D, etc. images
- More and more legal criteria



Example of Challenge



A/P X-ray, patient standing up

COOB angles :
T5-T11 = 40°
T11-L4 = 32°



A/P X-ray, patient standing up

COOB angles(after surgery):
T5-T11 = 8°
T11-L4 = 10°



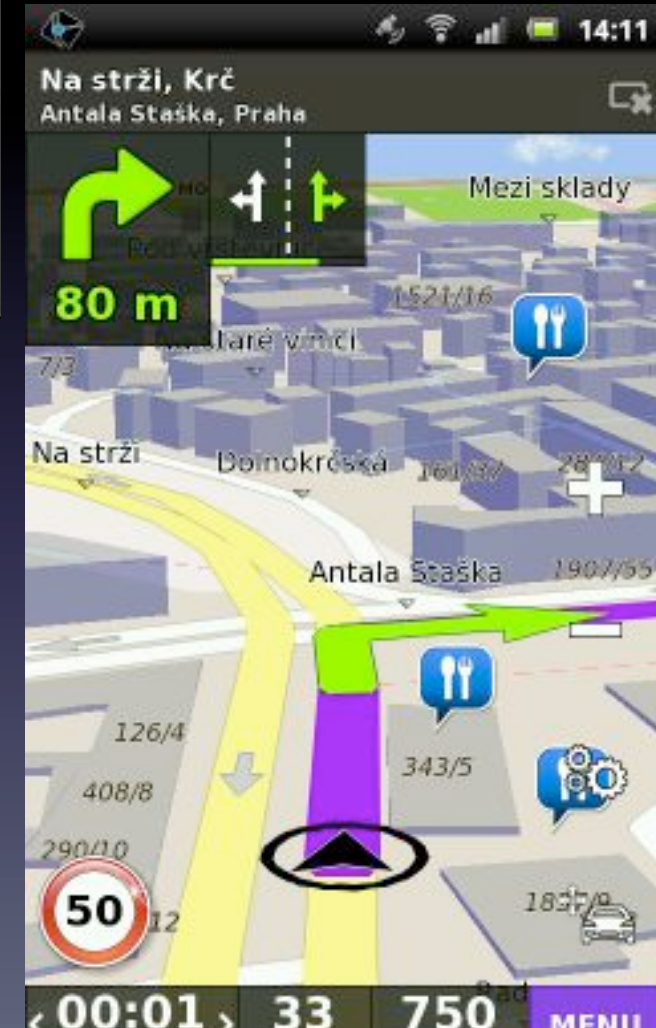
Example of Challenge

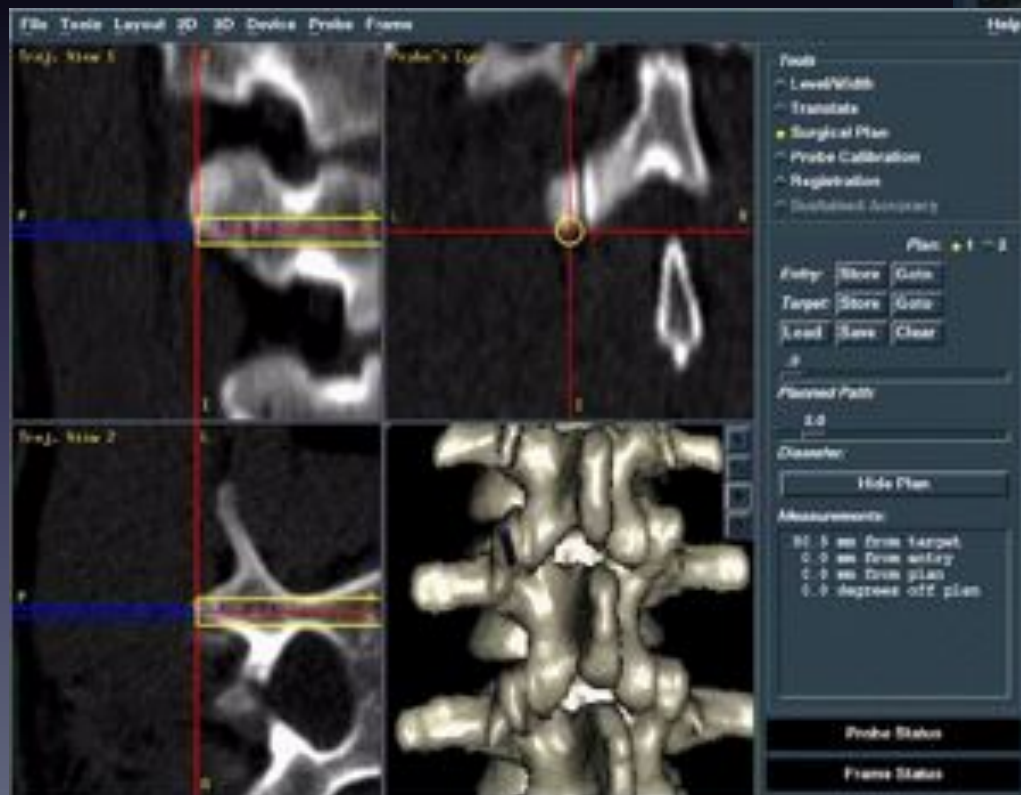
- 10 to 40% of misplaced screws
 - Why is it so difficult?

Example of Challenge



How can computers help?





Video Example

- Note the elements of Navigation
- What is the *map*?
- What is the *local frame*?
- How to make them *match*?

Pre-operative Images are

- A. Ultra Sound images
- B. MRI Images
- C. Fluoroscopic Images
- D. CT Scanner Images

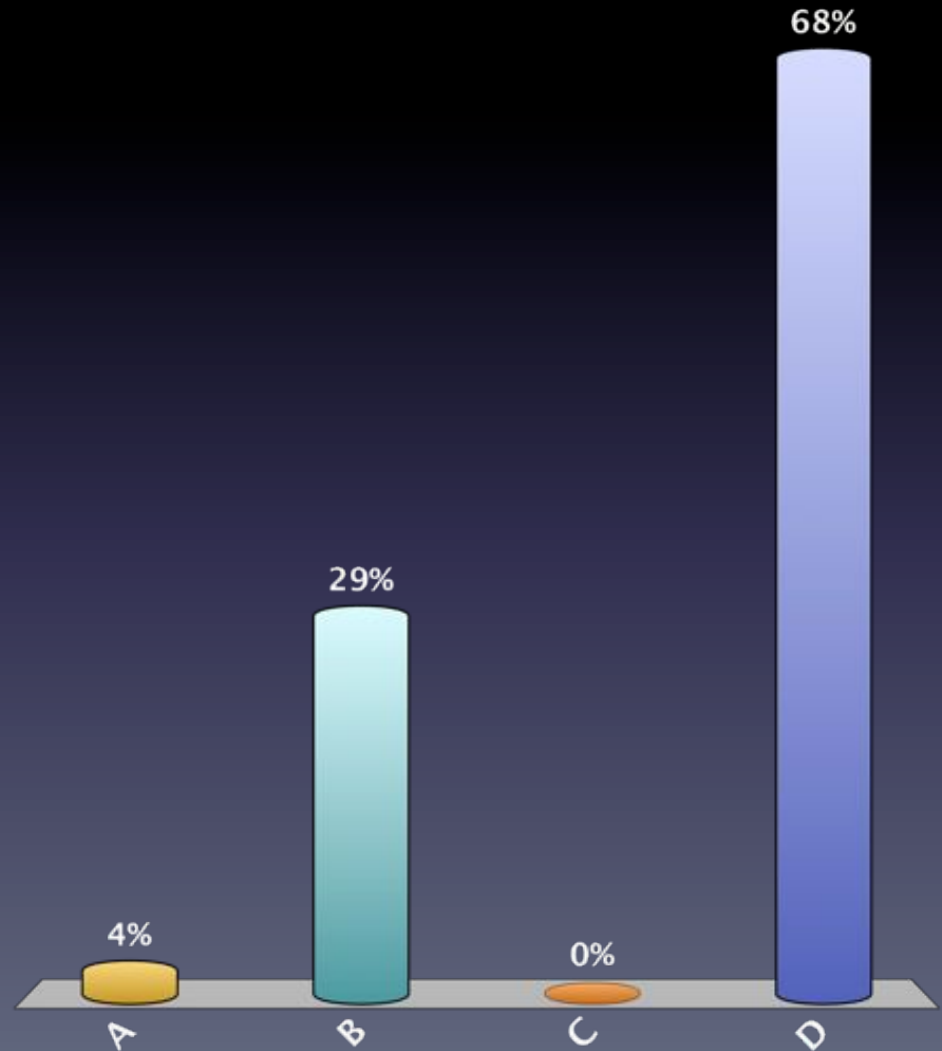
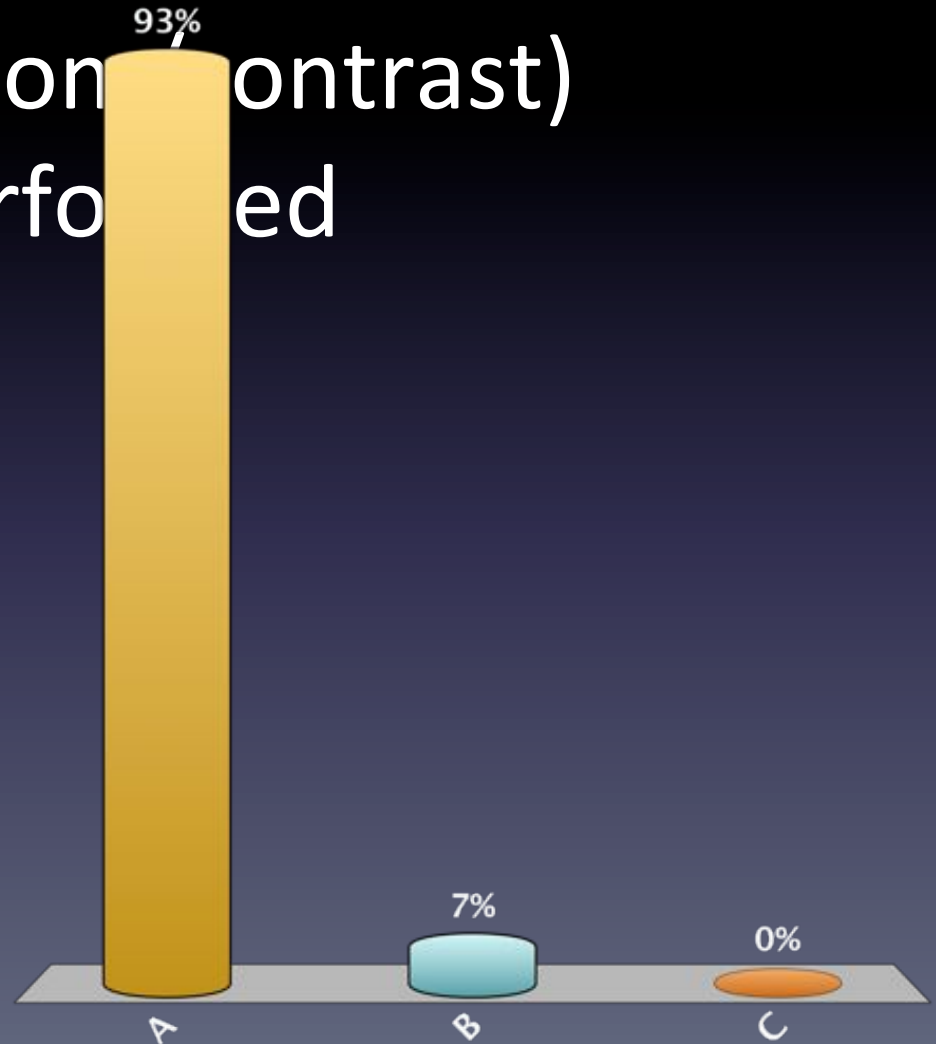


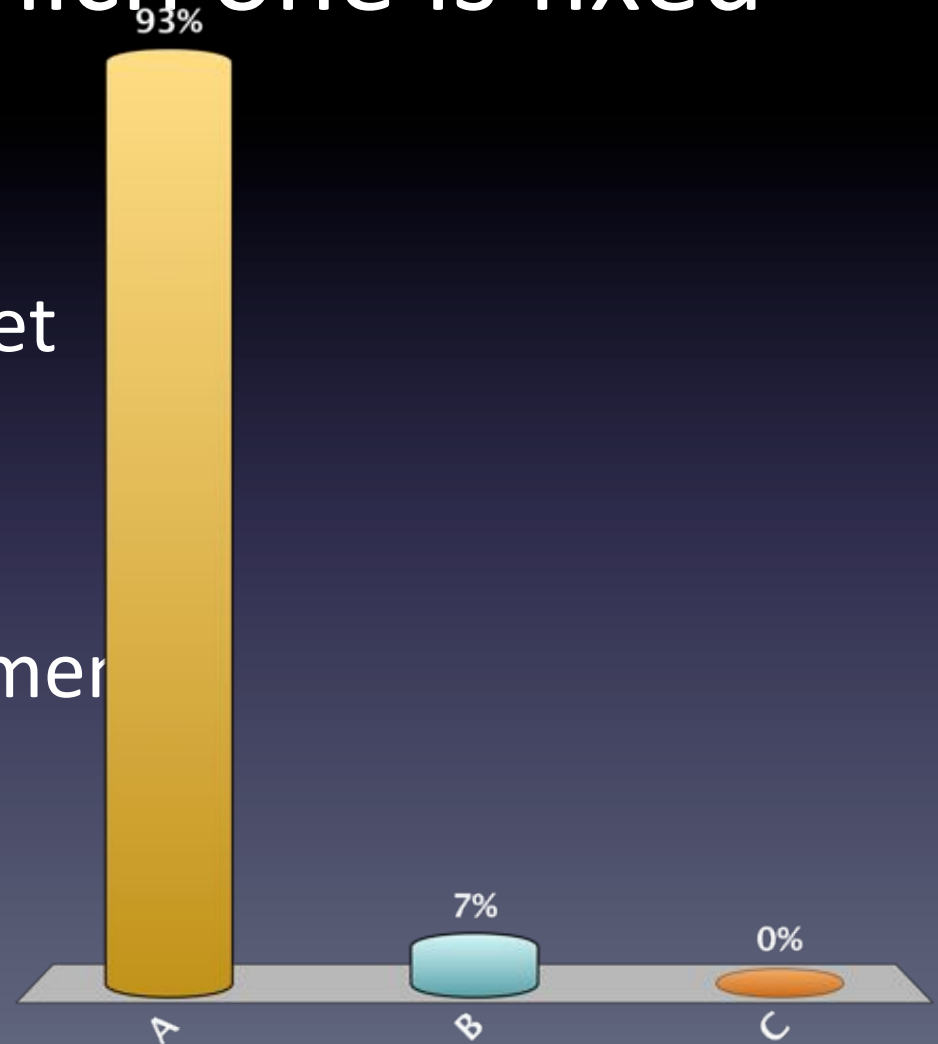
Image Processing Steps (Segmentation, 3D reconstruction, Adjusting zoom and contrast) are performed

- A. Before the operation
- B. During the operation
- C. After the operation



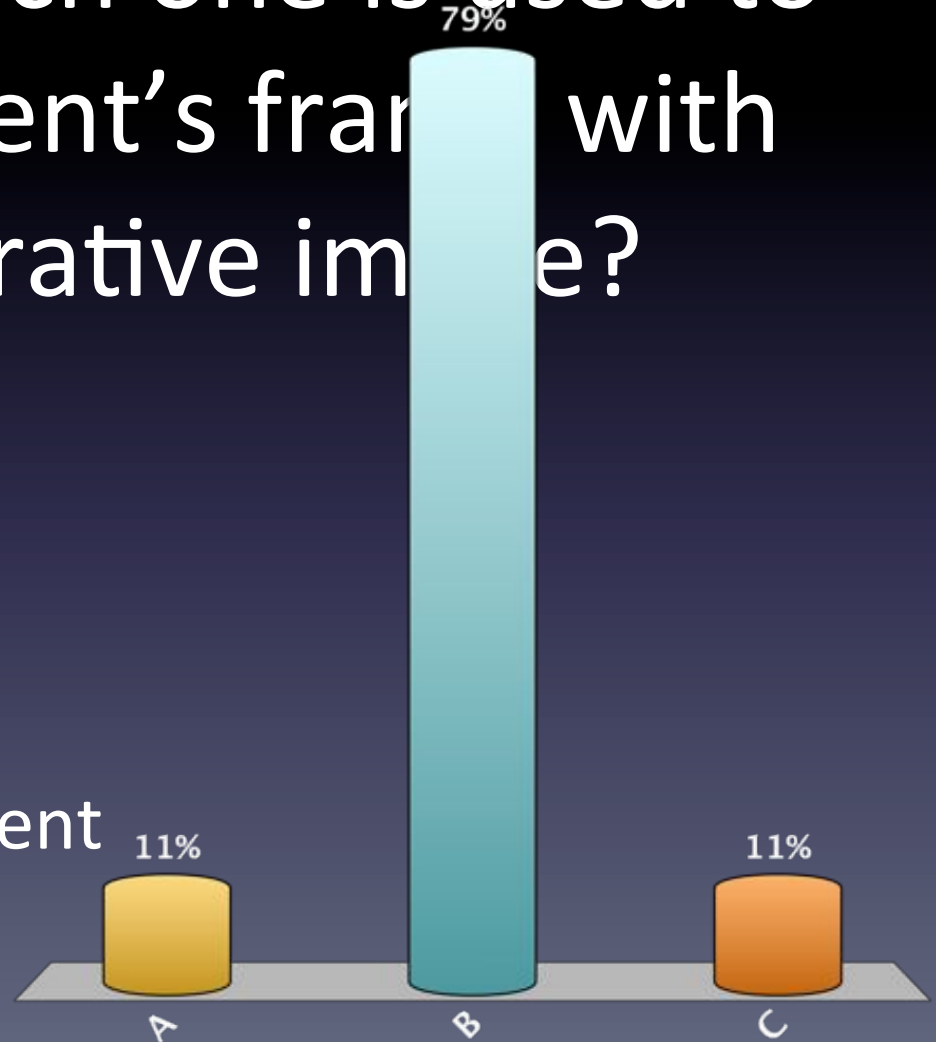
Among the 3 per-operating references , which one is fixed

- A. The patient's head set
- B. The probe
- C. The tip of the instrument



Among the 3 per-operating references , which one is used to match the patient's frame with the pre-operative image?

- A. The patient's headset
- B. The probe
- C. The tip of the instrument





Imaging

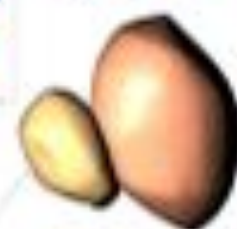
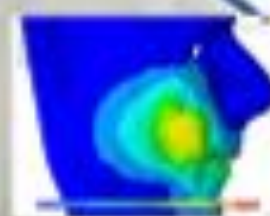


Sensing

Models



PERCEPTION



ACTION

REASONING

Simulation



Navigation



Registration and data fusion

Robotics



Course Organization

When	What	Who
01/10/2014	Introduction & Sensors	Céline Fouard
08/10/2014	Medical Imaging Part I	Céline Fouard
15/10/2014	Medical Imaging Part II	Céline Fouard
05/11/2014	Image Registration Part I	Jocelyne Troccaz
12/11/2014	Image Registration Part II	Jocelyne Troccaz
19/11/2014	Biomechanical Modeling Part I	Emmanuel Promayon
26/11/2014	Biomechanical Modeling Part II	Emmanuel Promayon
03/12/2014	No Lecture	
10/12/2014	Computer Exercise Part I	E. Promayon & C. Fouard
17/12/2014	CAMI Applications Part I & II	Jocelyne Troccaz
07/01/2015	Computer Exercise Part II	E. Promayon & C. Fouard