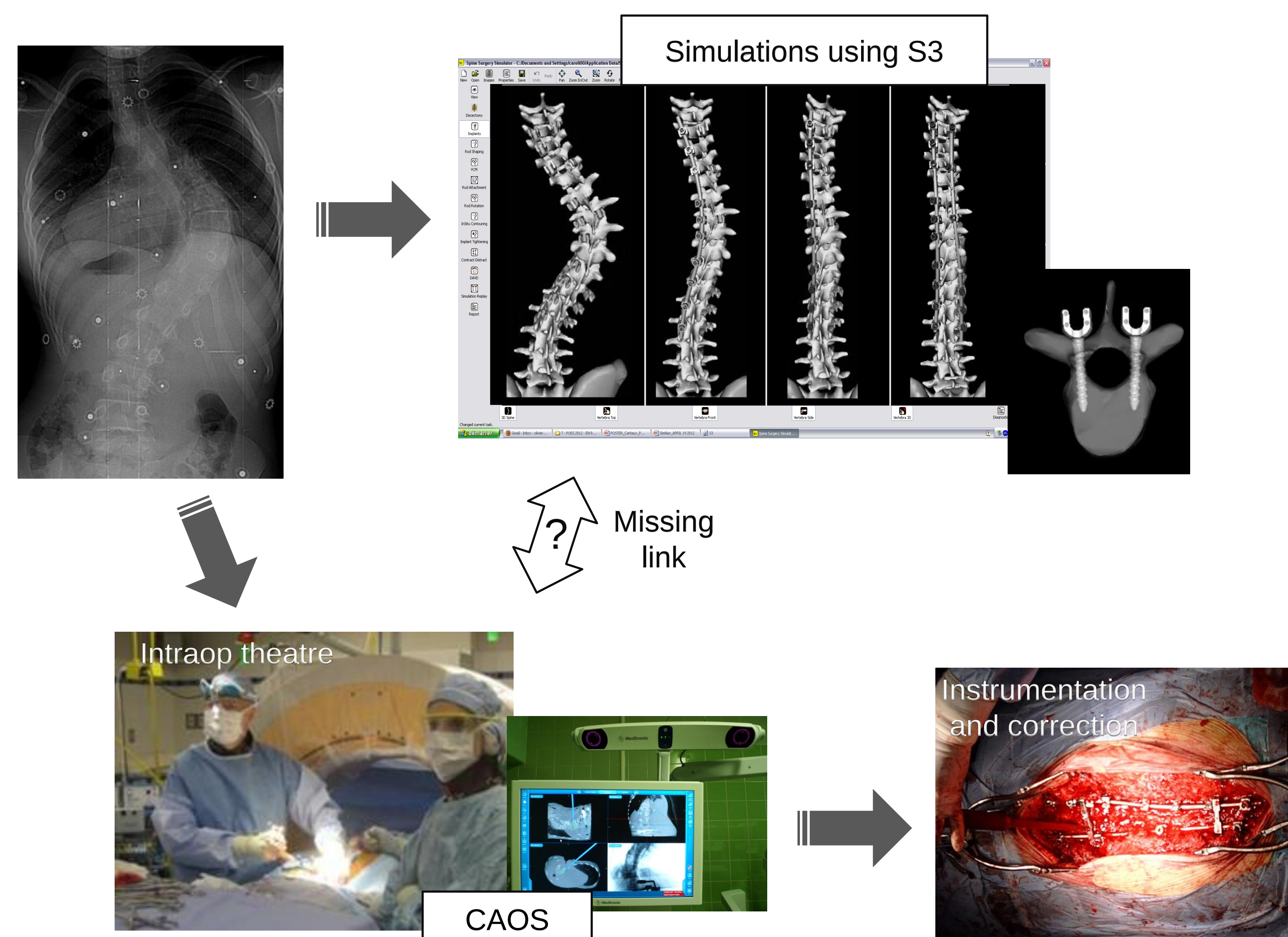


Intraoperative simulator for navigated surgeries of the scoliotic spine: first results

Olivier Cartiaux PhD^{1,2}, Marina D'Ercole^{1,2}, Hubert Labelle MD¹, Farida Cheriet PhD^{1,2}, Carl-Éric Aubin PhD^{1,2}
1: Sainte-Justine University Hospital Center; 2: École Polytechnique de Montréal

Introduction

- Scoliotic spine instrumentation = complex surgery requiring many decisions pre- and intraoperatively^{1,2}
- Preop computational simulator (S3) → allows planning screw pattern design and simulating instrumentation correction³
- Commercially available intraop imaging/navigation systems (CAOS) → allow guiding pedicle screws insertion⁴



Objective

To develop a new computational simulator for navigated surgeries of the scoliotic spine

Prototype development and testing

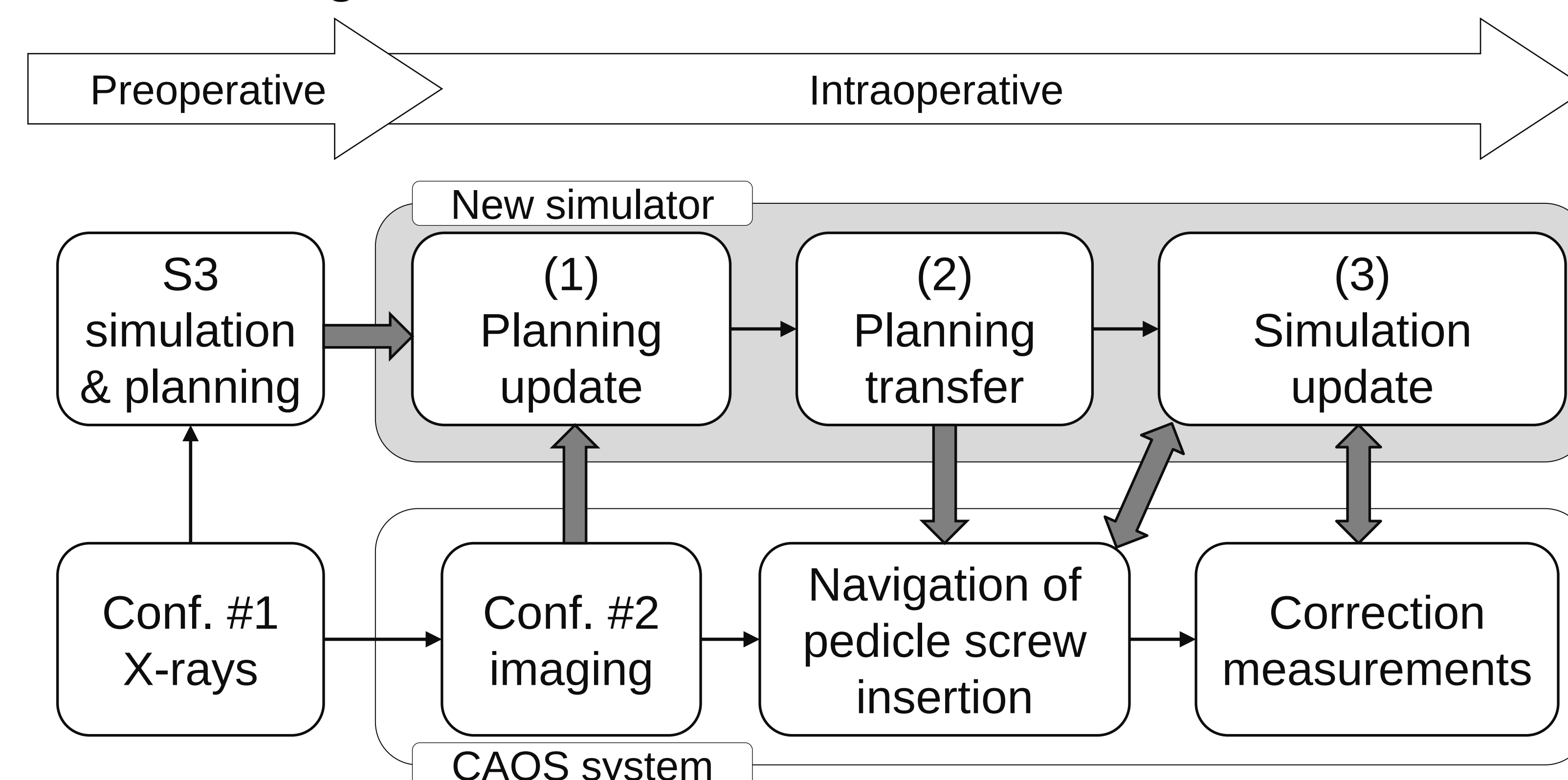
- Synthetic model of a scoliotic spine
- Configuration #1
 - Preop standing posture
 - Biplanar radiographs
 - S3 simulation/planning
 1. Desired pedicle screw trajectories
 2. Correction maneuvers
 3. Resulting clinical indices (Cobb angles...)



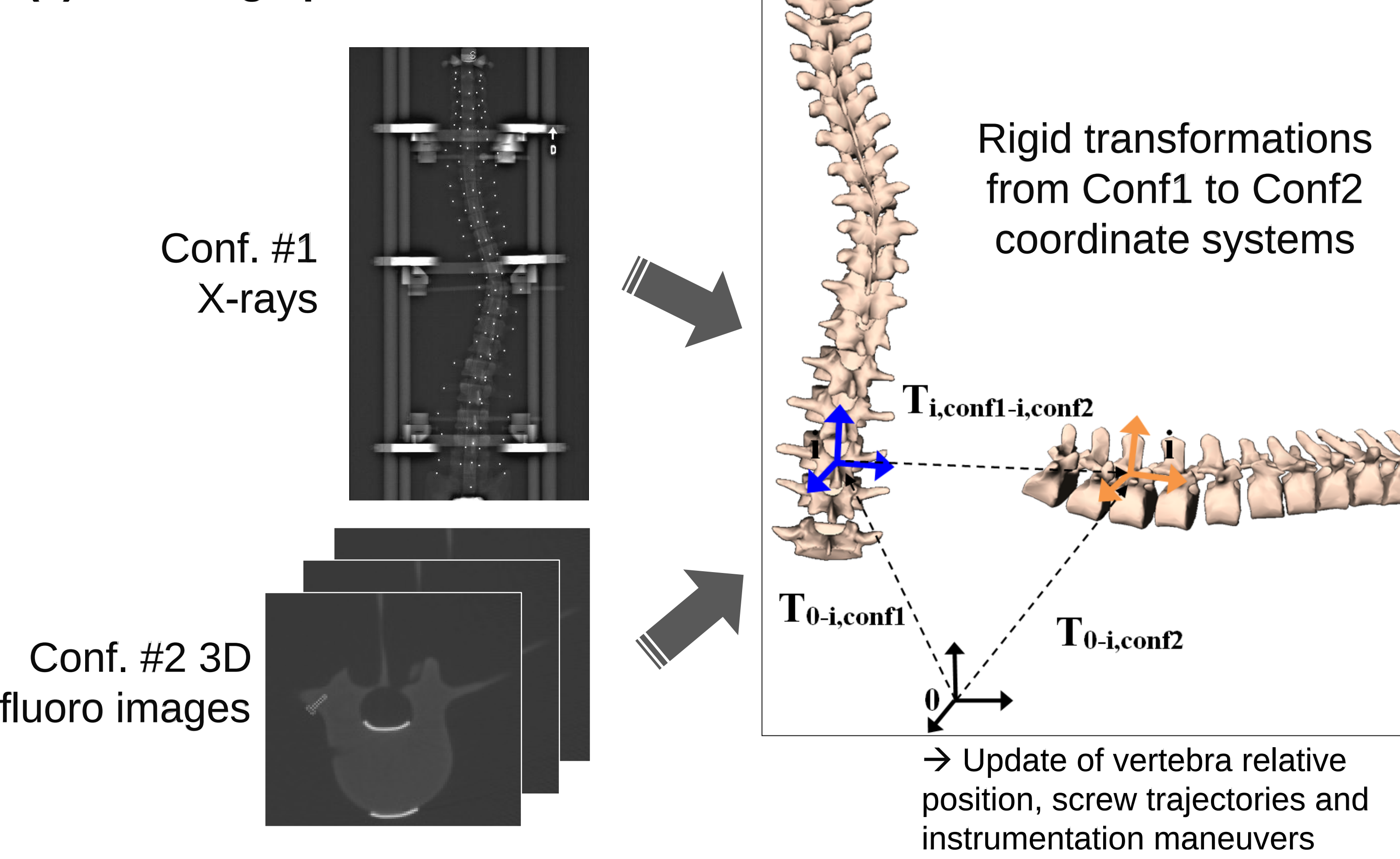
- Configuration #2
 - Intraop prone positioning
 - Intraop 2D/3D fluoroscopic images



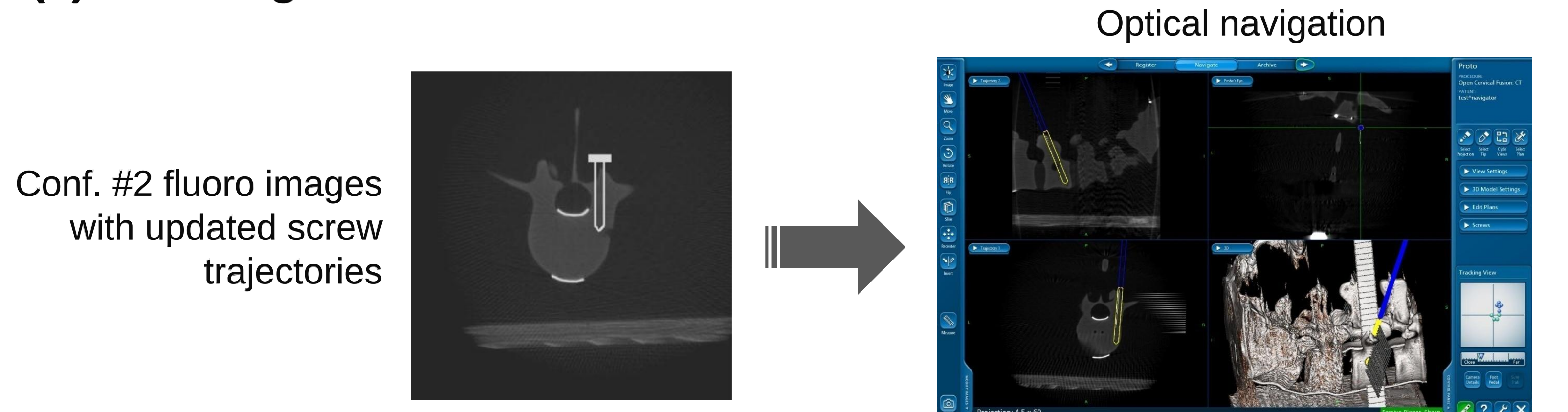
Workflow diagram



(1) Planning update



(2) Planning transfer

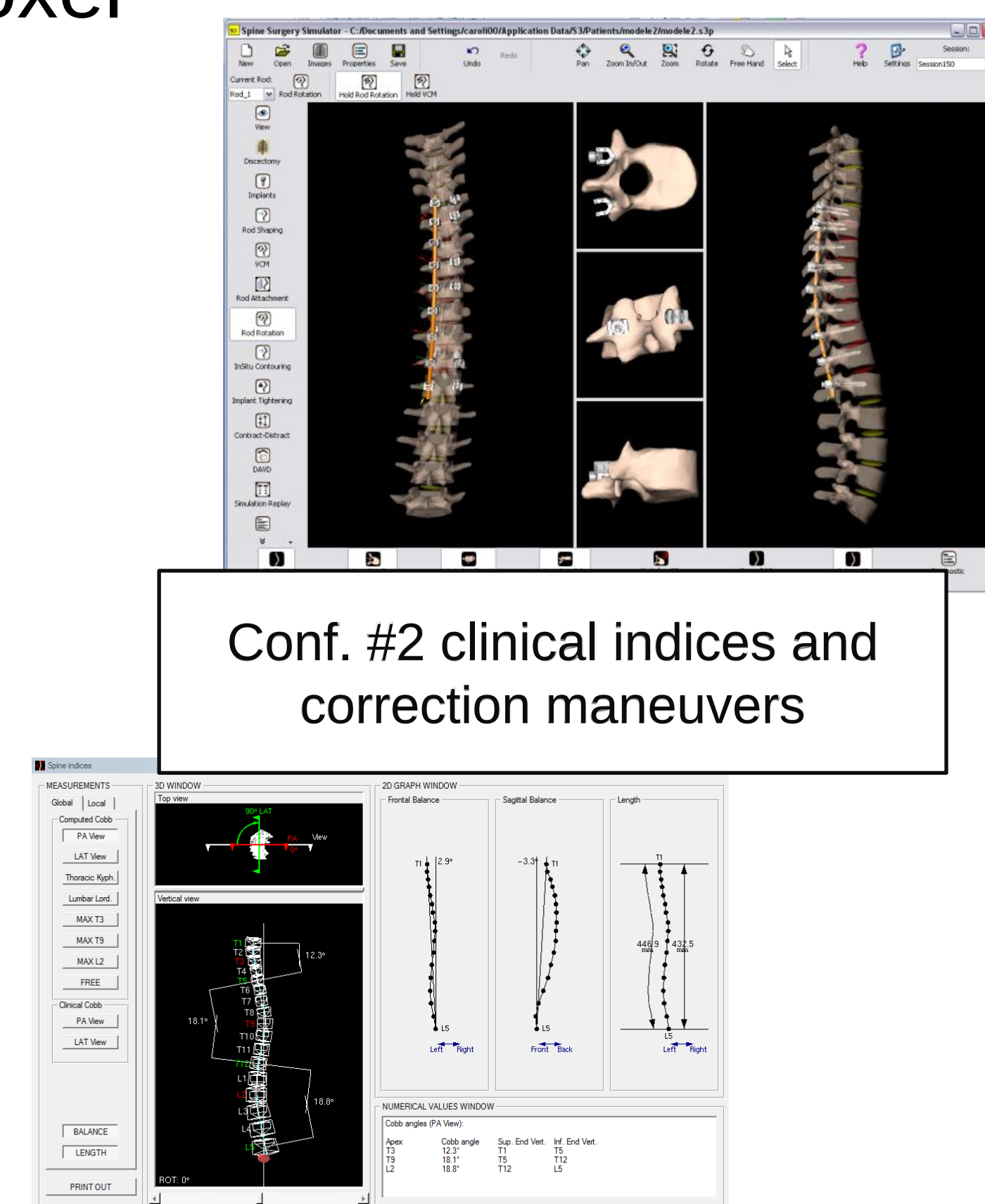


First results

- (1) Planning update accuracy ~ 0.5 mm
- (2) Planning transfer accuracy ~ 1 voxel
- (3) Simulation update:

	Cobb angle	
	Pre-instrumentation	Simulated instrumentation
Conf. #1	34	12
Conf. #2	24	12

(3) Simulation update



Conclusion and perspectives

- First results using a physical model:
 - Intraop data from CAOS systems can be used to update preop simulations/planning, account for changes occurring in the OR, and test other instrumentation strategies
 - These results have to be validated during real surgeries
- The new intraop simulator may contribute to obtain real-time feedbacks during CAOS surgeries and optimize correction

References

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