

## Clinical Challenges

## Solution

## Methodological Challenges



## Simulation

## Capture of Surgical Processes

## Synthesis of Surgical Process Models

OntoSPM ontology  
OntoSPM serves as a language for describing individual surgical procedures



Server-based  
Acquisition  
via OR

### Petri net synthesis:

- Test and Flip nets (T&FN)
- Well suited to model surgical procedures.
- Region-based Petri net synthesis algorithms (6) tailored to T&FN (7)
- Uses linear algebra in the Boolean ring
- Allows inference of generic surgical process models, with meaningful generalization

Surgical process model of the last phase of 22 optical procedures without specialties



Emergency department  
Ponchaillou  
University Hospital



SSPM virtual operating room in the Immersia platform



## Next Steps

- Data acquisition of opening phase of brain tumor surgery
- Ontology v. 1.0
- Extension of T&FN synthesis to support: (i) multi-actor decomposition and (ii) hierarchical models, with several granularity levels.
- Visualisation/interaction/validation of models
- 3D models of instruments and actors and corresponding behaviors
- Implementation of clinical scenarios
- Tests with scrub nurses

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Synthesis of 19 cataract surgeries

