



Equipe MediCIS

LTSI UMR U1099 • INSERM/Université de Rennes I

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## Internship Subject: Surgical Process Models Viewer

**Localization:** Laboratoire Traitement du Signal et de l'Image (LTSI), MediCIS Team

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### Context

Surgical Process Models (SPMs) decompose surgical procedures at different levels of granularity [1]. For example, surgical intervention can be divided into successive phases corresponding to the main periods of the intervention. A phase is composed of one or more steps. A step is a sequence of activities used to achieve a surgical objective. An activity is a physical action performed by the surgeon. Each activity is broken down into different components, including the verb of action, the target involved in the action (usually an anatomical structure) and the surgical instrument used to perform the action. Lower granularity levels are closer to kinematic data, such as surges and dexemes [2]. A surge was defined as a surgical motion with explicit semantic meaning, composed by dexemes. A dexeme is a numerical representation of the performed physical motion.

In the past years, the MediCIS team has developed tools for automatic gesture recognition [3] or automatic annotation of SPM [4]. Other tools were developed for the analysis of this SPM through the computation of metrics based on kinematic and label data.

### Objective of the internship

The general objective of this internship is to develop a Surgical process model viewer with the final aim of providing feedbacks to trainees after training sessions on a simulator by including analysis tools already developed.

To achieve this goal, the internship will be divided into multiples steps:

- Develop a viewer able to read video, represent kinematic data and surgical process annotation. It must be possible to navigate between these modalities synchronously;
- Make the viewer adjustable to different configurations (multi-video, focus on specific data, ...);
- Integrate previously developed tools to provide feedback to the user;
- A user evaluation study could be considered according to the intern's progression;
- Writing the internship report and a draft of the scientific paper if the results are satisfying.

### Profile researched

The intern must be comfortable with programming (C++), and with Linux environment. Having background on QT and graphical user interfaces building is a plus. The working language will be in French and English.

This internship can be for a duration of 3 to 6 months, depending on the candidate. The remuneration will depend on the duration.



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## References

- [1] F. Lalys and P. Jannin, “Surgical process modelling: a review,” *Int. J. Comput. Assist. Radiol. Surg.*, vol. 9, no. 3, pp. 495–511, Sep. 2013.
- [2] F. Despinoy *et al.*, “Unsupervised trajectory segmentation for surgical gesture recognition in robotic training,” *IEEE Trans. Biomed. Eng.*, vol. 63, no. 6, pp. 1280–1291, 2015.
- [3] D. Sarikaya and P. Jannin, “Surgical Gesture Recognition with Optical Flow only,” *ArXiv190401143 Cs*, Apr. 2019.
- [4] A. Huaultmé, F. Despinoy, S. A. Heredia Perez, K. Harada, M. Mitsuishi, and P. Jannin, “Automatic annotation of surgical activities using virtual reality environments,” *Int. J. Comput. Assist. Radiol. Surg.*, Jun. 2019.