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Surgical Process Models : Acquisition, Analysis, and Display

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The proposed PhD position addresses modeling surgical procedures and associated processes. Until now progress and research in computer assisted surgery mainly focus on technological issues. The explicit understanding of surgical processes involved before, during and after the surgical procedure is an important issue that was not taken into account until now. We previously introduced a methodology including design of an ontology and associated tools for 1) describing surgical procedures and 2) analyzing data and extracting knowledge from these descriptions. This surgical knowledge may improve the design of computer assisted surgical systems. It may also help surgeons for teaching or quality approach. A first initial implementation was done and allowed us to emphasize limitations of this approach.

The project aims to enter in a second phase for improving the methodology and demonstrating the added value of this approach. Optimisation and verification of the existing surgical ontology are first required. The emphasis will be given in adapting or developing relevant methods for analysis and modeling of such data. Classical data mining, text mining, process mining, and workflow mining are some domains that may be studied for the analysis. Use of Bayesian networks will be studied for representing results of analysis. Evaluation of extracted knowledge will be performed. Clinical relevance of the results will be confronted with neurosurgeons who are fully involved in this study.

Associated Partners : Neurosurgical Department (Rennes, France), ICCAS Medical school University (Leipzig, Germany)

References :

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Technical skills: Programming: Php, PostGreSql, C++ ; Data management and mining: UML, XML, Ontology, CART, C4.5, Text mining; Statistics
Personal skills: Motivation, Autonomy, Methodology, Writing