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Title: Hospital patient flow optimization & Decision support system

Scientific field: OR, Optimization & Supply Chain

Key words: Flow optimization, Hospital & patient constraints, Decision Making & DSS

- Context:
  - Cooperation program between Professors Liming ZHANG (U. of Macau) and A. EL KAMEL (EC Lille/CRIStAL) started in 2013
  - Cooperation program between Professors PENG, Zhuoyue SONG & Yue YU (BIT) and A. EL KAMEL (EC Lille/ CRISIAL) started in 2013
  - Cooperation program between Professors G. GONG (BUAA/AST Key-Lab), S. WANG (BUAA/MC Lab) and A. EL KAMEL (EC Lille/ CRISIAL) started in 2007
    - Joint project, involving the 3 partners in the frame of LIA 2MCSI
    - A. EL KAMEL is Regular Visiting Professor to BUA in 2008 involved in a KEY-Project
    - Visiting Professor position at EC Lille to G. GONG (2009) & to S. WANG (2010)
  - 4 Chinese PhD students, with CSC support, are now working in my research team

Detailed subject

- Background:

The High demands for service, high costs, limited budget, and healthcare resources, constantly provide new challenges to their managers and decision-makers. As a result, decision-makers are continuously studying performance and efficiency of existing healthcare systems, and must be able to evaluate the outcomes of any changes they make to these systems. However, they don’t have enough methodologies and tools for decision support and adapted control.
Health system managers must often maximize the use of their available resources while being constrained by specific budget limits. In order to do this, managers must implement highly efficient systems that minimize their costs while providing a specified level of care.

The PhD project aims to study and develop the modeling, the optimization and the implementation of a Decision Support System to anticipate the tension inside hospitals and to prepare proposals for tensions avoidance.

Maternity and emergency areas are particularly representative of these tensions in hospitals. The highest number of patients must be cared for adequately in a given time period to minimize waiting time and increase patient satisfaction.

- **Work plan, Research program:**
  - Identify, extract and model the tension indicators for the hospital by leveraging information from multiple heterogeneous sources: medical information, city or hospital...
  - Develop a decision support system capable of modeling the appearance of tension and propose the anticipation of tension thus established, using innovative computer models such as the multi-agent systems, fuzzy logic… This system will be evaluated in two aspects: relevance of proposed outcomes and ergonomic aspects. It will seek to identify and model corrective actions for the conduct of business processes, to avoid the most anticipated tensions.

- **References:**
  - I. Hadj Khalifa, A. El Kamel and P. Yim, Transportation process of containers BPMN-modeling and transformation into ACTIF model, accepted and in press, ROMJIST 2011.