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Agents Endowed with Uncertainty Management Behaviors to Solve a Multiskill Healthcare Task Scheduling

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Abstract Health organizations are complex to manage due to their dynamic processes and distributed hospital organization. It is therefore necessary for healthcare institutions to focus on this issue to deal with patients' requirements. We aim in this paper to develop and implement a management decision support system (DSS) that can help physicians to better manage their organization and anticipate the feature of overcrowding. Our objective is to optimize the pediatric emergency department (PED) functioning characterized by stochastic arrivals of patients leading to its services overload. Human resources allocation presents additional complexity related to their different levels of skills and uncertain availability dates. So, we propose a new approach for multi-healthcare task scheduling based on a dynamic multi-agent system. Decisions about assignment and scheduling are the result of a cooperation and negotiation between agents with different behaviors. We therefore define the actors involved in the agents' coalition to manage uncertainties related to the scheduling problem and we detail their behaviors. Agents have the same goal, which is to enhance care quality and minimize long waiting times while respecting degrees of emergency. Different visits to the PED services and regular meetings with the medical staff allowed us to model the PED architecture and identify the characteristics and different roles of the healthcare providers and the diverse aspects of the PED activities. Our approach is integrated in a DSS for the management of the Regional University Hospital Center (RUHC) of Lille (France). Our survey is included in the French National Research Agency (ANR) project HOST¹.

Keywords decision support system; pediatric emergency department; multiskill task scheduling; multi-agent system; cooperation; negotiation.

¹Hôpital: Optimisation, Simulation et évitement des Tensions (ANR-11-TecSan-010 : <http://host.ec-lille.fr/wp-content/themes/twentyeleven/docsANR/R0/HOST-WP0.pdf>)

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