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HYBRID METHOD FOR TASK SCHEDULLING IN A DISTRIBUTION CENTER

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ABSTRACT

The following thesis describes a new methodology for scheduling processes in a distribution center (or warehouse). This work allows to optimize the put away and picking strategies simultaneously, considerinlimited resources constrains. It also includes the use of a combination of technologies related with operations research including discrete event simulation (DES), linear programming (LP) and design of experiments (DOE).

1 PROBLEM

Efficiency in Supply Chain Management is mostly determined by the competence in operations management in the distribution centers (DC). Different trends in manufacturing and distribution have made the order picking process more and more important and complex.

Although the distribution centers have a key role in the success, or failure, in supply chains (Frazelle 2002) at the design stage, there is no systematic or scientific approach to the physical design of warehouses (Goetschalckx 2002, Emmet 2005, Baker 2007). or using technologies and operating equipment (Rowley 2000). In the absence of a defined and accepted methodology warehouse designers develop their own methods (Oxley 1994).

2 OBJECTIVE

To solve this problem we propose a hybrid method that fits the complexity of the picking process with high variability and integrated with other warehousing operations.. This paper suggests a innovative approach to conduct a near optimal task planning taking into account: available information for agents who belong to the supply chain, the virtual simulation of the dynamics of the processes involved and optimization techniques to configure the best answer to the management operational processes. Finally using Design of Experiments (DOE) to select the most influential factors for the development in enhancing solutions.

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3 DESCRIPTION

The thesis presents the progress in research on selecting picking strategies. The method considers the order picking strategies coupled with other issues such as the put away policies and resources task assignment.

The methodology considers the interdependencies between the coupled problems and the dynamic effects inherent in its integrations within the supply chain.

The work includes a discrete event simulation (DES) model with a set of algorithms multicriteria for selecting locations: Picking strategies that minimize empty runs and operator task assignments, which combines the important tasks of high priority with minor tasks. The main objective is to maintain a balanced workload level without losing the service level agreement with the customers.

It is necessary therefore to determine a methodology to combine the analytical approach and process simulation. (Gu et al.2010) indicates that a significant need to integrate both approaches (analytical and simulation models) to achieve a greater flexibility in analyzing problems warehouse. This was also noted by (Ashayeri and Gelders 1985), and its application was demonstrated by (Enyan and Rosenblatt et al. 1994).

To summarize the main steps of the proposed method are: Information analysis to extract the main characteristic data, main material movements in the DC. Calculation of possible movements in the DC according to different picking strategies and location of elements according to different criteria such as physical distribution, item family, item rotation of residence time expected. Initially a static analysis of planning tasks with available resources is made. It is used as a starting point for the subsequent dynamic analysis by simulation. The simulation includes the physical layout model and the most important rules of behavior from the resources used in the facility. The simulation tool selected is Incontrol Enterprise Dynamics. The fast calculation of the simulation allows periodic updates considering the variability in process conditions. The source of variability may be both internal (Distribution Center) and external (Supply Chain).Finally different experiments are conducted (DOE) to select the most influential factors and improve the solution found iteratively.

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