A Branch and Bound Algorithm to Minimize Makespan on Identical Parallel Machines with Consumable Resources

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Abstract. In this paper, we study a scheduling problem for minimizing the makespan on identical parallel machines with consumable resources in a node of a supply chain. The goal is to provide a first exact approach to this problem through the use of Branch and Bound method. We propose two new heuristics and apply other with a series of lower bounds that are incorporated into our algorithm. We tested a large number of randomly generated instances that allow us to compare the computation time and quality of lower bounds and heuristics.

Keywords: Scheduling, Makespan, Parallel Machines, Branch and Bound.

1 Introduction

We study a parallel machines scheduling problem of order picking in a platform with a distribution company without manufacturing which manages about 100 stores and several trucks of transport. This platform is connected to a set of suppliers and a set of clients. The manner of working platform is all known. Several ways to make deliveries are identified and many assumptions can be made for departures deliveries, this leads to vehicle routing to make such distributions, while optimizing their costs through scheduling preparation store orders.

This research proposes to include realistic constraints very encountered, but are rarely taken in the literature. Therefore, this study will highlight the importance of this problem in the industry.

Rest of the paper is organized as follows. In Section 2 we make an analysis of the literature. Section 3 describes our problem and the method of resolution. Section 4 describes the new proposed heuristic. Section 5 provides lower bounds. Experiments are made in Section 6. Finally, section 7 concludes the work.

2 Literature Review

In this section, we focus on problems with non-renewable resources.