Algorithms and Effective Dominance Relations for a No-Wait Flowshop Scheduling with Random Setup Times

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Extended Abstract

We address a two-machine no-wait flowshop scheduling problem where setup times are stochastic which could be due to a wide range of factors in manufacturing process, Gonzalez-Neira et al (2017), Wang and Choi (2012). In some real-life production environments, having consecutive operations (no-wait process) is a must, e.g., pharmaceutical, chemical, and plastic industries, Allahverdi (2016), Hall and Sriskandarajah (1996). Moreover, resources used in production need to be arranged before starting a new task. The time needed for this arrangement is defined as setup time which is not always known in advance, Allahverdi (2015). Morever, minimizing maximum lateness also known as Lmax is vital to reduce the late penalty fees and loss of customer satisfaction. Therefore, minimizing Lmax in a no-wait environment with unknown setup times is important. We first establish a new dominance relation and show that it is, on average, more than 80 % efficient than the existing one in the literature. Moreover, since the problem is NP-hard and infinite possible realizations are possible, it is very unlikely to have an optimal solution for problems of reasonable size by only utilizing dominance relations. There exists no algorithm in the literature for the considered problem, therefore we

propose constructive algorithms to minimize the maximum lateness. The performances of the proposed algorithms are evaluated based on extensive simulations. The numerical results show that all the algorithms are at least 15 % better than a benchmark solution. Moreover, we also find that the best performing algorithm is at least 100 % better than the worst one. The average computational time of the newly proposed algorithm is less than a second. Therefore, the proposed algorithm is efficient in reducing the error and also fast.

Keywords: Flowshop scheduling, algorithms, no-wait, maximum lateness, random setup times

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