Minimizing Total Completion Time in Two-Machine Flow Shops with Exact Delay Using Genetic Algorithm & Ant Colony Algorithm

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We study the problem of minimizing total completion time in a two-machine flow shop with exact delay. There are n jobs, one upstream machine M_1 and one downstream machine M_2. Each job has to be processed first on machine M_1, then on machine M_2, and has a delay between the machines called the "exact" delay time. The objective is to find a schedule that minimizes the total completion time of the jobs. It has been proven that there is no algorithm that can find the optimal schedule in polynomial time unless P=NP. In this paper, we developed two meta-heuristics based on Genetic Algorithms (GA) and Ant Colony Optimization (ACO). We study the performance of the GA and the ACO through experiments. After finding the right parameters and operators, we find that both the GA and the ACO are very efficient in terms of running time; however, in terms of quality of the solution, the GA outperforms the ACO.