

EA FOR SOLVING COMBINED MACHINE LAYOUT AND JOB ASSIGNMENT PROBLEMS

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ABSTRACT. Machine layout and material flow between machines are crucial considerations for improving productivity in any manufacturing environment. The machine layout and the operations assignment problems are both known to be NP hard problems. In this paper, we consider a combined machine layout and job assignment problem and introduce an evolutionary algorithm to solve this combined problem. The usefulness of our approach is demonstrated through numerical examples.

1. Introduction. Machine layout design has been regarded as the key to improve productivity in any manufacturing system. An improved layout design reduces the manufacturing lead time and increases throughput [1, 2, 3]. The primary objective of machine layout problems is to obtain the most effective machine arrangement (relative locations of machines) and the path of material flow so that the overall system cost (usually machining cost plus the material handling cost) is minimized. The major types of machine arrangements, considered in practice, are process based, the flow-line (also known as single line), the multi-line, the semi-circular and the loop layout. The details on these layouts can be found in [4]. Based on the pattern of material flow, these layouts can be grouped as flow shop and job shop. In the flow shop layout, all products usually require similar sequence of operations. As a result, the machines are physically arranged either as single straight line, semi-circular or in a loop. The flow of material in such arrangements is unidirectional from the first to the last operation. In job shop, the physical arrangement is usually multi-line where different jobs require different sequence of operations. As the frequent rearrangement of machines is an infeasible task, the jobs (with a known order of operations) need to move in different directions for the required operations in different machines.

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