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A CASE STUDY

Genetic algorithmic approach single machine scheduling problem to minimize total penalty cost

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ABSTRACT

This paper, we present single machine scheduling problem (SMSP) approach to the modern industrial manufacturing areas. Scheduling deals with the process of assigning limited machine (resources) to a set of n jobs (tasks) over a period of time with multiple due dates (D.D.). Penalty is imposed if jobs are not completed within their due dates. The objective was to minimize the total penalty for all jobs by using some properties of single machine scheduling problem and to solve genetic algorithm (GA) approach. Finally, a numerical example was illustrated for proposed method.

KEY WORDS : Single machine, Processing time, Customer due dates, Total penalty cost, Genetic algorithm (GA)

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Single machine scheduling problem (SMSP) is one of most important problems in manufacturing, because there are finite jobs (tasks) and limited resources (machine). Therefore, SMSP can provide good ideas for complex system. We consider SMSP under the processing time and all jabs have common due dates. A SMSP investigates the possible arrangements of jobs that need to be processed on only one machine under one or some specified criteria.

Assigning or sequencing some activities which require to be processed through a set of limited available resources (instance machines, labour, material and equipment) is called scheduling. The scheduling objectives are to satisfy production constraints and minimize production costs. Scheduling is also useful to increase the profitability in competitive environment. Effective scheduling strategy may help companies to responds to market demands quickly and to run plants efficiently. This helps them to be more competitive in today's market place.

Consider the problem of the determination of optimal due dates and optimal sequence for N independent jobs to be processed on a single machine. All jobs are available at time zero. Processing times are known and deterministic. The penalty for a job in a sequence is assumed to be a linear function of the due date assigned to the job and the earliness/ tardiness for the job in the schedule. The same linear penalty function is used for all jobs. The objective is to minimize the total penalty for all jobs. The number of distinct due date's m, to be assigned to the jobs is assumed to be prespecified and known.

We allow m to take any value in the set {1, 2, ...,N}. Job preemption is not allowed. In the recent literature several authors, Bagchi (1989), Baker and Bertred (1981), Panwalkar *et al.* (1982), Eilon and Chowdhary (1976), Weeks (1979), Weeks and Fryer (1977) have studied this problem. The readers are directed to Baker and Scudder (1990) for a brief review of this literature. The problem considered in this paper is directly related with the problems considered in Panwalkar, Smith *et al.* (1982) and Seidmann *et al.* (1981).

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