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Original Research Article

REDUCE THE TIME SPAN OF JOB SHOP BY SCHEDULING METHOD

Neeraj Chandra, Amit Kumar Kachhawaha

Dr. C V Raman University, Kota Bilaspur

Abstract: Conventional methods of solving scheduling problems based on priority rules still result schedules, sometimes, with significant idle times. To optimize these, this thesis model the problem of a flow shop scheduling with the objective of minimizing the makes pan. This paper model the problem of a flow shop scheduling with the objective of minimizing the makes pan. The objective is to minimize the make span of batch-processing machines in a flow shop. The processing times and the sizes of the jobs are known and non-identical. The processing time of a batch is the longest processing time among all the jobs in that batch. Consequently, comparison based on Gupta's heuristics, RA heuristic's, Palmer's heuristics, CDS heuristics are proposed in this work. Gantt chart was generated to verify the effectiveness of the proposed approaches.

Key Words: Scheduling, Optimize, Gantt chart.

Introduction

Flexible Manufacturing System (FMS) is an automated manufacturing system which consists of group of automated machine tools, interconnected with an automated material handling and storage system and controlled by computer to produce products according to the right schedule. Manufacturing scheduling theory is concerned with the right allocation of machines to operations over time. FMS scheduling is an activity to select the right future operational program or diagram of an actual time plan for allocating competitive different demands of different products, delivery dates, by sequencing through different machines, operations, and routings for the combination of the high flexibility of job shop type with high productivity of flow-shop type and meeting delivery dates. FMS Scheduling system is one of the most important information-processing subsystems of CIM system. The productivity of CIM is highly depending upon the quality of FMS scheduling. The basic work of scheduler is to design an optimal FMS schedule according to a certain measure of performance, or scheduling criterion. This work focuses on productivity

For Correspondence:
neerajchandra10@gmail.com
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oriented-make span criteria. Make span is the time length from the starting of the first operation of the first demand to the finishing of the last operation of the last demand.

The inherent efficiency of a flexible manufacturing system (FMS) combined with additional capabilities, can be harnessed by developing a suitable production plan. The classical flow shop scheduling problem is one of the most well-known scheduling problems. There are set of jobs and a set of machines. Each job consists of chain of operation, each of which needs to be processed during an uninterrupted time period of a given length on a given machine. Each machine can process at most one operation at a time. A schedule is an allocation of operations to time intervals of the machines. The problem is to find the schedule of minimum length. This work try to minimize the make span of batch-processing machines in a flow shop. The processing times and the sizes of the jobs are known and non-identical. The machines can process a batch as long as its capacity is not exceeded. The processing time of a batch is the longest processing time among all the jobs in that batch. The problem under study is NP-hard for makespan objective. Consequently, comparison based on Gupta's heuristics, RA heuristic's, Palmer's heuristics, CDS heuristics are proposed. Gantt chart was generated to verify the effectiveness of the proposed approaches. Koulamas and Kyparisis [1] developed single-machine scheduling with waiting-time-dependent due dates in which due dates are linear functions of the job waiting-times. They construct an optimal sequence and assign the optimal due dates analytically in a single-machine setting when due dates are linear functions of the job waiting-times and their objective is to minimize the maximum job lateness. Das, et.al [2] developed, Optimization of operation and changeover time for production planning and scheduling in a flexible manufacturing system and deals with the production planning problem of a flexible manufacturing system. They specifically addresses issues of machine loading, tool allocation, and part type grouping with the objective of developing an operation sequencing technique capable of optimizing operation time, non-productive.

Scheduling

A minimal downtime and minimal waiting time are the constraints in these kinds of problems. Flow shop scheduling is a special case of the shop scheduling tasks where there is a strict order of all operations performed on all jobs. In this case, each machine can perform more than one operation for a particular job. It is a typical combinatorial optimization problem, where each job has to go through the processing in each and every machine on the shop floor. Each machine has same sequence of jobs. The problem of Job-shop Scheduling flexible (FJSP) is a generalization of the traditional JSP, where there are a set of machines available and each operation is allowed to be processed on any one of the available ones. A FJSP is more troublesome than the established JSP, because it adds a level of decision yet beside that sequencing i.e. job routes. Towards job route decides appropriate machine to process a particular operation among the available machines. Need to assign a job to a machine/resource to process it, Need to decide how many jobs can be assigned to each machine scheduling.

Methodologies

Scheduling is the process by which look at the time available for job, and plan how it will use it to achieve the goals. Manufacturing scheduling theory is concerned with the right allocation of machines to operations over time. The basic work of scheduler is to design an optimal FMS schedule according to a certain measure of performance, or scheduling criterion. This work focuses on productivity oriented-make span criteria. Make span is the time length from the starting of the first operation of the first demand to the finishing of the last operation of the last demand. The approaches used in this work were the comparison based on four heuristic algorithms namely Gupta's algorithm, CDS algorithm were proposed. Here the main objective is to find the efficient heuristics algorithm for minimizing the make span. In this work hierarchical approach were used to determine the optimal make span criteria. Machine utilization and production rate

are used as the criteria for evaluating part input and scheduling procedures.

Flow Shop Scheduling Methods

Heuristics for general 3-Machine Problems

1. Gupta's Heuristic Algorithm.
2. CDS Heuristic Algorithm.

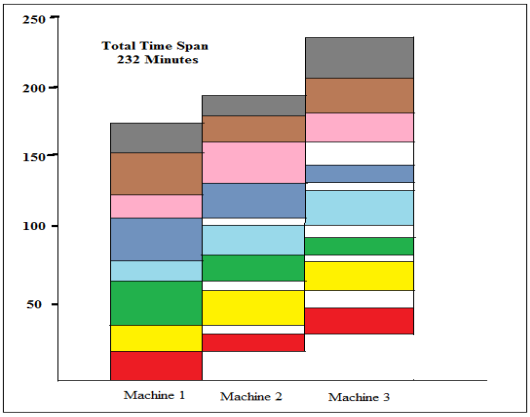

Fig. 1 Observation flow time

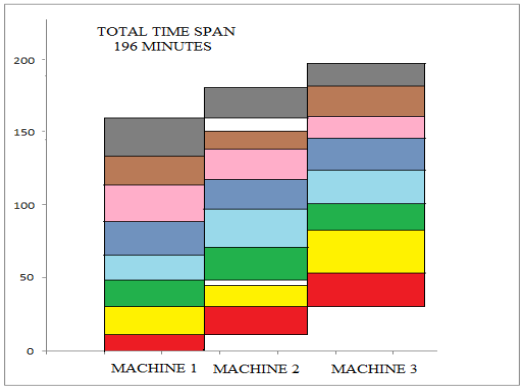

Fig. 2 Result obtained

Discussion

Instances of the job shop problem (10x10, 8x15, 5x10, 10x 15, 5x15, 5x20, 6x24, 10x20,) are considered. Three machines can influence the decision variables. Several cases with different values of this parameter are studied. However, in each case, it is assumed that the machine time is known as soon as it occurs. This machines has a direct consequence on the number of operation that are fixed and indirectly reflects on the total number of operation present in the potential re-scheduling. The different simulations tested in this research consider various times of these three machines. From the above two method the obtained sequence times are less tha the observation time span. Both method has reduce the time span of job shop but gupta's heuristic rule has reduce maximum time span i;e 196 and CDS rule take 200 time to complete all operation in here machines. Reducing the time span of the scheduling method deteriorates the increasing production rates. In addition, if the operation occurs early in the schedule as per order of machines and does not affect delay time, it is possible to cover up delay time in the job shop scheduling approach. Each optimization problem must have an objective function which has to be either minimized or maximized in order to get a solution. In this case the objective function is the make span value or the length of the schedule. The make span value can be defined as follows: Here each job has a no operations and each operation has a particular make time. When these make times are arranged in the sequence of the schedule then each machine gets one particular make time. Out of all the machines the machines which have the maximum make time that is the make span value, there comparison graph are shown in fig. 3.

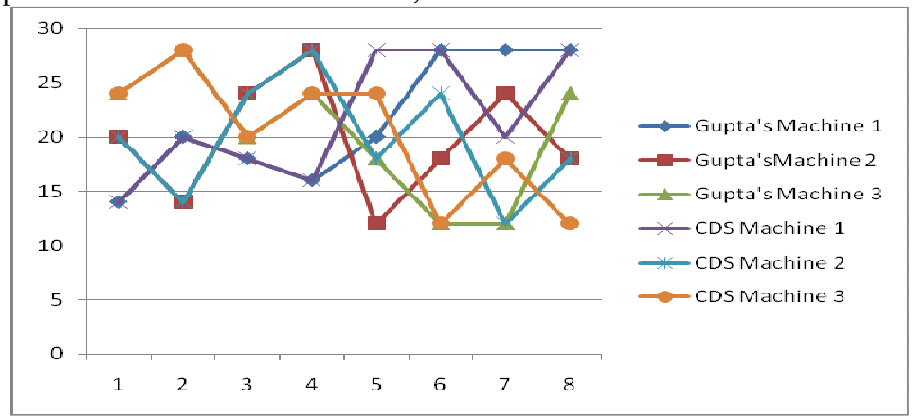

Fig 3 Comparison Graph of Machines

Conclusion

This work arranges the jobs in a particular order and gets many combinations and chooses that combination where we get the minimum make span. This study try to solve the problem of a flow shop scheduling with the objective of minimizing the makes pan. Here the objective is to minimize the make span of batch-processing machines in a flow shop. Comparison based on Gupta's heuristics, CDS heuristics are proposed here. Analytic solutions in all the heuristics are investigated. Gantt chart was generated to verify the effectiveness of the proposed approaches. Further research may be conducted to investigate the applications of other meta heuristics to the lot-streaming flow shop problem.

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