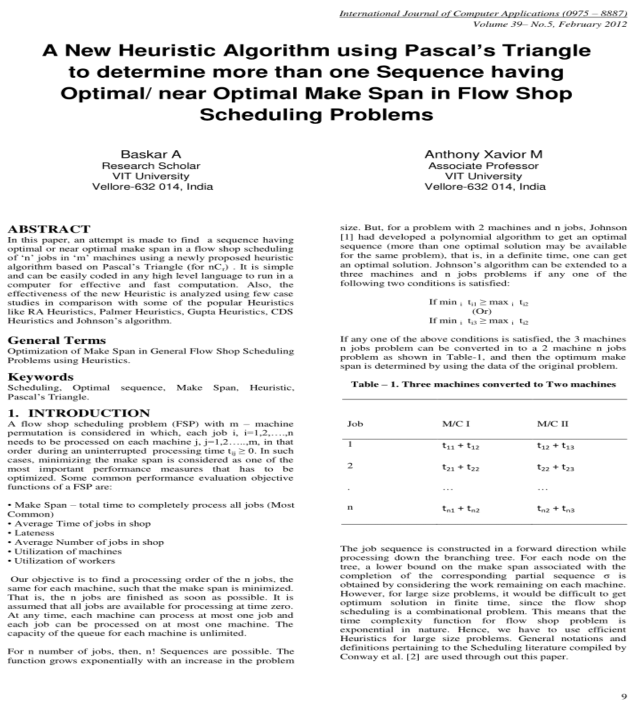
Multi-objective Flowshop Scheduling: A Genetic Algorithmic Approach



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A New Heuristic Algorithm using Pascal's Triangle to determine more than one Sequence having Optimal/ near Optimal Make Span in Flow Shop Scheduling Problems

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ABSTRACT
In this paper, an attempt is made to find a sequence having optimal or near optimal make span in a flow shop scheduling of 'n' jobs in 'm' machines using a newly proposed heuristic algorithm based on Pascal's Triangle (for nC_r) . It is simple and can be easily coded in any high level language to run in a computer for effective and fast computation. Also, the effectiveness of the new Heuristic is analyzed using few case studies in comparison with some of the popular Heuristics like RA Heuristics, Palmer Heuristics, Gupta Heuristics, CDS Heuristics and Johnson's algorithm.

General Terms
Optimization of Make Span in General Flow Shop Scheduling Problems using Heuristics.

Keywords
Scheduling, Optimal sequence, Make Span, Heuristic, Pascal's Triangle.

1. INTRODUCTION
A flow shop scheduling problem (FSP) with m – machine permutation is considered in which, each job i, i=1,2,….,n needs to be processed on each machine j, j=1,2…..,m, in that order during an uninterrupted processing time $t_{ij} \geq 0$. In such cases, minimizing the make span is considered as one of the most important performance measures that has to be optimized. Some common performance evaluation objective functions of a FSP are:

- Make Span – total time to completely process all jobs (Most Common)
- Average Time of jobs in shop
- Lateness
- Average Number of jobs in shop
- Utilization of machines
- Utilization of workers

Our objective is to find a processing order of the n jobs, the same for each machine, such that the make span is minimized. That is, the n jobs are finished as soon as possible. It is assumed that all jobs are available for processing at time zero. At any time, each machine can process at most one job and each job can be processed on at most one machine. The capacity of the queue for each machine is unlimited.

For n number of jobs, then, n! Sequences are possible. The function grows exponentially with an increase in the problem size. But, for a problem with 2 machines and n jobs, Johnson [1] had developed a polynomial algorithm to get an optimal sequence (more than one optimal solution may be available for the same problem), that is, in a definite time, one can get an optimal solution. Johnson's algorithm can be extended to a three machines and n jobs problems if any one of the following two conditions is satisfied:

$$\text{If } \min_i t_{i1} \geq \max_i t_{i2}$$
(Or)
$$\text{If } \min_i t_{i3} \geq \max_i t_{i2}$$

If any one of the above conditions is satisfied, the 3 machines n jobs problem can be converted in to a 2 machine n jobs problem as shown in Table-1, and then the optimum make span is determined by using the data of the original problem.

Table – 1. Three machines converted to Two machines

Job	M/C I	M/C II
1	$t_{11} + t_{12}$	$t_{12} + t_{13}$
2	$t_{21} + t_{22}$	$t_{22} + t_{23}$
.	…	…
n	$t_{n1} + t_{n2}$	$t_{n2} + t_{n3}$

The job sequence is constructed in a forward direction while processing down the branching tree. For each node on the tree, a lower bound on the make span associated with the completion of the corresponding partial sequence σ is obtained by considering the work remaining on each machine. However, for large size problems, it would be difficult to get optimum solution in finite time, since the flow shop scheduling is a combinational problem. This means that the time complexity function for flow shop problem is exponential in nature. Hence, we have to use efficient Heuristics for large size problems. General notations and definitions pertaining to the Scheduling literature compiled by Conway et al. [2] are used through out this paper.

In this paper, we consider the problem of extended permutation flowshop scheduling with the intermediate buffers. The Kanban flowshop problem considered.Request PDF on ResearchGate   Multi-objective Flowshop Scheduling: A Genetic Algorithmic Approach   This work attempts to develop an algorithm in the area.A genetic algorithmic approach to multi-objective scheduling in a Kanban- controlled flowshop with intermediate buffer and transport constraints.Multi-objective Flowshop Scheduling: A Genetic Algorithmic Approach [S. Deva Prasad] on mydietdigest.com *FREE* shipping on qualifying offers. This work.Abstract Since multi-objective flow shop scheduling problem (MFSP) plays a .. [29] proposed an interactive genetic algorithm-based framework for optimizing.In this paper, a Multi Objective Genetic Algorithm (MOGA) is proposed to derive the optimal machine-wise priority dispatching rules (pdrs) to.A hybrid flowshop scheduling problem (HFSP), as described by Linn and . [11] proposed multi-objective genetic algorithm (MOGA). [38] showed how they can incorporate simulation into genetic algorithm approach to the scheduling of a.This seller is currently away until May 16, , and is not processing orders at this time. You can add this item to your watch list to purchase later.S. M. Johnson, Optimal two- and three-stage production schedules with setup C. R. Reeves, A genetic algorithm for flowshop sequencing, Computers and with multiple objectives - A genetic algorithmic approach, Production Planning.this approach is a Pareto solution may be discarded in this evolutionary mechanism Multi-objective Messy Genetic Algorithm (MOMGA and. MOMGA-II)[26,27], . of the problem structure of multi-objective permutation flow shop scheduling.genetic algorithm and variable neighborhood mydietdigest.com [5]Flow shop scheduling to minimize the total completion . In this paper an ant colony optimization (ACO) method is presented to solve multi objective flow shop scheduling problem.C.: Scheduling in flowshop and cellular manufacturing systems with multiple objectives a genetic algorithmic approach. Production Planning & Control 7.(US); Bookseller Inventory #: ; Title: Multi-objective Flowshop Scheduling: A Genetic Algorithmic Approach; Author: S. Deva Prasad; Book condition.A Promising Genetic Algorithm Approach To JobShop Scheduling, Multi- Objective Genetic Algorithm and it's Application to Flowshop Scheduling. Computers.1 E-constraint method. 2 Tchebycheff .. with Multiple. Objectives: A Genetic Algorithmic Approach. . R., Flow Shop Scheduling with Multiple Objective of.Hiroyuki Tamura, A new multiobjective genetic algorithm with distribution algorithm for multi-objective permutation flow shop scheduling problem, Int. J. Prod. . The fuzzy ARTMAP method is better suited to the problem of.Geiger, M.J.: Improvements for multi-objective flow shop scheduling by Pareto Iterated Kariv, O., Hakimi, S.L.: An algorithmic approach to network location problems. genetic local search in memetic algorithms for multiobjective permutation.However, multi-objective approach for scheduling to reduce the total . Colin R. Reeves, A genetic algorithm for flowshop sequencing.

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