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Multistage Flow-Shop Scheduling With Weighted Jobs

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ABSTRACT: *There are so many techniques to attempt multistage flow shop scheduling problem. A few of techniques may be described as critical path method. Branch-Bound algorithms method of adjacent pair wise job inter change hemistich method, and Guatts method etc. This paper develops multistage scheduling with weight of job. The weight of a job shows the relative priority over some other job in a schedule of job. Higher the weight a job has become more important in comparison with other job in the operating schedule. An idle Waiting time operation Oiw is Recently introduced by* ***Maggu and Das (1980)*** *in scheduling Theory operation techniques is an easy approach in economical and computational senses to solve equipment job for job block multistage flew shop scheduling problem.*

The scheduling problem arise when inventory costs for jobs are involved. There Are two types of scheduling problems: weighted and simple. Further the Scheduling problem involving "weight" of jobs is referred to as "weighted Scheduling problems" whereas the scheduling problem does not involve "weight" Of job is called "simple" or un weighted scheduling problem".

The Paper presents the heuristic approach for multistage flow shop weighted Scheduling problem in the reference of ***Maggu (1982)*** *study. In the multistage flow shop problem each job consists of several tasks which require processing by district*

Resources but there is a common route for all jobs. Recently ***Miyzaak in(1980) and Maggu in (1982)*** *have studied flow shop scheduling problem in which computational algorithm for the optimal or near optimal solution of the problem are described. Improving local search heuristics for some scheduling problem have given by P.Bruker J.Hurnik and F.Werever in (1997) and weighted flow tome bounds for scheduling identical processor is given by S.Webster in (1995). Scheduling identical parallel machine to minimize total weighted completion time is given by H.Belouadah and C.N Posts in 1994.*

KEYWORDS: *Multistage flow shop scheduling, Branch-Bound algorithms, weighted.*

I. MATHMATICAL ANALYSIS

Flow shop model with weights can be stated as follow:-

1- Let n be the no of job processed and ith job in the arbitrarily sequence S can Be denoted by ji where (i=1,2,3,……n) all jobs become avaolable for Processing at time t=0.

2- The manufacture system consists of different machine which are numbered According to order of production stage. Let Mj be the jth machine in the.
System where (j=1,2,3……). Each machine can only process one job at a time and each job can only processed by one machine at any time.

3- Every job is completed through the same production ordering that is
M1 M2 ⟶

4- Let Mij denote the processing time of job ji on Mj set up times for operation Are sequences independent and are include in the processing time. Handling Times are assumed to be neglected.

5- Fj (i) devote the partial flow time of ji counted form the starting time of first Job j1 on M1 to be the completion time of J1 on M1 in particular, Fm (i) is Called as flow time a f ji.

6- The same job sequence occurs in each machine, in other words no passing is Allowed in the shop.

7- Each job is assigned weight Wi according to its importance.

8- The performance measure is weighted mean flow time define by

$$Fw \quad \{\sum_{i=1}^{n} Wi\, Fm(i)\}/\sum Wi$$

9- n*F*w express ~~the~~ total weighted flow time.

Heuristic algorithm for optimal or near optimal solution, the heuristic approach m is given by into following steps.

Step1- Find Min (Mij) for every i=1,2,3…n j=1,2

Step2- (i) if Min (Mij) = Mi1 then
J
M'11 =Mi1-Wi
M'12 = Mi2

` (ii) if Min (Mij) = Mi2 then
M'i1 = Mi1
M'i2 = Mi2 +wi

Step3- Formulate a new problem as below

Job	Machine A	Machine B
(i)	M1	M2
	M'i1/wi	M'i2/wi
1	M'11/w1	M'12/w1
2	M'21/w2	M'22/w2
3	M'31/w3	M'32/w3
-	-	-
-	-	-
N	M'n1/wn	M'n2/wn

Step4- Apply Johnson's (1994) procedure to find optimal solution for Reduce problem in step 3.

Step5- One of the sequence thus obtained in step 4 is either optimal or Near to optimal for the original problem minimizing the weighted Mean flow time.

2. Numerical illustration

we will silve our problem one by one as according Maggu and Miyazaki consider "7 – job 2- machine" flow shop scheduling problem with weight as in the Following table:

Job	Machine M1	Machine M2	Weights
i	Mi1	Mi2	Wi
1	4	7	3
2	6	11	5
3	10	14	6
4	15	19	4
5	24	21	1
6	26	22	2
7	30	25	8

Table 1.1

Find optimal and near optimal scheduling minimizing the weighted mean flow time

By step 1 – we find
Min (Mi) I = 1,2,3,4,5,6
J = 1,2
Min (M11,M12) = Min (4,7) = 4
M'11 = M11-w1
4 - 3 = 1
M12' = M12 = 7
Min (M12,M22) = Min (6,11) = 6
M'21 = 6 - 5 = 1
M22' = M22 = 11

Min (M31 , M32) = Min (10 , 14) = 10
M31' = 10 - 6 = 4
M32' = M32 = 14
Min (Min 41 , M42) = Min (15 , 19) = 15
M41' = 15 – 4 = 11

By Step 2
Min (M51 , M52) = Min (24 , 21) = 21
M52' = 21 + 1 = 22
M51' =M51 = 24
Min (M61,M62) = (62 , 22) = 22
M62' = 22+2 =24
M61' = M61 = 26
Min (M71, M72) = Min (30 , 25) = 25
M72 =25 + 8 = 33
M71' = M71 = 30

By Step 3 - Formulation a new problem as below:
.

Job	Mavhine	Machine
i	M1	M2
1	1/3	7/2
2	1/5	11/5
3	4/6 = 2/3	14/6=7/2
4	11/4	19/4
5	24/1=24	22/1=22
6	26/2=13	24/2=12
7	30/8=15/4	33/8

Table 1.2

By Step 4- with the help of Johnson (1954) method the reduce problem gives us the optimal schedule. 2.1.3.4.7.5.6.

Now the weighted mean flow time for this sequence 2,1,3,4,7,5,6

Job	Machine	Machine
(i)	M1	M2
	In - out	In - out
2	0-6	6 - 17
1	6-10	17 - 24
3	10-20	24 – 38
4	20-35	38 - 57
7	35-65	65 – 90
5	65-89	90 – 111
6	89-115	115 - 140

Table 1.3

Here F2(1) = 6 , F2 (2) = 17 , F2 (3) = 24 , F2 (4) = 38
F2 (5) = 65 , F2 (6) = 90 , F2 (7) = 115

$$F_w = \frac{\sum w_i F_i}{\sum w_i}$$

(i) $\frac{3x6 + 5x17 + 6x24 + 4x38 + 1x38 + 2x90 + 8x115}{3 + 5 + 6 + 4 + 1 + 2 + 8}$

(ii) $\frac{18 + 85 + 144 + 152 + 65 + 180 + 920}{29}$

$= \frac{1564}{29} = 53.93$

Now this schedule 2,1,3,4,7,5,6 is near optimal to the schedule 1,2,3,4,5,6,7

Which gives weighted mean flow time as?

$$\frac{1492}{29} = 51.44$$

II. CONCLUSION

The model presented in the section is near to real time of left communication Our study provides a guideline to be system based on optimal continue policy.

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