Scheduling

Notes 10

Palmer's Heuristic for Minimizing Makespan in Flow Shop Problems

- This algorithm will try and find out a weighted sum for each of the jobs. So, we will try and give some weights to each of these machines, and then we find a weighted sum for every job.
- The algorithm has 2 steps.
- Step 1: For n job m machine flow shop problem, determine the slope Ai for i th job.
- $A_i = -\sum_{j=1}^{m} \{m - (2j-1)\} P_{ij}$
- Step 2: Order the jobs in the sequence based on decreasing order of the Ai values.
- Find Cmax value.

Example

Machine / Job	1	2	3
1	6	5	4
2	8	1	4
3	3	5	4
4	4	4	2

Solution

	m=1	m=2	m=3	
Job	3-(2x1-1)=2	3-(2x2-1)=0	3-(2x3-1)=-2	Ai
1	6	5	4	-4
2	8	1	4	-8
3	3	5	4	2
4	4	4	2	-4

Sequences: 3-1-4-2 or 3-4-1-2

Finding Cmax for the 3-1-4-2 Sequence

	1	2	3
3	3/3	5/8	4/12
1	6/9	5/14	4/18
4	4/13	4/18	2/20
2	8/21	1/22	4/26

Cmax: 26

Finding Cmax for the 3-4-1-2 Sequence

	1	2	3
3	3/3	5/8	4/12
4	4/7	4/12	2/14
1	6/13	5/18	4/22
2	8/21	1/22	4/26

Cmax: 26

According to Palmers's heuristic 3-1-4-2 and 3-4-1-2 are the best sequences.

Comparing CDS, (NEH)and Palmer's algorithms

	M1	M2	M3
J1	16	18	12
J2	14	10	11
J3	13	20	15

CDS

- According to CDS 3-1-2 is the best sequence and Cmax is 74.

	M1	M2	M3
J3	13/13	20/33	15/48
J1	16/29	18/51	12/63
J2	14/43	10/61	11/74

NEH heuristic

- 3-2-1 is the best sequence and Cmax is 73.

	M1	M2	M3
J3	13/13	20/33	15/48
J2	14/27	10/43	11/59
J1	16/43	18/61	12/73

Palmer’s Heuristic

- According to Palmer’s heuristic the best sequence is 3-2-1 and Cmax is 73.

N Job M Machine Heuristics in Job Shop Scheduling Problems

- In job shop problems, there are different routes for different jobs.
- Each job has a pre specified route or order of visit of the machine, it is also not absolutely necessary that all the jobs will visit all the machines.

- In job shop scheduling problems, different heuristics can be used to solve the problem. Some of the methods are based on dispatching rules and some of them are not.
- Most common dispatching based methods are SPT, LPT or EDD based approaches. They are easy to understand and implement.
- First off all, the dispatching rule is determined and then the Gantt chart is drawn and the solution is found.
- We analyze SPT based heuristic for job shop scheduling problem.

- We will not keep a machine idle if there are jobs waiting in front of it.
- If we have to choose between two jobs or among a set of jobs that are waiting, we would pick a job which has the smallest processing time.

There are 3 jobs , 3 machines job shop problem. We will find Cmax according to SPT based heuristic.

J1	M1 (7)	M3(8)	M2 (10)
J2	M2(6)	M1(4)	M3(12)
J3	M1(8)	M2(8)	M3(7)

Cmax is 40

Resources

- Algorithms for Sequencing and Scheduling, Ibrahim M. Alharkan
- https://fenix.tecnico.ulisboa.pt/downloadFile/282093452004307/5.1%20-%20Scheduling.pdf
- http://nptel.ac.in/reviewed_pdfs/110106045/lec27.pdf
- http://prolog.univie.ac.at/teaching/LVAs/KFK-PM/SS08/pm_ch8.pdf
- https://nptel.ac.in/reviewed_pdfs/110106045/lec28.pdf