Scheduling

Notes 12

Assignment Problems

- They determine which job is processed on which machine with minimum cost.

Job 1

Job 2

Job 3

Job 4

Job 5

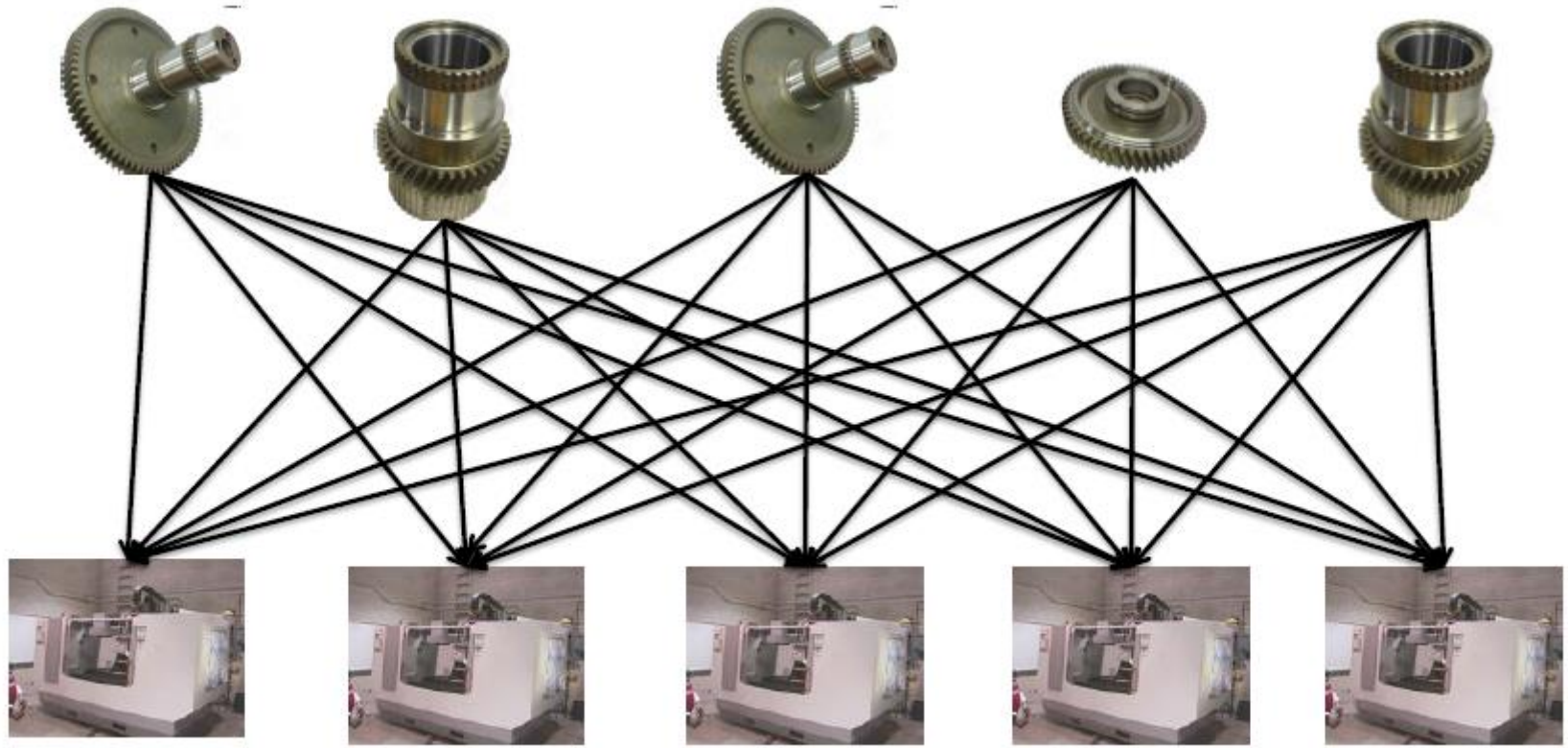
Machine A

Machine B

Machine C

Machine D

Machine E



The Hungarian Method

- Step 1: Subtract the lowest number in each row from the numbers in that row so that each row will contain at least one Zero (0).
- Step 2: Subtract the lowest number in each column from the numbers in that column so that each column will contain at least one Zero (0).
- Step 3: Cross all zeros with as few straight lines as possible.
- Step 4: Add the lowest number among the uncovered numbers to the numbers where the lines cross.
- Step 5: Subtract the lowest number among the uncovered numbers from the uncovered numbers.
- Step 6: Use the new matrix and assign the jobs to machines that have achieved zero in the corresponding cells.
- Step 7: Use the original matrix to find the total cost for the assignment.

- There are 5 jobs and 5 machines. Find the optimal assignment with minimum cost.

	A	B	C	D	E
1	20	40	60	40	30
2	30	50	40	30	10
3	40	10	20	30	50
4	50	60	30	20	30
5	20	30	60	50	40

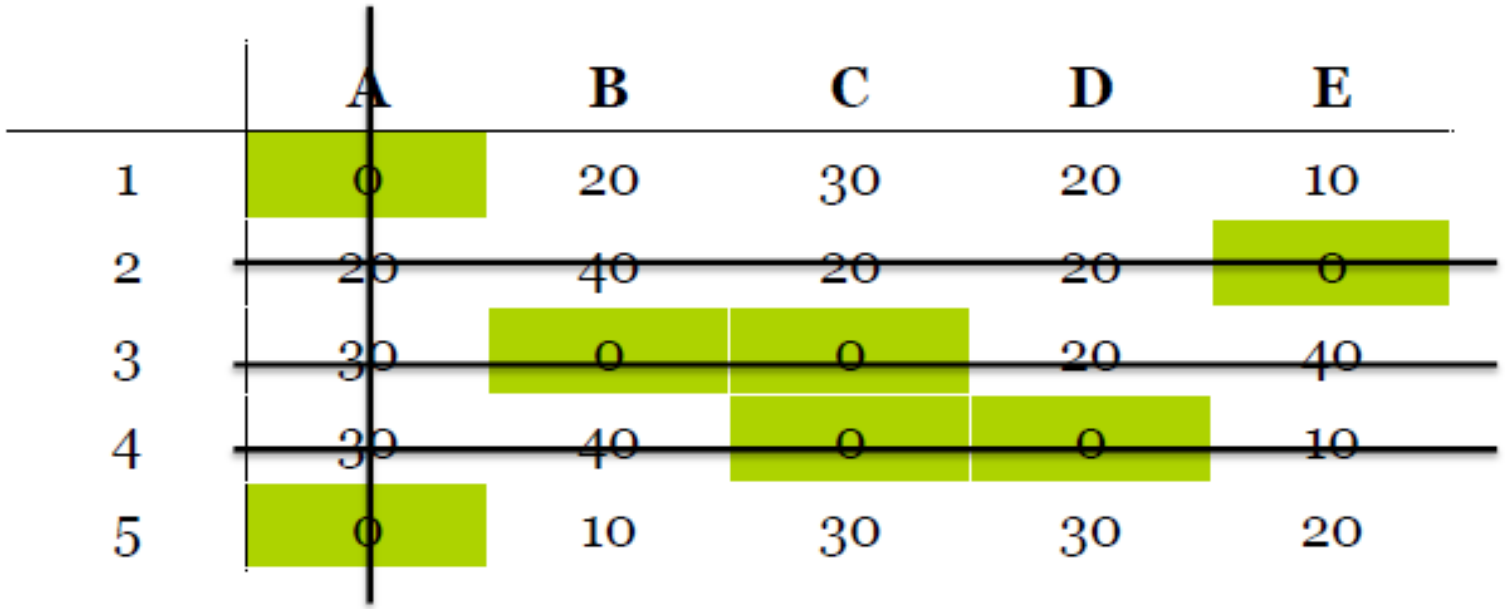
Step 1

	A	B	C	D	E
1	0	20	40	20	10
2	20	40	30	20	0
3	30	0	10	20	40
4	30	40	10	0	10
5	0	10	40	30	20

Step 2

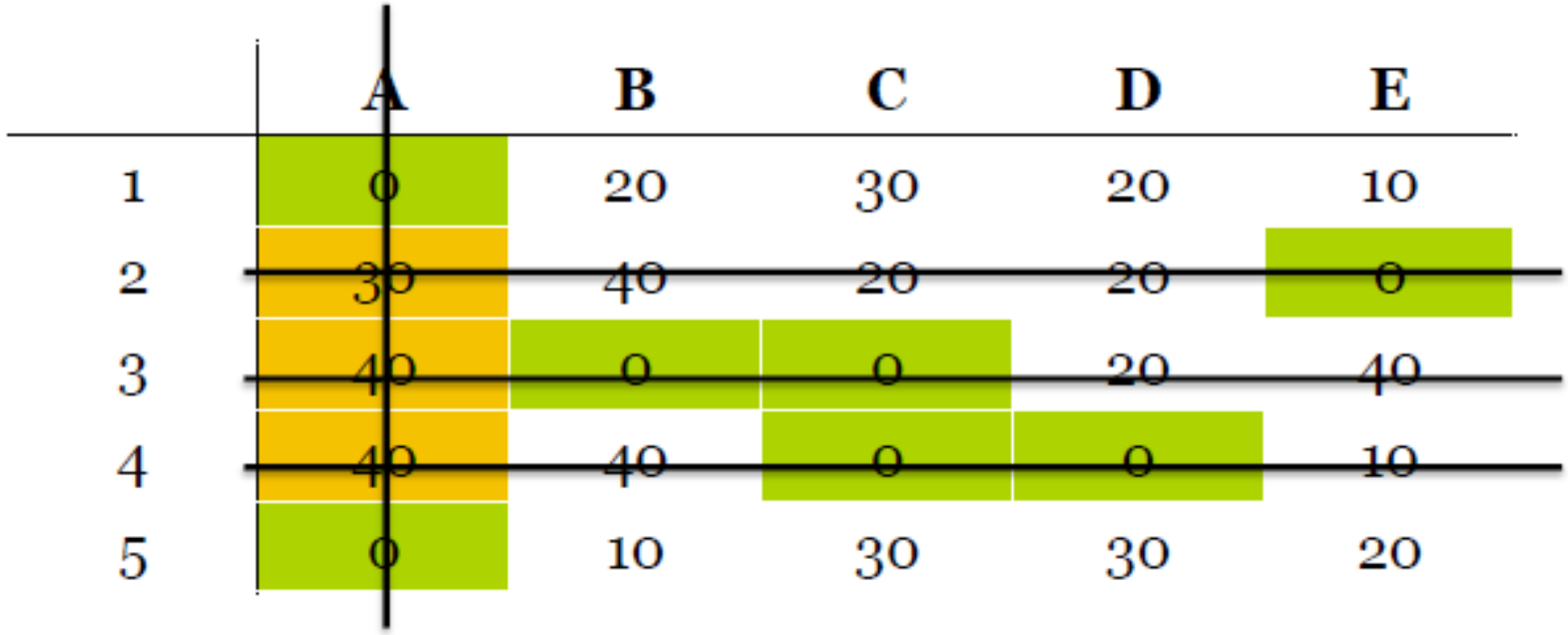
	A	B	C	D	E
1	0	20	30	20	10
2	20	40	20	20	0
3	30	0	0	20	40
4	30	40	0	0	10
5	0	10	30	30	20

Step 3



	A	B	C	D	E
1	0	20	30	20	10
2	20	40	20	20	0
3	30	0	0	20	40
4	30	40	0	0	10
5	0	10	30	30	20

Step 4



	A	B	C	D	E
1	0	20	30	20	10
2	30	40	20	20	0
3	40	0	0	20	40
4	40	40	0	0	10
5	0	10	30	30	20

Step 5

	A	B	C	D	E
1	0	10	20	10	0
2	30	40	20	20	0
3	40	0	0	20	40
4	40	40	0	0	10
5	0	0	20	20	10

Step 6

	A	B	C	D	E
1	0	10	20	10	0
2	30	40	20	20	0
3	40	0	0	20	40
4	40	40	0	0	10
5	0	0	20	20	10

Step 7

- Total cost = 20+10+20+20+30 =100

Resources

- Algorithms for Sequencing and Scheduling, Ibrahim M. Alharkan,
- www.csus.edu/indiv/b/blakeh/mgmt/documents/opm101chapter15_000.ppt
- http://zoomin.idt.mdh.se/course/KPP227/Documents/LE9_Scheduling.pdf
- http://nptel.ac.in/courses/110106046/Module%208/Lecture%203.pdf
- http://www.math.harvard.edu/archive/20_spring_05/handouts/assignment_overheads.pdf