

Manual for the Single/Multi machine Simulation Tool

Algorithms

EDD
 SPT
 WSPT
 Hodgson
 ATC
 M. Hodgson

Processing Time: Number of jobs:

Due Date:

Weight:

Machines
 1
 2
 3

ID	PT	DD	W	ID	PT	DD	W	CT	E	T
1	7.0	13.0	1.0	2	2.0	13.0	3.0	2.0	11.0	0.0
2	2.0	13.0	3.0	8	5.0	20.0	2.0	5.0	15.0	0.0
3	10.0	16.0	2.0	1	7.0	13.0	1.0	7.0	6.0	0.0
4	3.0	24.0	1.0	4	3.0	24.0	1.0	5.0	19.0	0.0
5	9.0	6.0	3.0	9	6.0	49.0	3.0	13.0	36.0	0.0
6	7.0	10.0	3.0	10	10.0	27.0	2.0	15.0	12.0	0.0
7	10.0	14.0	2.0	3	10.0	16.0	2.0	15.0	1.0	0.0
8	5.0	20.0	2.0	6	7.0	10.0	3.0	22.0	0.0	12.0
9	6.0	49.0	3.0	7	10.0	14.0	2.0	23.0	0.0	9.0
10	10.0	27.0	2.0	5	9.0	6.0	3.0	24.0	0.0	18.0

Cmax: 24
 Lmax: 18
 Tmax: 18
 Completion Time: 131
 Weighted Completion Time: 311
 Tardiness: 39
 Weighted Tardiness: 108
 Number of Tardy Jobs: 3
 Weighted Number of Tardy Jobs: 8

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1 Introduction

The purpose of this tool is to show how the different algorithms for the single and multi machine problem work. Included are the EDD, SPT, WSPT, ATC, Hodgson and the modified Hodgson algorithm. As this tool was created for teaching purposes it may not be able to handle very large number of jobs. This manual shows you how to input the Data of the jobs, select the algorithm, select the number of machines, where to find the results and which part of the animation represents what.

2 Algorithms

2.1 EDD

The EDD algorithm sorts the jobs with respect to their due date, starting with the lowest. It is used to minimize the maximal tardiness (lateness).

2.2 SPT

It sorts the jobs with respect to their processing time, starting with the shortest one. This algorithm is used for minimizing the flowtime and the lateness.

2.3 WSPT

To minimize the weighted flowtime, the jobs are sorted by their processing time divided by their weight.

2.4 ATC

This algorithm is used for minimizing the total (weighted) tardiness. For each job an individual priority is calculated which depends on its weight, processing time, due Date and the average processing time of all jobs.

2.5 Hodgson and modified Hodgson

The Hodgson/modified Hodgson algorithm minimizes the number of tardy/weighted tardy jobs by putting jobs with long processing time at the end.

3 How to use the tool

3.1 Data input

There are three ways to input data, which cannot be mixed during one run:

1. Manually
2. Random generation
3. Reading data from a file

3.1.1 Manual input

To create a specific job it is necessary to enter the data in the fields and click on the add button.

Processing Time:	<input type="text" value="0"/>
Due Date:	<input type="text" value="0"/>
Weight:	<input type="text" value="1"/>
	<input type="button" value="add"/>

After adding all jobs the start button on the left side has to be clicked.

3.1.2 Random Generation

To generate random jobs you first have to enter the number of jobs in the according box and then press the Start Random button.

Number of jobs:

3.1.3 Reading data from a file (not in applet version)

The file from which the data is read has to be an excel file called Data.xls and the area of the data has to be called ParametersTable. The first column called ID, stores the ID of the jobs. The second one (PT) stores the processing time, the third (DD) the due date and the last column (W) the weight of the jobs as shown in the next graphic:

ParametersTable $f(x)$ Σ = W				
	A	B	C	D
1	ID	PT	DD	W
2	1	9	37	5
3	2	1	67	1
4	3	2	71	5
5	4	10	27	1
6	5	1	130	4
7	6	3	23	5
8	7	8	167	1
9	8	11	92	1
10	9	6	23	2
11	10	5	103	2
12	11	8	40	2
13	12	8	50	4
14	13	10	109	1
15	14	1	45	2
16	15	8	78	2
17	16	8	173	4
18	17	9	65	3
19	18	9	116	1
20	19	10	109	5
21	20	7	60	1
22	21	8	88	5
23	22	7	38	5
24	23	4	95	2
25	24	10	74	5
26	25	11	173	4
27	26	1	149	2
28	27	7	91	1
29	28	6	83	4
30	29	6	172	3
31	30	6	170	4
32				

3.2 Selecting an algorithm

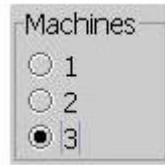
The algorithms can be chosen at the radio buttons on top.

Algorithms

EDD
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 Hodgson
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 W. Hodgson

3.3 Selecting the number of machines

The radio buttons in the middle are used for selecting the number of machines, where 1, 2 or 3 machines can be selected.



3.4 Output

There are 3 areas where data is shown:

1. The results at the bottom
2. The Incoming jobs on the right
3. The finished jobs on the right

3.4.1 Results

The results are shown on the bottom and are updated whenever a job is finished.

Cmax: 0
Lmax: 0
Tmax: 0
Completion Time: 0
Weighted Completion Time: 0
Tardiness: 0
Weighted Tardiness: 0
Number of Tardy Jobs: 0
Weighted Number of Tardy Jobs: 0

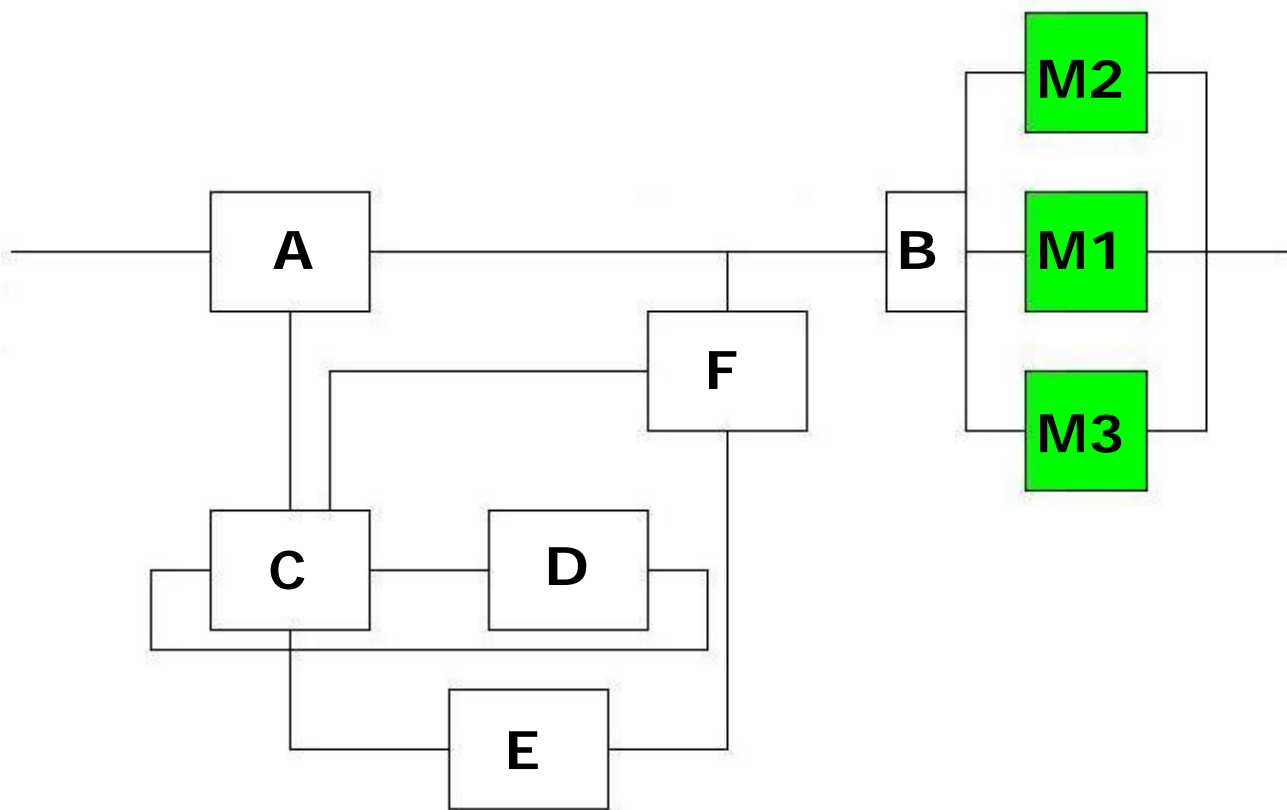
3.4.2 Jobs

The jobs are shown on the right side. The first column shows the incoming and the second the finished jobs, where ID stands for the number/ID of the job, PT for the processing time, DD for the due Date, W for the weight, CT for the completion time, E for the earliness and T for the tardiness of each job.

ID	PT	DD	W	ID	PT	DD	W	CT	E	T
1	7.0	13.0	1.0	2	2.0	13.0	3.0	2.0	11.0	0.0
2	2.0	13.0	3.0	8	5.0	20.0	2.0	5.0	15.0	0.0
3	10.0	16.0	2.0	1	7.0	13.0	1.0	7.0	6.0	0.0
4	3.0	24.0	1.0	4	3.0	24.0	1.0	5.0	19.0	0.0
5	9.0	6.0	3.0	9	6.0	49.0	3.0	13.0	36.0	0.0
6	7.0	10.0	3.0	10	10.0	27.0	2.0	15.0	12.0	0.0
7	10.0	14.0	2.0	3	10.0	16.0	2.0	15.0	1.0	0.0
8	5.0	20.0	2.0	6	7.0	10.0	3.0	22.0	0.0	12.0
9	6.0	49.0	3.0	7	10.0	14.0	2.0	23.0	0.0	9.0
10	10.0	27.0	2.0	5	9.0	6.0	3.0	24.0	0.0	18.0

3.5 The animation

The jobs are animated with the following rectangles and lines:



The rectangles C-F are only used for the Hodgson algorithms. In rectangle A the jobs are sorted for the EDD, SPT, WSPT and ATC algorithm. Rectangle C and D select which job will be put at the end. These job is stored in rectangle E. The rectangles F and B are used for collecting all jobs before sending them to the machines, which are represented by the rectangles M1, M2 and M3.

3.6 Known Bugs

The simulation wont work properly if the engine/animation is started in virtual time mode. Then only 2 jobs will be created and an error occurs. Further the only possibility to see the data of all jobs, when more than 30 jobs are created is to scroll down by clicking and holding the right mouse button and dragging the whole animation.