

RESEARCH ARTICLE



ISSN: 2321-7758

SCHEDULING AND SIMULATION

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Article Received: 04/09/2013

Article Revised on: 12/09/2013

Article Accepted on:13/09/2013



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ABSTRACT

Now a day's manufacturers are facing rapid and fundamental changes in the ways business is done. Producers are looking for simulation systems increasing throughput and profit, reducing cycle time, improving due-date performance, etc. This paper discusses how simulation is used to design new manufacturing systems and to improve the performance of existing ones. While deterministic scheduling and simulation have often been seen as competing approaches for improving these systems, we will discuss four important roles for simulation when developing deterministic scheduling approaches. Topics to be discussed include: manufacturing issues addressed by simulation, simulation software for manufacturing applications, techniques for building valid and credible models, and statistical considerations.

Keyword: Optimization, performance evaluation, simulation, scheduling

INTRODUCTION

Simulation and scheduling are proven techniques in research and in industrial production. The idea of the use of simulation in production dates back to the 1960s of the last century. The current situation in the industry calls for still faster development in production, which seeks to directly respond to the wishes and needs of its customers – consumers. The ability to flexibly respond to rapidly changing conditions (market) may help to ensure the competitiveness of the enterprises of production simulation to others.

Computer simulation is one of the most effective means for the design of logistics and production processes and rationalization of procedures of management of production systems. Simulation of complex systems, we can easily examine what would be in practice too expensive or time-consuming, or even impossible.

We define as the process for the allocation of limited at the time of scheduling. The main idea is to

optimize one or more scheduling objects in the decision-making process.

Where can we use a simulation?

Simulation allows us to get a draft system after the implementation of the measures, to look into the future. Computer simulation supports the following decision. Selection of potential management strategies, the way to enter tasks into production, scheduling, allocation of tasks to each machine, ways to get through the system, individual tasks task order and how they transition system, evaluation of management strategies, determine the size of the batches, etc. Simulation is a means of support not only for managers but also for managers. Using the simulation obtained Director sure in that it will be possible in a given time frame scheduled tasks are actually carried out, and the animation during the manufacturing process can help to clarify and better understanding of the processes. Computer simulation of production is actually "test factory" on

your computer. Levels at which is used in a business simulation are shown in Figure 1.

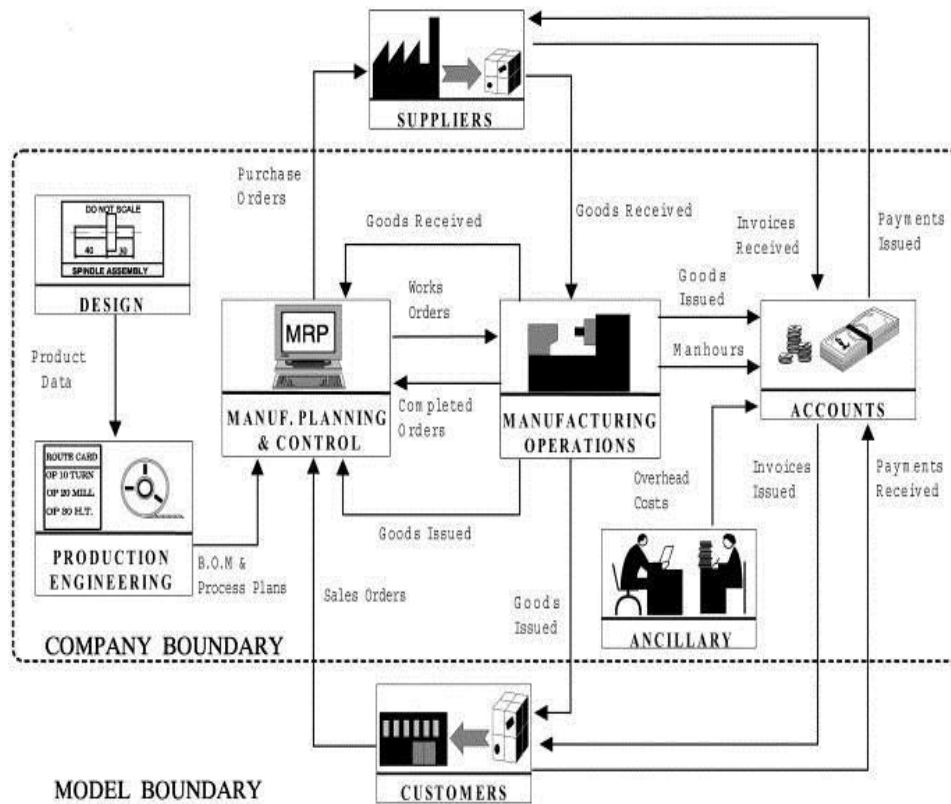


Fig.1: The levels at which are used in a business simulation

Among the methods of modeling and simulation in process of purposes not base on scheduling include:

- I) Comparison of the characteristics of a number of alternative proposals and support the selection of suitable schedule variations.
- II) To provide assurance that the final draft does not contain basic deficiencies.
- III) Shortening the time of putting a new schedule to update, if there are unexpected changes.
- IV) Identifying the possibility of narrow space and its possible backup-support
- V) The identification and testing of various tasks in the production of scheduling and strategy award.
- VI) For the preservation of a model for the use of knowledge in a repeating stage.
- VII) Provision of funds for the education and training of engineers through the system in the form of new production model training driving simulator.

SIMULATION PROGRAMS IN THE PRODUCTION SCHEDULING

In the production of a number of problems such as large transport distance, lack of capacity of storage facilities, poor layout of workplaces, downtime, excessive stocks, unavailability of workplaces during breaks, poorly planned procedure, excess or lack of personnel of individual operations, etc. These problems can be eliminated by using a simulation. Simulation systems and simulators have a wide selection of generators of random values that fully cover the requirement for the generation of random phenomena in the process of production. This would ensure a more realistic timetable for the production order.

Simulation programs designed to simulate the production system are many, for example- Simulator of Witness, (Skoda Auto Mlada Boleslav), eM-Plant (VW), Quest, Delmia, Arena, SIMUL8, Automod AweSim, SIMPLE ++, Cosimir and many more. Among the manufacturing companies of the world

class isn't that he did not use prediction technology as a standard management tool.

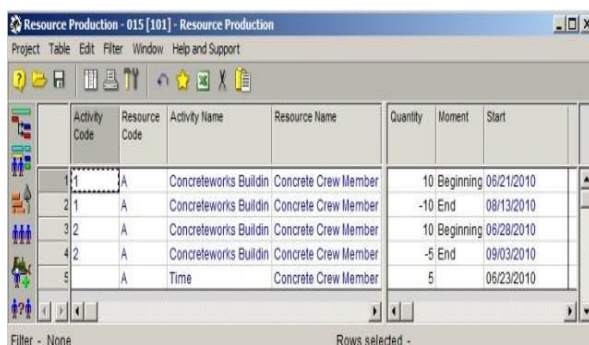
Model of the process allows the analyst to track the behavior of the process, the operations that can take a few days to be carried out in a matter of minutes. Simulation of the processes allows you to collect and analyze data, perform scheduling with them a variety of experiments and changes without the need to interrupt the running of the mission-critical operations.

Scheduling production and simulation system is to draw any information on production capacity and contracts of the database system planning and management of production. Transmission is possible according to international standards and ensures the rapid exchange of data.

Most commercial simulation packages used analytical method of "Monte Carlo". It is used for analyses that are too mathematically challenging (e.g., in the absence of an analytical solution) or for analyses that are financially very demanding.

The results of the simulation systems provide important information about the analysis process scheduling. Their analysis we obtain the information e.g. the schedule of work for each of the operators, a detailed overview of contracts, etc.

One of the biggest benefits of the simulation supported by the production of limited resources, such as planning schedules is the worker's condition or disorder. In this case, the workers can quickly and easily change production and divide its subordinate place, see picture 2.



Activity Code	Resource Code	Activity Name	Resource Name	Quantity	Moment	Start
1	A	Concreteworks Buildin	Concrete Crew Member	10	Beginning	06/21/2010
2	A	Concreteworks Buildin	Concrete Crew Member	-10	End	08/13/2010
3	A	Concreteworks Buildin	Concrete Crew Member	10	Beginning	06/28/2010
4	A	Concreteworks Buildin	Concrete Crew Member	-5	End	09/03/2010
5	A	Time	Concrete Crew Member	5		06/23/2010

Fig. 2 Model- Resource Production

The simulation is experimenting with a computer model of a real production system, with a view to optimizing the course of production. For simulation analysis it is important to know which simulation model correctly represents the system, i.e. which model is correct. When the model is not correct, then the results may not ever be used in the decision-making process.

A simulation based on the formation of the timetable, retrofitting and optimization

A simulation based on the formation of the timetable: The simulation can be used to establish a schedule with a planning horizon ranging from a few hours to days. Depends largely on the ability of creating a simulation model, which is the basis of the process and the system.

A simulation based on the improvements schedule

When we already have one and then use the timetable of the simulation, we can improve it or add other requirements that are not present in the original model.

Simulation based on optimization of timetable

Optimization is characterized by the use of meta-heuristic methods such as genetic

Algorithms, taboo search and simulated annealing. This technique can be used on a production system or only on his part and is computationally demanding.

SIMULATION USED FOR PARAMETER SETTINGS AND TEST INSTANCE GENERATION FOR SCHEDULING

A lot of scheduling problems are NP consuming. Using heuristic methods, we can get a solution to the problem. Some of the heuristics we need to accommodate a large range of different situations parameterized. Scheduling algorithm using the parameter, we can write the following:

- Find a job (high workload, the term to maturity ...) that exist in the production system.
- Find a view that assigns each task the appropriate parameters of the selected heuristics.
- Use the parameters associated with each task in step 2 that determine the production control instructions.

The value of the special-purpose function obtained using these parameters are determined by the simulation.

SIMULATION FOR EMULATION AND EVALUATION SCHEDULES

We have given scheduling a production problem. This simulation method consists of two major parts: the emulator for the real system and evaluation of the system. When using the emulator simulation is used to compare the alternatives scheduling production. Scheduling algorithm using the emulator we can write as follows:

- ✓ Representation of discrete simulation system.
- ✓ To create the interface between the scheduled model of production and part demand by simulation model.
- ✓ Enter the manufacturing process control, i.e. to determine which scheduling models can be deleted.
- ✓ Implement the schedule, obtained through the interface within the simulation.

The use of simulation for performance evaluation is a major drawback, that is, that it is often computationally demanding.

CONCLUSION

The simulation is becoming an important tool in the field of scheduling currently in production. Strongly supports the decision making workshop staff and contributes to significant improvement and speed up their work. Just a simulation takes into account the requirements that are needed in production. A simulation supported timetables of production shows over the traditional governance workshop contracts the benefits, for example realistic production plan with available resources, the simulation of the process we can include stochastic influences, we can optimize the production from different points of view, etc.

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