

System Simulation——Simio Technology and Application

Abstract: This book will explain the basic conceptions, principles and methods of system simulation especially the discrete system simulation. The introducing processes are consistent with the steps to solve the real system simulation project. In each chapter, combined with small targeted models, the new generation real 3D simulation software Simio will be taught step by step. Following this example teaching method, the reader can easily grasp the advantages and usage of Simio. In the end, through two larger models, the understanding of system simulation and Simio will be more deeply, the first one is a production system model and the second one is a logistics system model.

This book can be used as the system simulation course teaching material for undergraduate and graduate students (discrete system simulation course, manufacturing industrial system simulation course, logistics industrial system simulation course, service industry system simulation course, etc.). It also can be used as reference book for system analysis and optimization by simulation.

1. Introduction

1.1 System Simulation

1.1.1 System simulation basic concept

1.1.2 System simulation basic classification

1.2 Simulation Software

1.2.1 System simulation development history

1.2.2 Commonly used system simulation software

1.3 System simulation technology and application

1.3.1 System simulation technology and characteristics

1.3.2 System simulation applications

Chapter Summary

Exercises and experiments

References

2. Simio Elementary

2.1 Simio concepts

2.1.1 Object hierarchies

2.1.2 Object types

2.1.3 Processes

2.1.4 Tokens and Entities

2.1.5 Projects and Models

Each concept has the small targeted small models which can help the beginner easily grasp the basic concepts, features of Simio.

2.2 Simio queuing system modeling

2.2.1 Queuing system concept

2.2.2 Queuing system characteristics and performance index

2.2.3 Queuing system modeling example

2.3 Simio inventory system modeling

- 2.3.1 Inventory system concept
- 2.3.2 Inventory system characteristics and performance index
- 2.3.3 Inventory system modeling example
- 2.4 Simio flow system modeling
 - 2.4.1 Flow system concept
 - 2.4.2 Flow system characteristics and performance index
 - 2.4.3 Flow system modeling example
- Chapter Summary
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- References

Through the typical cases to introduce the user interface of Simio and to explain the concepts, characteristics and modeling methods of typical discrete system such as queuing system and inventory system, also explain the typical continuous system such as flow system. In this chapter, the reader can grasp the basic modeling technology of Simio while study the theories of system simulation through typical cases.

- 3. Input Data Analysis
 - 3.1 Input data analysis basic method
 - Concepts, steps and methods of Input data collection and analysis*
 - 3.2 Data collection and test
 - 3.3 Data distribution and fitting
 - 3.3.1 Theoretical distribution
 - 3.3.2 Empirical distribution
 - 3.4 Data directly using
 - Chapter Summary
 - Exercises and experiments
 - References

Input data analysis is the basic of system simulation. Through the Simio data processing tool and models, introduce the basic flow and three processing modes of input data (Fitting as theoretical distribution, Fitting as empirical distribution and directly using).

- 4. The Simulation Logic Control
 - 4.1 Entity produce logic
 - 4.2 Entity waiting and storage
 - 4.3 Entity path choice
 - 4.4 Entity process, combine and dispatch
 - 4.5 Resource
 - 4.6 Entity transport
 - 4.7 Complicated logic control
 - Chapter Summary
 - Exercises and experiments
 - References

Combined with typical small examples introduce the Simio simulation logistic control methods with object, processes, Definitions, Elements, Properties, States, Events, Functions, Lists, Tokens and Externals.

5. Simulation Debugging

5.1 Model checking and verification

5.2 Simio debugging tools and techniques

5.2.1 Simio window debugging tools

5.2.2 Simio animation graph debugging tools

5.2.3 Simio other debugging tools

Chapter Summary

Exercises and experiments

References

Simulation debugging is the insurance of simulation fitting degree and confidence. Combined with typical small examples introduce the concepts and methods of model checking and verification. Introduce the application of Simio debugging tools and techniques.

6. Simulation Result Analysis

6.1 Concepts and methods

6.1.1 Concepts

6.1.2 Termination type simulation results analysis

6.1.3 Nonterminal type simulation results analysis

6.2 Simio result analysis tools and techniques

6.2.1 Simio window debugging tools

6.2.2 Simio animation graph debugging tools

Chapter Summary

Exercises and experiments

References

Simulation result analysis is the key point of system simulation, no results effective analysis the simulation has no meaning. Combined with typical small examples introduce the concepts and methods of simulation result analysis. Introduce the application of Simio simulation result analysis and techniques.

7. Production System Simulation

7.1 Production system summarize

7.2 Production system key point analysis

7.3 Case study

7.3.1 Case description

7.3.2 Process analysis

7.3.3 Data preparation

7.3.4 Modeling

7.3.5 Model execution

7.3.6 Results analysis

Chapter Summary

Exercises and experiments

References

8. Logistics System Simulation

8.1 Logistics system simulation summarize

8.2 Logistics system simulation key point analysis

8.3 Case study

8.3.1 Case description

8.3.2 Process analysis

8.3.3 Data preparation

8.3.4 Modeling

8.3.5 Model execution

8.3.6 Results analysis

Chapter Summary

Exercises and experiments

References

Through a production system model and a logistics system model, firstly, to display the methods, processes and steps of simulation, secondly, to deepen the understanding of Simio system, thirdly, to form the simulation engineer's visual angle and way of thinking. The modeling processes are consistent with the steps to solve the real system simulation project.

9. System Simulation Future Development

9.1 Technology hot spot analysis

9.2 Technology development prospective

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References

Appendix: Probability and Mathematical Statistics Foundation

I Basic conception

II Common distributions

III Sampling and statistical inference

Annotations: The structure of this book maybe makes a little change in the process of writing.