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The Determination of Optimum In-process Inventory

Susumu SUZUKI (鈴 木 晉)

In order to improve productivity and reduce unit cost, it is necessary for any profit-making firm to set proper in-process inventory in order to make materials flow between production stages smooth.

As it is effective, in general, to control the amount of overtime, it is necessary to set an upper limit of in-process inventory as a criteria of control, and when the in-process inventories at the end of regular working time (7 hours a day) are larger than the upper limit, operations are continued through the overtime work.

This thesis intends to determine the optimum upper limit of in-process inventory which minimize the total cost that consists of storage cost, production lead time cost and overtime cost, and the digital computer is employed to search theoretically the optimum upper limit, and sometimes, simulation approach is applied to break through theoretical difficulties.

Some Notes of Degeneracy in Linear and Quadratic Programming

Masahiro ARIGA (有 賀 正 弘)

The purpose of this thesis is to systematically analyze the concept of degeneracy in linear and quadratic programming, and to explain its geometrical and economic meaning.

Firstly, the definition and the geometrical meaning of degeneracy in a system of linear equations, which is followed by the definition of the primal-and-dual-degeneracy for the optimization problem, and the meaning and a necessary and sufficient condition to avoid the ocurrence of degeneracy.

With the aid of numerical examples, anomalous phenomena when degeneracy occurs in the optimum solutions are described and these phenomena are explained algebraically. The geometrical meanings are also clarified.

One of these phenomena is the existence of certain relations between the optimum solutions and the constraints when degeneracy occurs. A necessary and sufficient condition in these phenomena is proved and termed "Primal Degeneracy-Dependency Theorem' for LP, and "Degeneracy-Dependency Theorem" for QP.

Some interesting results were obtained when we compared the degeneracy con-

ditions in LP and QP, and also we got interesting results when we considered precisely the degeneracy conditions in the primal-and-dual problems.

Finally we show the economic applications of degeneracy conditions and propose the procedures to obtain the information on sensitivity around the optimum solutions under degeneracy conditions.

Analysis of Multiple Autoregressive Time-series

Kenji HARA (原 謙 次)

M. H. Quenouille gives the following method for analysing multiple autoregressive series: Multiple autogressive scheme $X(t)$

$$\boldsymbol{A}_0(X(t)-\sum_{i=1}^{n}\boldsymbol{U}_iX(t-i))=\boldsymbol{\varepsilon}(t)$$

can be represented by some single autoregressive schemes $y_j(t)$:

$$y_jX(t)=\boldsymbol{t}_j'(t) \qquad (j=1, \cdots, m)$$

$$y_j(t)=\alpha_jy_j(t-1)+\gamma_i(t)$$

If the original scheme is the markoff scheme, we can obtain the better estimates of $\boldsymbol{U}_1$ by such operations. In this paper, we discuss the various problems in carrying out analysis of time series observed in practice.

Optimization of Chemical Process

Tokushiro HOSODA (細 田 篤 志 郎)

Recently, the problems of optimal design or the optimal operation for plant unit in the chemical and petro-chemical industries, are well studied. And it is very important to work the optimization of the complex system of connected plant units.

This thesis describes an alternative approaches for the optimization of the chemical processing model, presented by Williams and Otto at the AIEE Winter General Meeting, New York, January 31—Februaıy 5, 1960.

This model is believed to represent a typical chemical process and the problems encounter in controlling it. That is, reaction, heat exchange, multiple separation steps (decanter, distillation column), and recycle streams are included, since these usually are part of a typical process. In addition, the operation of the Williams plant is influenced by the cost of discarding by-product, a finite market for the