

DODGE-ROMIG PLANS REVISITED

(Pelan Dodge-Romig Dilawati Semula)

SHYAMAPRASAD MUKHERJEE

ABSTRACT

Single sampling inspection plans proposed by Dodge and Romig have been critically examined in respect of the distribution of the number of defectives in a sample as and also the requirement of customer's risk being equal to 0.10. The problem of determining the plan parameters has been formulated as a non-linear integer programming, a non-zero-sum (bi-matrix) game problem between the producer and the customer, and also as problem in (non-statistical) decision analysis. Further, the requirement about a given customer's risk has been considered as a fuzzy constraint in a fuzzy non-linear integer programming problem which can be eventually solved in terms of two non-linear integer programming problems, assuming a trapezoidal membership function. Different optimality criteria for determining the plan parameters as constituting the strategies in a decision matrix, where states of nature correspond to various plausible values of lot fraction defective and the pay-off is the average amount of inspection, have been considered. Finally, the author indicates how this analysis is relevant to a wide class of statistical decision problems, particularly many non-parametric tests.

Keywords: decision matrix; non-zero-sum game; regret; prior distribution; fuzzy programming

ABSTRAK

Pelan inspeksi tunggal cadangan Dodge dan Romig telah diteliti secara kritis dari sudut taburan bilangan kecacatan dalam sampel bersama-sama dengan keperluan risiko pelanggan yang ditetapkan pada 0.10. Masalah menentukan parameter pelan telah diformulasikan sebagai suatu yang di dalam pengaturcaraan integer tak linear, iaitu suatu masalah permainan hasil tambah bukan sifar (dwimatriks) di antara pengeluar dengan pelanggan, juga sebagai suatu masalah dalam analisis keputusan (tak berstatistik). Selanjutnya, keperluan risiko seseorang pelanggan dipertimbangkan sebagai suatu kekangan kabur dalam masalah pengaturcaraan integer tak linear kabur yang akhirnya boleh diselesaikan sebagai dua masalah pengaturcaraan integer tak linear, melalui fungsi keahlian trapezium. Kriteria keoptimuman yang berbeza-beza untuk menentukan parameter pelan sebagai membentuk strategi di dalam matriks keputusan, yang keadaan semula jadinya berpadanan dengan pelbagai nilai yang mungkin bagi kecacatan cebisan dan pulangannya menjadi purata amaun inspeksi, telah dipertimbangkan. Akhir sekali, pengarang menunjukkan kerelevanan analisis ini kepada suatu kelas yang luas bagi masalah keputusan berstatistik, khususnya dalam ujian tak-berparameter.

Kata kunci: matriks keputusan; permainan hasil tambah bukan sifar; sesalan; taburan prior; pengaturcaraan kabur

References

- Chakraborty T.K. 1988. A single sampling attribute plan of given strength based on fuzzy goal programming, *Opsearch* **25**: 259-271.
- Chakraborty T.K. 1992. A class of single sampling plans based on fuzzy optimisation. *Opsearch* **29**: 11-20.
- Dodge H.F. & Romig H.G. 1967. *Sampling Inspection Tables*. New York: John Wiley & Sons.
- Hurwicz L. 1951. Optimality criteria for decision making under ignorance, Cowles Commission Discussion Paper. *Statistics* 370.
- Miller D.W. & Staff M.K. 1973. *Executive Decisions and Operations Research*. New Delhi: Prentice Hall of India.
- Mukherjee S.P. 1969. Some problems in parameter determination for Dodge-Romig Plans, Proc. ICQC (Tokyo).
- Mukherjee S.P. & Dey B.R. 1995. A game theoretic solution to parameter determination in Dodge-Romig Plans (unpublished).
- Rao S.S. 1978. *Optimisation Theory and Practice*. New Delhi: Wiley Eastern.

Shyamaprasad Mukherjee

Savage L.J. 1951. The theory of statistical decisions. *Jour. Amer. Stat. Assoc.* **46**: 55-67.
Wald, A. 1949. Statistical decision functions . *The Annals of Mathematical Statistics* **20**:165-205.
Working E.J. 1928. The f-binomial distribution. *Bell System Technical Journal*.

President

Indian Association for Productivity, Quality & Reliability (IAPQR)

AD-276, Sector - I

Salt Lake City

Kolkata 700064, INDIA

E-mail: prof.mukherjee@gmail.com