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動態管制圖之研究

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## 1. ABSTRACT

In the former project (92.8~93.7), we will propose the designs of various adaptive control charts for two dependent process steps, and the measurement approach for the control charts performance are discussed. In this project (93.8~94.7 and 94.8~95.7)), these provided adaptive control charts for multiple dependent processes will be designed from the economic statistical viewpoint. Their performances are compared with traditional fixed control charts. Data analyses show that the cost and performance of the economic statistical adaptive control charts outperform the fixed control charts. These topics have not been addresses so far, so the results will be useful and powerful in practice and academic research.

**Keywords:** Adaptive control charts, Markov chain, fixed control policy, performance.

## 2. RESEARCH MOTIVATION AND OBJECTIVE

To detect an out-of-control process efficient. So far, many papers consider the process mean control for a single process with adaptive sample size, sampling interval or sample size and sampling interval. However, many products are produced from dependent process steps. Hence, some adaptive control policy for dependent process steps is proposed to improve the detection efficiency in the former NSC project. So far, the economic statistical

design of the adaptive control policy for the dependent process steps has not been addressed. In the project, we propose the approaches to solve the problem from statistical and economic viewpoints.

## 3. RESULTS AND DISCUSSION

### Results:

Two topics are finished, and the two papers will be submitted to international journal. The two topics are as follows. (1) An economic statistical model of adaptive sampling interval control chart for dependent process steps is proposed, whose quality can be affected by the occurrence of two special causes, which result in a shift in the process means. The proposed model improves the performance and cost of the fixed sampling interval control charts on dependent process steps. Using the proposed adaptive process control policy for dependent process steps, the process may be monitored with better performance and lower cost.

A Markov chain approach is extended to derive the economic statistical model of the dependent process steps used to determine the design parameters of the adaptive  $\bar{X}$  and  $e$  control charts under two special causes. The expression for the economic model is easier to obtain through the proposed approach rather than by adopting others. The developed model can be extended to study other control charts, like attributes charts or multivariate charts.

(2) We extend the model in (1) to consider the controlling effect of adaptive sampling

interval and sample size of the dependent process steps which together minimize the long term cost. Using the proposed design, the dependent process steps may be monitored adaptively with minimum cost.

A Markov chain approach is extended to derive the adaptive economic model of the dependent process steps used to determine the design parameters of the adaptive sampling interval and sample size control chart, which together minimize the long term cost. It is demonstrated that the expression for the ASSI economic model is easier to obtain through the proposed approach rather than by others, and the performance and cost of the optimal adaptive controlling policy outperforms the optimal fixed controlling policy. The proposed approach can be applied to solve the real problem of the dependent process steps. The proposed processes control approach may use not only on manufacturing industry but also on service industry.

### Suggestion:

All the two topics consider the adaptive process control for dependent process steps. The approaches may be extended to derive the adaptive control charts from economic viewpoints for over-adjusted process steps, or for other control charts, like CUSUM, EWMA and attribute control charts etc.

## 4. EVALUATION

Two topics are finished and will be submitted to international journals. We expect that they will be published on the journals.

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