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SUATU PERBANDINGAN ANTARA CARTA-CARTA KAWALAN BERSTATISTIK DENGAN CARTA KAWALAN BERDASARKAN RANGKAIAN NEURAL

(A Comparison between Statistical Control Charts and
a Neural Network Based Control Chart)

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ABSTRAK

Carta kawalan merupakan suatu alat kualiti yang paling berpengaruh dalam kawalan proses berstatistik dan ia digunakan dengan luasnya dalam proses perkilangan. Apabila permintaan berkaitan dengan kawalan proses semakin meningkat, carta kawalan tradisional tidak lagi mencukupi untuk mengesan perubahan yang mendadak dalam sesuatu proses. Oleh yang demikian, petua larian digabungkan dalam carta kawalan Shewhart $\overline{X}$. Langkah ini, dan juga carta kawalan EWMA diperkenalkan untuk mengatasi pembatasan terhadap kepekaannya. Carta kawalan berdasarkan rangkaian neural merupakan satu langkah baru dan pencapaiannya dibandingkan dengan carta kawalan berstatistik. Data ujian yang sama dijana daripada pemboleh ubah rawak normal piawai dengan menggunakan SAS. Data ini dianggap sebagai data dalam kawalan untuk ketiga-tiga jenis carta kawalan**.** Kriterium yang digunakan untuk membandingkan prestasi kedua-dua jenis carta adalah purata panjang larian (ARL). Daripada keputusan yang didapati, rangkaian neural mempunyai ARL yang lebih baik berbanding dengan petua larian dalam carta kawalan tradisional dan juga carta EWMA ketika mengesan anjakan kecil dan besar dalam min proses.

Kata kunci: purata panjang larian; rangkaian neural; petua larian; EWMA; Shewhart $\overline{X}$

ABSTRACT

Control chart is one of the most powerful quality tools in statistical process control and is widely used in the manufacturing process. As the demand of the quality control increases, traditional control chart is no longer sufficient to detect the sudden change in a process. Thus, run rules are built-in into the Shewhart $\overline{X}$ control chart. This improvement, and also EWMA charts are introduced to overcome the limitation to its sensitivity. Neural network based control chart is a new approach and its performance is compared with the statistical control charts. The same test data from the standard normal random variable is generated using SAS. This data is assumed as the in-control data for the three types of control charts. The criteria to compare the performance of both types of control charts is the average run length (ARL). From the results obtained, neural network has a better ARL than the statistical control charts which includes the run rules of Shewhart $\overline{X}$ control chart and the EWMA chart when detecting small and large shifts in the process mean.

Keywords: average run length; neural network; run rules; EWMA; Shewhart $\overline{X}$

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