Sirimas Pongjanla 2010: Variation Analysis of Neural Network Based Approximation Function. Master of Engineering (Industrial Engineering), Major Field: Industrial Engineering, Department of Industrial Engineering. Thesis Advisor: Mr. Pornthep Anussornnitisarn, Ph.D. 112 pages.

A goal of this research is to investigate the performance of neural network based approximation function in variation prediction. This research develops a scalable artificial neural network (SANN) approximation for pull-control production system as a case study. The pull-control production system in this case study consists of serial workstations and its buffer in which controlled by Kanban method. Three types of SANN, which are 1) Initial workstation 2) Intermediate workstation and 3) Final workstation, were developed to approximate the performance of the production system. This SANN is designed to predict the mean and variance of the four major production performance measures which are: 1) production cycle time 2) the amount of work-in-process 3) the number of sales and 4) the number of lost sales.   Several experiments are conducted to investigate the impact of the number of workstations and the process variation on the performance of SANN.

The results of this research show that SANN effectively predicts (approximates) the mean and variation of the four performance measures of the pull-control production system. The recommended train data size is fifty percent of the set of solutions for individual workstation in developing SANN for the Initial workstation, the intermediate and the final workstation. From the results, direct approximation of the confident interval of performance measures is not possible. However, when using SANN to predict the range of variation in all performance measures, the results indicate the effective prediction. The predictability of variation in cycle time and the number of sales are about 99%. The predictability of variation in work-in-process is about 80% due to the impact from the increase of the number of workstations. The predictability of variation in the number of lost sales is about 90% due to the impact from the small and non continuous value of measures. In conclusion, SANN has shown a great promised in accessing the stochastic measures in large production system.

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