\textit{np} CONTROL CHART BY USING BAYESIAN APPROACH

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Abstract

Quality is one of the variables that consumers consider in choosing a product. Generally, every company wants the quality of products and services always have been better than ever. Good quality comes from a process control. One of the tools can be used to control the quality of the production process is control chart. Generally, control chart is divided into attribute control chart and variable control chart.

In this final project, a design of attribute control chart is analyzed by using Bayesian approach and Binomial distribution. This analysis is conducted for generate new control chart as an alternative to the Shewhart attribute control chart that existed before for detect assignable causes. The value of ARL (Average Run Length) is compared to test the performance of the design of control chart with \( p \) control charts and Shewhart \( np \) control chart.

The analysis results shows that to obtain upper control limits and lower control limit of control chart by using Bayesian approach, the posterior belief based on Bayesian rules is first defined. Furthermore, the posterior belief is updated by using a recursive function in order to obtain a sample point that is plotted \( \Sigma_{i=1}^{k} x_i \). Upper control limits and lower control limit of control chart is obtained from confidence interval of \( \Sigma_{i=1}^{k} x_i \) which conducted with the normal approach. Meanwhile, The value of ARL comparison from three of control chart from \( p_1 = 0.11 \) until \( p_1 = 0.25 \) indicates that the \( np \) control chart by using
Bayesian approach has good performance during $p_1 = 0.11$ to $p_1 = 0.14$

**Keywords**: Statistical quality control, control chart, Bayesian rules, $p$ control charts, $np$ Shewhart control chart and Average Run Length (ARL).