ABSTRACT

This thesis provides an approach of statistical quality control on production processes based on categorical data. Categorical data are classified into nominal scale of coding. But the intermediate assessments are not considered. We aim to resolve the intermediate classifications by fuzzy logic. The work of statistical quality control for categorical data on production processes highlights the following:

- Fuzzy probabilistic approach control charts.
- Fuzzy probabilistic approach control charts with Markov dependence
- Fuzzy probabilistic approach exponentially weighted moving average control charts.
- Fuzzy statistics approach control chart for multinomial attribute processes.

First, we propose a fuzzy probabilistic approach control charts to deal with multivariate attribute processes. Soft computing of quality in the fuzzy evaluation procedure is described. Construction of control charts using membership function and fuzzy probabilistic approach procedures are derived. Numerical example is given to demonstrate the performance of both the approaches of the control charts.

Secondly, control charts with Markov dependence for categorical data is developed. Here control chart uses the weighted sum of movements of non conforming units with respective stationary probability and degree of severity of non-conformance with fuzzy statistics evaluation procedure to all the quality
characteristics. It gives the efficiency of identifying the assignable causes present when an out of control signal appears.

The third, exponentially weighted moving average control charts for categorical data is proposed. We propose a fuzzy probabilistic approach for generating the smoothing parameter which is estimated by using the rate of change of defective item and thereby constructing the control charts depends on the nature of the process which helps to reasonably smoothing the production process.

Finally, we present multinomial attribute process propose control charts by using various fuzzy measures, namely fuzzy midrange, centroid, median and mode. Further, we use power method to identify the significance of the attributes factors. Numerical example is given to illustrate the control charts with these measures.

Statistical process control charts are used in process understanding, assess process stability and identifying changes that indicate either improvement or deterioration in quality. Fuzzy probabilistic approach is useful for making optimal decision under intermediate assessments between categorical coding. We propose to use the intermediate assessment or assessment of categorical data as signal of images, then there is a better way of detecting the assignable causes on production processes. Thus, there is a wide scope for applying image processes or digital image processes in the area of statistical processes control charts on the production processes.