

Modified CUSUM Algorithm for Gradual Change Detection in a Time Series Data

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Abstract : The main objective in a change detection problem is to develop algorithms for efficient detection of gradual and/or abrupt changes in the parameter distribution of a process or time series data. In this paper, we present a modified cumulative (MCUSUM) algorithm to detect the start and end of a time-varying linear drift in mean value of a time series data based on likelihood ratio test procedure. The design, implementation and performance of the proposed algorithm for a linear drift detection is evaluated and compared to the existing CUSUM algorithm using different performance measures. An approach to accurately approximate the threshold of the MCUSUM is also provided. Performance of the MCUSUM for gradual change-point detection is compared to that of standard cumulative sum (CUSUM) control chart designed for abrupt shift detection using Monte Carlo Simulations. In terms of the expected time for detection, the MCUSUM procedure is found to have a better performance than a standard CUSUM chart for detection of the gradual change in mean. The algorithm is then applied and tested to a randomly generated time series data with a gradual linear trend in mean to demonstrate its usefulness.

Keywords : average run length, CUSUM control chart, gradual change detection, likelihood ratio test

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