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A Novel Image Monitoring Procedure Using Jump Regression

Anik Roy
Indian Statistical Institute, Kolkata, India

Abstract

Image monitoring is a comparatively new research area in the field of statistics and machine learning that has wide applications in different areas including medical diagnostics and disease monitoring, satellite imaging, security systems, and so on. Traditionally, quality control techniques have been used widely in manufacturing industries to inspect a process over time to detect any non-random or special cause of variation in the observed data. Due to rapid progress in image acquisition techniques, sequences of images are now a popular data format. Therefore, detection of changes in images over time has become an important research area. In the literature, existing intensity based image surveillance methods to detect out of control images are often unreasonable in many real-life applications where a change in contrast between the background and foreground of an image should not indicate an out-of-control image as long as the boundaries of the image objects remain unchanged. In this regard, we propose a control chart to monitor grayscale images using detected edges of the images. Specifically, we focus on monitoring the Hausdorff distance between the point-set of detected edge pixels in each image from the corresponding point-set of the estimated true in-control image. The proposed control chart should be easy to execute for the practitioners in many real-life applications. Numerical studies show that it outperforms several competing methods in various examples. This is a joint work with Dr. Partha Sarathi Mukherjee(Indian Statistical Institute, Kolkata).

Keywords:
Edge-Based Image Monitoring; Hausdorff Distance; Shewhart-Type Chart.