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## Damage Detection on the NPL Footbridge Under Changing Environmental Conditions

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Over the years 2009 to 2011, a full-scale footbridge was the subject of a comprehensive monitoring campaign at the UK's National Physical Laboratory. The footbridge was densely instrumented with a variety of different sensors covering a variety of different modalities. The bridge was monitored in its normal undamaged condition over an extensive period covering a wide range of seasonal variations in its environment. At times in the monitoring campaign systematic damage was introduced. For structural health monitoring of the bridge an unsupervised learning approach, or novelty detection, is desirable, where one assumes that only measurements of the normal condition are available to define a baseline. The standard issue then arises of projecting out the environmental variations from feature data so that alarms are not raised as a result of benign changes. In the current paper, the means of removing the environmental effects is via the use of the cointegration algorithm, which has recently been adapted for this purpose from the discipline of econometrics. Damage detection results are presented based on the use of Statistical Process Control (SPC) algorithms. The results are shown to be consistent with the history of the bridge throughout the experimental campaign.

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**Ключевые слова:**

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