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Detection performance of dynamic correlation processors using de-noised signal space-spanning templates

Correlation detectors are often used in a context in which detections are implicitly assumed to be identifications. This assumption is valid at sufficiently high detection thresholds. But we often wish to set thresholds as low as possible in order to detect signals obscured by noise. By doing so, we introduce the possibility of detecting signals not from the source of interest. In this work I study the performance of dynamic correlation processors in two scenarios: close-in monitoring of an active coal mine using single channel detectors, and global monitoring using 3-component detectors. In both scenarios a first pass through the data is used to create sets of detectors that span the space of high-SNR signals. Detections from these detectors are used to create de-noised templates using singular value decomposition. The new suites of detectors are then used to re-process the data. The new templates have large projections on one another, so it is common to produce many triggers per signal. For most detections there are tens to hundreds of triggers considered, showing that the signal space was well sampled. Where interevent separations are known, the detectors are shown to be highly specific.

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