Title:

A Survey on Audio-Video Based Defect Detection Through Deep Learning in Railway Maintenance

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Abstract:

Within Artificial Intelligence, Deep Learning (DL) represents a paradigm that has been showing unprecedented performance in image and audio processing by supporting or even replacing humans in defect and anomaly detection. The railway sector is expected to benefit from DL applications, especially in predictive maintenance applications, where smart audio and video sensors can be leveraged yet kept distinct from safety-critical functions. Such separation is crucial, as it allows for improving system dependability with no impact on its safety certification. This is further supported by the development of DL in other transportation domains, such as automotive and avionics, opening for knowledge transfer opportunities and highlighting the potential of such a paradigm in railways. In order to summarize the recent state-of-the-art while inquiring about future opportunities, this paper reviews DL approaches for the analysis of data generated by acoustic and visual sensors in railway maintenance applications that have been published until August 31st, 2021. In this paper, the current state of the research is investigated and evaluated using a structured and systematic method, in order to highlight promising approaches and successful applications, as well as to identify available datasets, current limitations, open issues, challenges, and recommendations about future research directions.

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