IDENTIFICATION OF DEFECTS IN THE PRODUCTION OF POWERED WINDOW REGULATORS USING DEEP LEARNING ON VIBRATION AND NOISE DATA

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Powered window regulator is an important component of automobile. Its smooth operation and timely response are crucial for the better functionality of automobile. Defects like noisy operation and slow response imply manufacturing faults. Conventional quality inspection uses auditory assessment method, which is labor insensitive and error prone. This study suggests a deep learning based automated fault detection using a ResNet-50 Convolutional Neural Network (CNN) to classify power window regulator using spectrograms derived from vibration signals. An accelerometer is employed to collect vibration data and labeled as OK or NOK. The time series vibration data is transformed into spectrograms via Short Time Fourier Transform (STFT). The fined tuned ResNet-50 model with a custom classification layer, achieved 96% validation accuracy and 0.066 loss.

The results show the model is able to accurately classify noise patterns. It eliminates human error and increases productivity by reducing inspection time 60%. This approach aligns with Industry 4.0 standards, providing a scalable solution for quality assurance in manufacturing. In future work, the model will be deployed on edge devices and will also introduce the root cause analyses. A web application will also be developed for remote supervision, defect sorting, and alerts for recurring issues.

Keywords: Powered Window Regulator, Vibration & Noise, Defects Detection, Deep Learning, ResNet-50, Convolutional Neural Network