FACULTY OF ENGINEERING AND ARCHITECTURE

NME 2023

The 6th International Conference on Numerical Modelling in Engineering

August 27-29, 2023, physically (NH Gent Belfort)

Quantification of two separate cracks by retrieval of relevant features from vibrational data using a deep 1D CNN network

Muhammad Irfan Shirazi, Samir Khatir, Magd Abdel Wahab

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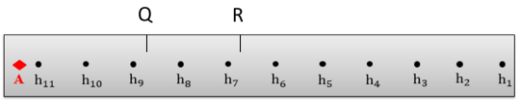
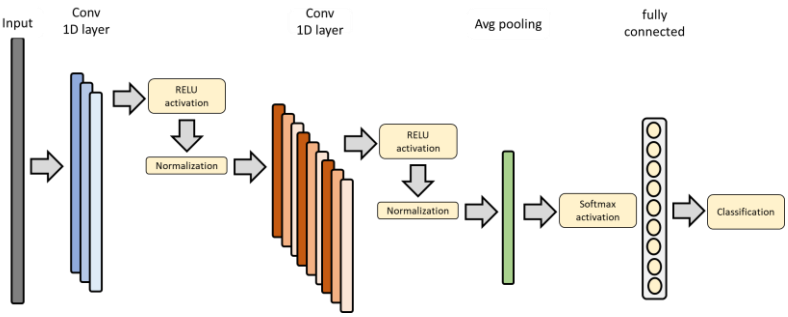
Introduction: Composites are integral part of modern society.. They have revolutionized the materials industry . For many of these critical applications, health monitoring is an important aspect to ensure safety and maintenance for long service life.

Artificial intelligence is a rapidly growing field of research in this area mainly because it allows lesser cost, high resolution to features and higher accuracy with large data. Moreover, latest advancements are also moving deep learning in the direction of real-time detection.

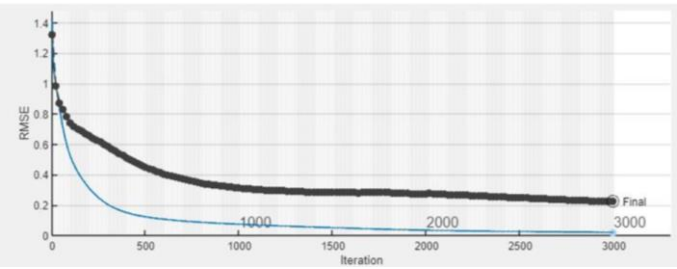
Methodology: A deep learning 1D-CNN is fed with data from healthy and damaged data from an accelerometer. The vibration data is collected from an FE model. The FE model simulates hammer strikes at 11 places.

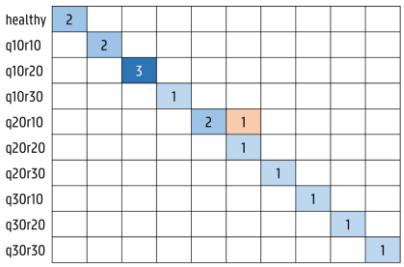
Crack depth	Crack location	
	100mm	184mm
10mm	Q10	R10
20mm	Q20	R20
30mm	Q30	R30





Results: The 1D-CNN is capable classifies the quantity of crack depth of quantifying two damages at the same time.





Conclusions: 1D-CNN is capable of extracting individual damage features from two cracks simultaneously.

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