

Wavelet Based Detection of Signal Disturbances in Cab Signalling System

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Abstract— The problem considered in the work is concerned to the methods to reveal and identify the signal disturbances occurred in the railway cab signaling system caused by electromagnetic interference from traction current. The continuous automatic locomotive signalling system (ALSN) is a type of cab signalling systems that provides track status information to the train cab and uses the rails as a continuous communication channel between track and train. To ensure the reliability of the transmission of ALSN commands to the train cab, the basic parameters of the coded current are periodically checked for compliance with certain requirements during planned test trips of a specially equipped railway car-laboratory. The ALSN signal is received by the coils of the car-laboratory and recorded by computer. Then an operator visually analyzes the recorded signal to detect problem segments with interference exceeding the limit level what requires a lot of time and does not provide the necessary accuracy. To automate the detection and identification of the ALSN signal disturbances, the following algorithm has been proposed. At the first stage, the wavelet packet energy Shannon entropy is used to reveal problem segments of ALSN signal. At the second stage, a detailed analysis of the ALSN signal using DWPT is performed to determine the type and parameters of interference at the revealed problem segments. To classify ALSN signal disturbances, an artificial neural network was used. The efficiency of the proposed algorithm was verified by processing of several specially simulated as well as real ALSN signals measured during tests.

Keywords—*electromagnetic interference, cab signalling system, signal disturbances, wavelet transform*

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