Research of possibility of application of scaled functions for the analysis of signals of defect detection of railway rails

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Annotation *- the method of analysis of signals of magnetic-dynamical crack detection in railway rails is described.*

Keywords *- fault detector, transversal crack, signal processing.*

I. INTRODUCTION

Detection of defects of rails in advance with methods of undestructive control is the most essential element of accident-free exploitation of the railway.

One of such methods is a speed magnetic-dynamical method. Without regard to numerous attempts to automatize the process of exposure of defects and their classification, basic work all the same lies down on the shoulders of experienced workers of carriage of defect detector. Thus authenticity of results of control by mobile facilities is insufficient. 20% of breaks of rails is caused by defects which were skipped by operators.

In 2000 year in Russia more than 63 % replacements of rails was provided because of defects in the head of rails;

More than 50 % replacements of rails was conducted through the most dangerous defects of type of transversal crack on the code 20.(1-2), 21.(1-2) and 26.3

The indicated defects are caused by the presence of technological (factory) defect, insufficient rolling-contact durability of metal, violation of technology of welding of rails. [2]

II. THEORETICAL PART

Research of possible methods of automation of process of the signal processing from the magnetic-dynamic carriage of defect detector is the purpose of this work.

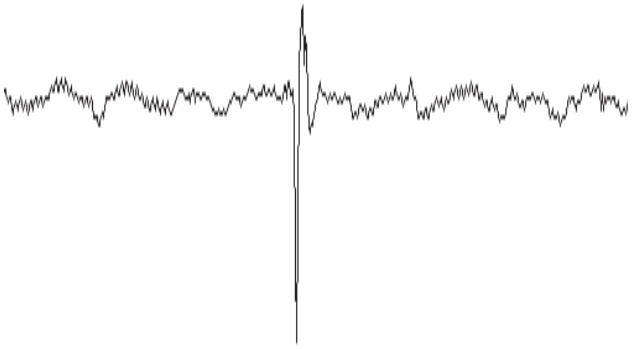

Fig.2. Signal from a transversal crack without going out on surface

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The wavelet analysis of defect detection signals was conducted with application of classic base functions, and also a wavelet was created on the basis of the practically recorded signal from a defect.

The maternal wavelet was created on the basis of signal from the real defect and the wavelet analysis of fault detection signal is conducted in this base. It gave possibility to conduct correlation of fault detection signal with the signal of defect taking into account that a defect can be stretched or compressed in time.

III. RESEARCH RESULTS

In the real records of fault detector counting out of signal is hardly tied to the coordinate, and that their stretch or compression due to the change of sampling frequency of ADC can be ignored.

On the basis of wavelet decomposition in the basis of signal from a defect the method of distinction of correlation functions from different defects and other elements of track was offered. Amplitude of correlation of sample of signal of defect with the sample of signal from the joint of track has bigger relative amplitude than auto correlation function of signal from a defect. It is related to big energy of signal from a rail junction. This factor limits possibility of application of correlation for the exposure of defects.

IV. CONCLUSION

With a different scale that is the feature of correlation of signals, that an auto correlation function always has a maximum at a scale 1:1, and correlation with other signals gives a maximum at the other scale. For distinction of such signals it is necessary to apply the algorithm of search of maximum and analysis of declination of function from it. This method can be easily realized using a neuron network.

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