Smart technology solutions for the NeTIRail-INFRA case study lines: Axle box acceleration and ultra-low cost smartphones

Nunez, Alfredo; Popa, Tudor; Anghel, Lucian Emmanuel; Hendriks, Jurjen; Moraal, Jan; Buretea, Laurentiu Dorin; Paragreen, Jon; Miron, Berbece; Gheorghe, Draghici; Campean, Mihail

Publication date
2018

Document Version
Accepted author manuscript

Citation (APA)
Nunez, A., Popa, T., Anghel, L. E., Hendriks, J., Moraal, J., Buretea, L. D., Paragreen, J., Miron, B., Gheorghe, D., Campean, M., Dollevoet, R., & Li, Z. (2018). *Smart technology solutions for the NeTIRail-INFRA case study lines: Axle box acceleration and ultra-low cost smartphones*. Poster session presented at Transport Research Arena 2018, Vienna, Austria.

VIENNA 2018 TRA
A digital era for transport
solutions for society, economy and environment

SMART TECHNOLOGY SOLUTIONS FOR THE NETIRAIL-INFRA CASE STUDY LINES: AXLE BOX ACCELERATION AND ULTRA-LOW COST SMARTPHONES

10296

Alfredo Núñez[1], Tudor Popa[2], Lucian Emmanuel Anghel[2], Jurjen Hendriks[1], Jan Moraal[1], Laurentiu Dorin Buretea[2], Jon Paragreen[3], Berbece Miron[4], Draghici Gheorghe[4], Mihail Campean[4], Rolf Dollevoet[1], Zili Li[1]

[1] Section of Railway Engineering, Delft University of Technology, Delft, The Netherlands.
[2] ADS Electronics, Bucharest, Romania.
[3] MERail Railway Research Group, The University of Sheffield, United Kingdom.
[4] RC-CF, Romania.

ABSTRACT

Results on the development of smart technology solutions for lower density railway lines are presented. The goal is to reach a cost effective inspection and asset management to minimize maintenance interventions time/cost without dedicated inspection vehicles.

The proposed methods in this paper include: 1) axle box acceleration measurements and 2) ultra-low cost smartphones.

The data is interpreted and converted from monitoring information into management information. Feasibility and preliminary studies were conducted in the railway lines of Romania. The results presented in this paper were obtained in the framework of the H2020 project NeTIRail-INFRA.

CONCLUSIONS

Methodologies based on accelerometers mounted either at the axle box or in the train vehicle are proposed for estimating track and ride quality.

The data collected from both systems contains useful information for railway infra-managers. With ABA, it is possible to rank the quality of the welds and rail defects. With the smartphone technology it is possible to map over the network the ride comfort, which is important for the users and for the safety.

With adaptive and intelligent signal processing methods, it is possible to extract the key information needed to anticipate the impact of degradation and determine the maintenance actions needed to correct the problems in the infrastructure.

AXLE BOX ACCELERATION MEASUREMENTS

For ABA measurements, a number of accelerometers are mounted on the axle boxes. Data is collected from accelerometers, a GPS receiver and either a tacho or speed-sensor for positioning. The train SNCF Class X 4500, that operates on the line Bartholomeu-Zarnesti was employed during operation (with passengers on-board).

Figure 1. NeTIRail-INFRA partners during the measurement campaign.

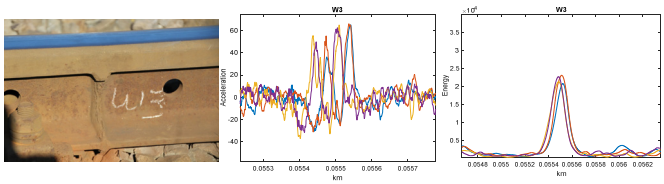

Figure 2. Example of measurements on a weld, a) photo of the weld, b) ABA in the time domain at the weld, c) energy due to weld-wheel impact.

This research was supported by H2020 project NeTIRail-INFRA No. 636237

ULTRA-LOW COST SMARTPHONES

The smartphone's ability to monitor passenger comfort on a train was in accordance with the standard ISO-2631-1:1997. The test was performed in Romania on route Bartholomeu– Zarnesti on a passenger train that moved for one hour over a distance of approximately 27 km.

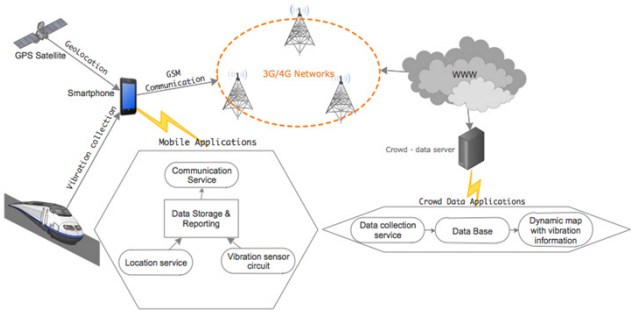

Figure 3. Architecture for system for track and ride quality monitoring.

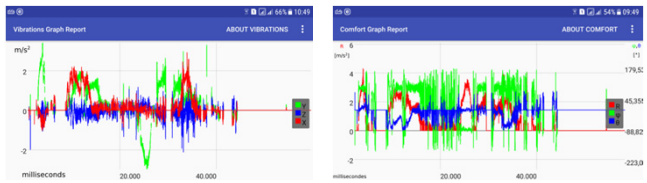

Figure 4. a) Vibration diagram, b) Comfort and rotational acceleration diagram.

www.traconference.eu

Hosted and organised by:
Austrian Ministry for Transport, Innovation and Technology
AIT Austrian Institute of Technology Tomorrow Today
austriatech

Co-organised by:
European Commission

Together with:
ACARE
alice
CEDR
ECTP Innovative Built Environment
ERRAC
ERTRAC
ETRA
WATERBORNE