Subject

Analysis of noise and vibration in rail transport

List of proponents (with e-mail address of the responsible person)

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Description of the international background of the proposal

Noise and vibration analysis and control has been extensively studied in the past 30 years, namely through several EC funded projects (Silent Track, Silent Freight, Eurosabot, Euroecran, Metarail, STAIRRS). The proponent has been responsible for the POLITO unit participating in 2000-2002 to STAIRRS (Strategies and Tolls to Assess and Implement noise Reducing strategies in Railway Systems) WP2 (Characterisation & Classification Methodologies). Aim of WP2 was to develop methodologies (experimental and analytical-numerical) for describing different types of railway track and vehicles separately and propose an appropriate classification system for trains and track types, aimed at determining the contributions of vehicle and rail to noise emission. Main output of the work has been the construction of a database containing train and track noise data from each participating country, and a proposed classification system. Furthermore, several analysis tools have been developed and tested that have proved suitable for separating the track and vehicle contribution to noise emission.

Research program objectives (intermediate and final) and expected results

Results obtained in STAIRRS have confirmed that an hybrid experimental / numerical approach is suitable for achieving the track / vehicle source separation. Another possible approach, that still has to be fully assessed, is to include signal analysis as a third tool. Preliminary investigations have proved the feasibility of using vibration signal analysis to classify train wheel types and identify wheel defects; a classification tool based on fuzzy-logic has already been developed at POLTO and tested on experimental data gathered during the STAIRRS project. Possible objectives of the research are:

- to further test the classification tool based on fuzzy-logic,
- to develop and test a classification approach based on neural networks
- to improve the separation tools using time-frequency analysis techniques.

List of publications of the proponents and/or specific references (with titles)