Automatic railway tracks squats detection

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ABSTRACT

The design of crack finding mechanism for locating cracks within the railway tracks. The Transportation of train continually depends on the railway tracks (rails) solely. If there's a track in rails, it creates the most important downside. The device placed within the wagon senses the variations and also the deviation within the track so it offers the signal to the microcontroller. The microcontroller checks the variations within the voltage of the measured price with the edge price. If the microcontroller detects the crack within the railway track, it right away gets the precise location info victimization stepper motor mounted on the wheels of the device and sends that location in keeping with the amount of revolution of the device and sends crack info to the management section. The management section displays the precise location that latitude and line of longitude price in map by victimization Arduino ISP package.

Keywords : ISP-Internet Service Provider.

Introduction

There is a need for manual checking to detect the crack on railway track and always railway personnel takes care of this issue, even though the inspection is made regularly. [1] Sometimes the crack may unnoticed. Because of this the train accident or derailment may occur. In order to avoid this situation and automate the railway crack detection has been proposed. Here ultrasonic sensor is used to detect the crack in the railway track by measuring distance from track to sensor, if the distance is greater than the assigned value the microcontroller identifies there is a crack. [2] The recent Indian railway network has a track length of 113,617 kilometers (70,598 mi) over a route of 63,974 kilometers (39,752 mi) and 7,083 railway stations. It is the fourth largest railway network in the world.

Indian rail network is still associated with lack of safety infrastructure. Our facilities are inadequate compared to the international standards and as a result, there have been frequent derailments that have resulted in severe loss of valuable human. About 60% of all the rail accidents is due to derailments, recent statistics reveal that about 90% are due to cracks on the rails. [3] Hence these cracks in railway lines have to be addressed with utmost attention due to the frequency of rail usage.

Literature Review

A Big Data Analysis Approach for Rail Failure Risk Assessment

[7] This method is based on the image processing approach for automatic detection of squats, especially severe types that are prone to rail breaks. It is based on measuring the visual length of the squats and use them to model the failure risk.

Detection of rail squats based on Hilbert-huang transform by using bogie acceleration measurement

This detection method of squats is based on the in-service vehicles is presented. The bogie acceleration signal is used to detect the squats on the track.[5] To validate the possibility of the proposed method. With the help of SIMPACK software, an in-service vehicle-track dynamic model and models of typical squats are built to generate the simulated bogie acceleration signals when the train wheels rolls over the squats.

Automatic Detection of Squats by using axle box acceleration method

[8] The method is based on a series of research results from our group in the field of railway engineering that includes numerical simulations, the design of the ABA prototype, real-life implementation, and extensive field tests. This method enhances the ABA signal by identifying the characteristic squat frequencies, using improved instrumentation for making measurements, and using advanced signal processing. Visual algorithms for automatic detection of squat flaws in railway rails. It seems that vision-based techniques can be a good alternative solution. The paper presents an algorithm allowing for the detection of these flaws.[4] It uses wavelet transform to extract the rail from the background of the image. [5] A Gabor filter bank along with a support vector machine (SVM) as a classifier were used in the squat detection process.

Proposed system

The frequency range of the inertance function is defined by the hammers used and the applicability of the measured data, which, in this case, cover frequencies between 50 and 3000 Hz. In the case of longitudinal and vertical accelerations (x and y-directions, respectively), axial symmetry of the wheel permits some correlation with squats (in the plane of the wheel). In the region of interest between 400 and 2000 Hz, observes a correspondence between many of the peaks and dips of both vertical and longitudinal signals meaning that there are many excited modes in common. In normal operating conditions, the wheel is loaded in the vertical direction, resulting in a higher vibration magnitude than in the case in which the wheel is lifted up for the hammer test. However, during the hammer test measurements, the wheel was lifted (at the bogie frame), and thus, the wheel load was only the weight of the wheel set, which is considerably less than the typical load of the train. Hence, the system was "theoretically" under the investigated unloaded condition with no noise from the vibrations of the track components, and longitudinal ABA has higher sensitivity to the impact of the hammer in the high-frequency range. The sensitivity of vertical and longitudinal ABA should be equal due to axial symmetry. The lower sensitivity of vertical ABA can be attributed to the fact that the wheelset hung on the bogie frame through the first suspension, which included damping from the damper and rubber pads. Under normal loading conditions, this concept was later proven in the field with extensive measurements.

In this sense, the loading of the wheel is not the most influential factor; thus, the mounting position of the vertical sensor on the highest loading path of the wheel or less-loaded location should not significantly change the resulting signal. The longitudinal response is between one and ten times the vertical response in the frequency range of interest. In longitudinal ABA, the response is theoretically purely due to an impact; thus, the sensitivity can be defined as 100Hammer test on the wheel Inertance is calculated. Finally, in practice, for many ABA measurements since 2009, the magnitude of longitudinal ABA at light squats/indentation is higher than that of vertical ABA. The magnitude of longitudinal ABA is 1.4 times higher than that of vertical ABA. A particularly important effect also occurs with the frequency contents. WPS is considerably stronger for the longitudinal ABA measurement. Due to this effect on the power spectrum, the use of longitudinal ABA is significant for improving the detection of light squats. In the case of moderate and severe squats, whose related frequency contents are different from those of light squats, the use of longitudinal ABA increased the hit rate from 60% to 100%. Additional Analysis and Remarks Regarding the sensitivity of lateral ABA to squats, theoretically, it is not evident how the vibrations caused by the impact at squats can be transmitted from the wheel–rail interface to the axle in the lateral direction. A squat causes an impact to a wheel in the vertical direction, which induces forced vibration of the wheel set. The mode shapes of the wheelset can be classified into two groups: wheel modes and axle modes. This is a powerful and economic solution for railway vehicles and hard industrial environments. IMx-R complies with the Technical Specifications for Interoperability (TSI) for high-speed trains, and can include 24 inputs that can be measured at the same time

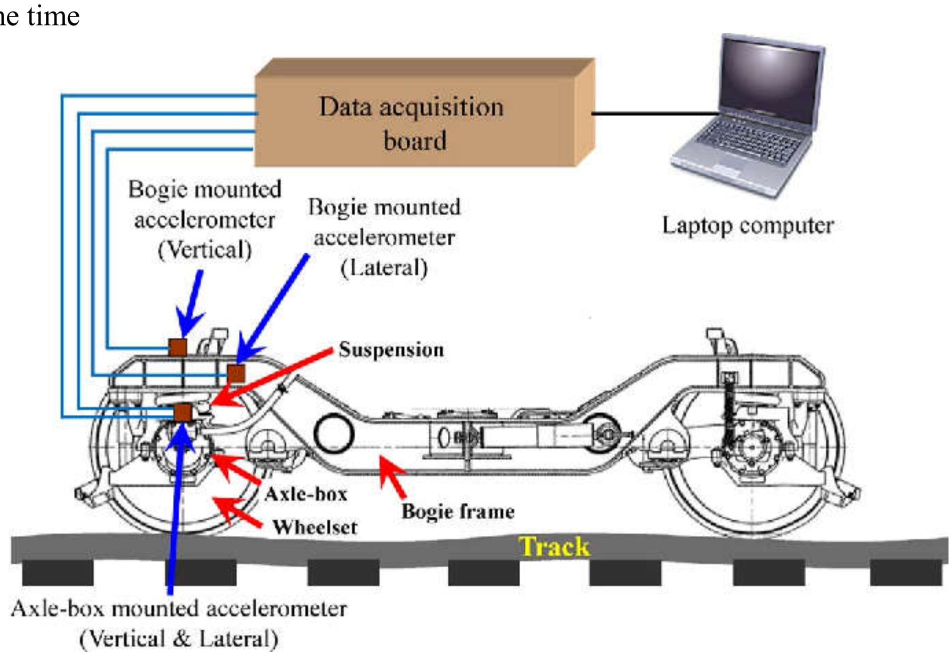

Figure 1. Block diagram of ABA

Results

By using this Autonomous vehicle for purpose of railway track inspection and crack detection, have a great impact in the maintenance of the tracks which will help in preventing train accidents to a very large extent. The regions where manual inspection is not possible, like in deep coal mines, mountain regions and dense thick forest regions can be easily done using this vehicle. This will help in maintenance and monitoring the condition of railway tracks without any errors and thereby maintaining the tracks in good condition, preventing train accidents to very large extent Railway track crack detection autonomous vehicle is designed in such a way that it detects the cracks or deformities on the track which when rectified in time will reduce train accidents.

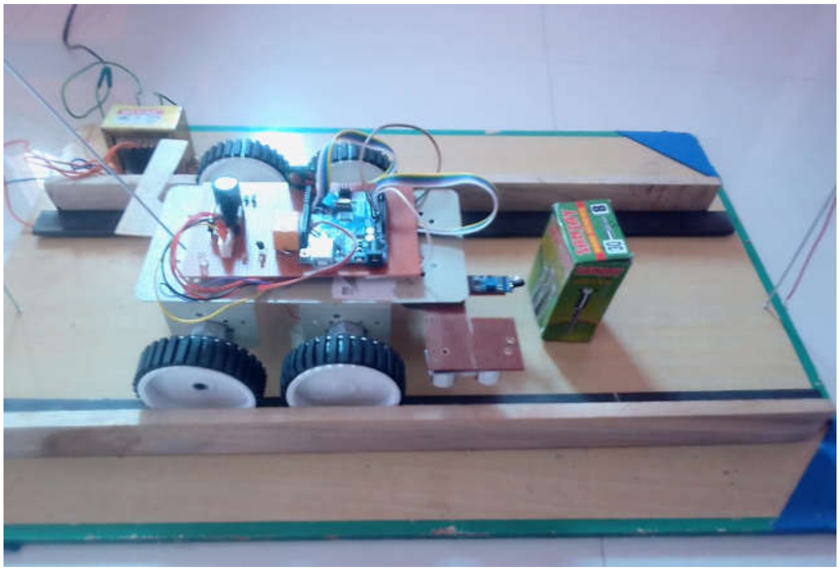

Figure 2. Vehicle movement along the track.

Conclusion

By using this Autonomous vehicle for purpose of railway track inspection and crack detection, have a great impact in the maintenance of the tracks which will help in preventing train accidents to a very large extent. The regions where manual inspection is not possible, like in deep coal mines, mountain regions and dense thick forest regions can be easily done using this vehicle.

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