

Chapter 38

Wayside Train Monitoring Systems: Origin and Application

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ABSTRACT

The present competitive world of transport particularly the rail industry is driven by automation and centralization. New ways are being devised each day by the operators and managers to improve efficiency, operational safety, and risk control. Big Data and its multiple applications play a significant role in developing ways of analyzing and evaluating the rail data gathered and using it to enhance the transport industry. Wayside train Monitoring System is a field that is slowly gaining popularity through the different methods it provides to handle the big Data of the transport industry. It can measure the operational performance of rolling stock and infrastructure assets as well as the direct surroundings. The chapter addresses the problem of overall safety and optimum cost of railways transportation. Consequently, the chapter aims to resolve the following issues: How can the rail industry leverage the enormous amount of data available? How can industry players benefit from the data and use it to understand the real needs of travelers?

INTRODUCTION

The discipline of data collection and analysis has undergone a drastic change in the last 10 years. Technological progress in industries such as sales, healthcare, road transport, aviation etc. has given birth to new opportunities. The big-data technology helps improving data collection and analysis by providing sophisticated tools for data collection, analysis, and visualization. It plays a vital role in reducing the

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Wayside Train Monitoring Systems

human intervention in the reporting systems. The public transport industry has been at the forefront of utilizing applications of this technology. The railway system can be categorized into two different principles. The first one, based on a functional approach and the second based on safety. These are the sub-systems of the railways that need immediate attention of the Big Data technology:

1. Infrastructure
2. Trackside control-command and signaling
3. On-board control-command and signaling
4. Energy
5. Rolling stock
6. Operation and traffic management
7. Maintenance

Among the multiple approaches available, Wayside Train Monitoring System (WTMS), if used to its full capacity, can prove to be highly significant. WTMS provides methods to improve the detection, reporting, and analysis of occurrences. The chapter aims to investigate the potential for Big-Data in the railway industry with an objective of improving the safety level of the Single European Railway Area and the efficiency of the occurrence reporting by reducing human interference in the reporting process.

BACKGROUND

In today's world, there are many opportunities available to improve the productivity, reliability, velocity and safety of railroads. A major challenge in this field is the efficient utilization of 'Big Data' to improve these factors. Big Data is an all-encompassing term for any collection of data sets so large and complex that it becomes highly cumbersome to process them using traditional data processing approaches.

The 3 elements of Big Data are summarized using the 3 V's approach: Volume, Velocity, and Variety.

1. Volume is the size of the data sets: the magnitude order is from Terabyte to Petabyte;
2. Variety means that big-data can deal with data coming from multiple sources and having different structure;
3. Velocity can be understood as the capability to comprehend the vast input data and produce meaningful output.

Currently, railroads are dependent on sources like GPS, AEI readers, electronic data exchange, video inspections, hand-held field tables etc. to collect enormous quantities of data. The data is primarily divided into 3 categories: Fixed, Mobile and Organizational elements. The Fixed element comprises of the network, which is made of lines, stations, terminals, and all kinds of fixed equipment that ensures safe and continuous operation of the system. The Mobile Elements refers to all types of vehicles traveling on that network and lastly, the Organizational elements are the sub-systems that deal with the functioning of the fixed and mobile elements.

Therefore, the data from all the above sources and much more is growing both in quantity and quality and is getting more vast and frequent. The traditional approaches are not being fruitful to analyze

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