REAL TIME KINEMATIC
GLOBAL NAVIGATION SATELLITE SYSTEMS
IN RAILROAD TRANSPORTATION

by
Peter Joseph Dailey

Dissertation Submitted to the
College of Engineering and Mineral Resources
at West Virginia University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

IN CIVIL ENGINEERING

Approved by
David R. Martinelli, PhD, Committee Chairperson
Darrell R. Dean, PhD
Jim French, PhD
Andrew Nichols, PhD
Avinash Unnikrishnan, PhD

Morgantown, West Virginia
2010

Keywords: transportation engineering; rail; railroad; infrastructure; track; trackway; railway; inspection; freight; GPS; GNSS; NDGPS; real time kinematic; RTK; VRS; positive train control; PTC; location determination system; LDS; yard; class yard; classification yard; hump yard; survey; profile; alinement; alignment; track occupancy; FRA; USDOT; degree of curvature; string line

Abstract

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Transportation of freight by rail is an exceptionally fuel-efficient mode. Rail's exceptional efficiency comes with a high cost for inspection and maintenance of the railway to insure train safety at design speed. The Federal Railroad Administration (FRA) imposes operational safety by requiring compliance with regulations that rely on timely track inspection.

Further, new standards for train movement authority, known collectively as positive train control, require knowledge of a train's exact location on the railway. This knowledge has traditionally relied on wired track circuits due to the need to distinguish a train's location on two or more parallel tracks.

The research examines a technology to augment signals from navigation satellites in real time, available from many state governmental agencies at little or no cost, yet proclaimed by the US Department of Transportation in 2008 as "unsuitable for transportation applications". The successful application of this technology may enable rail companies to inspect the track way with greater safety at lower cost, and enable train location determination systems in positive train control independent of wired track circuits.

The results of three experiments conducted within the safety and access constraints of a Class I railroad are presented. The first surveys a 58-track hump yard by locomotive during production operations. The second determines horizontal track alignment over 29 miles of mainline track using inspector's Hi-Rail. The third experiment tests the hypothesis that RTK GNSS technology can meet the FRA's stringent requirement as a reliable indicator of track occupancy. The research outcome suggests more efficient techniques for selected track inspection tasks, as well as a wireless method to determine track occupancy.

Acknowledgements

The author wishes to thank the following organizations and individuals for their guidance and assistance.

West Virginia University
Dr. David Martinelli, Dr. Darrell Dean

Nick Joe Rahall Transportation Center
Robert Plymale, Dr. Richard Begley, Dr. Dianna Long, Alejandro Sanchez, Carlos Ramirez, Salvador Djeukeng

Marshall University
Dr. Anthony Szwilski, Dr. William Pierson, Dr. Rick McCormick

CSX Transportation
Michael Ward, John West, Bernie Sanders, Mike Nall, Gil Barnes, Don VanWormer, Ron Bright, Les Miller, Bill Kelly, Rodney VanPelt, JR McCloud

Ohio Department of Transportation, Aerial Engineering
Dave Beiter

Dedication

This research is dedicated to the men and women of the railroad industry that go to work thinking of their own and of their coworker's safety; perform their duties while remembering to work safely; and at the end of each shift, return safely home to their loved ones. Then, wake up and do it all again, every day.

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