REAL TIME KINEMATIC GLOBAL NAVIGATION SATELLITE SYSTEMS IN RAILROAD TRANSPORTATION

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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.

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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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